

# Core 304L/4307

EN 1.4307, ASTM TYPE 304L / UNS S30403

## General characteristics

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.

Core 304L/4307 is an austenitic stainless steel that belongs to the standard CrNi stainless steel family.

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 304L/4307 is commonly available from many stainless steel stockists in many product forms and dimensions. Core 304L/4307 is also available in the temper rolled condition with higher strength.

## Typical applications

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

# Products & dimensions

## Cold rolled products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
2B	Cold rolled, heat treated, pickled, skin passed	0.25-6.35	12-2070	0.25-7.00	18-2070
2BB	Bright-pickled	0.25-3.50	30-1524	0.25-3.50	350-1530
2C	Cold rolled, heat treated	0.80-6.00	30-1500		
2D	Cold rolled, heat treated, pickled	0.30-6.35	30-1610	0.30-6.35	35-1610
2E	Cold rolled, heat treated, mech. desc. pickled	0.33-6.65	12-2070	0.33-6.35	18-2070
2F	Cold rolled, heat treated, skin passed	0.33-3.58	12-1524	0.33-3.58	18-1524
2G	Ground	0.30-4.00	12-1592	0.30-6.35	18-2070
2H	Work hardened	0.05-6.00	3-1530	0.30-6.00	18-1530
2J	Brushed or dull polished	0.30-3.00	30-1530	0.30-3.00	400-1530
2K	Satin finish	0.50-4.00	12-1600	0.50-4.00	18-1524
2M	Patterned	0.30-3.50	30-1530	0.30-3.50	400-1524
2R	Cold rolled, bright annealed	0.05-3.50	3-1500	0.25-3.50	18-1500
2W	Profile rolled	0.40-1.50	36-1275	0.40-1.50	400-1250

## Continuous hot rolled products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
1C	Hot rolled, heat treated, not descaled	1.90-10.00	50-1620		
1D	Hot rolled, heat treated, pickled	2.40-12.70	50-2070	2.40-12.70	50-2070
1E	Hot rolled, heat treated, mech. desc.	1.36-5.10	50-1620	1.36-4.50	50-1620
1G	Ground	1.90-3.00	750-1350	1.90-3.00	750-1350
1H	Hot rolled, temper rolled	2.00-10.00	35-1530	2.00-10.00	35-1530
1M	Patterned	1.90-3.00	750-1350	1.90-3.00	750-1350
1U	Black hot rolled	1.90-10.00	50-1550		

## Quarto plate products, available dimensions (mm)

Surface finish		Coil / Strip		Plate / Sheet	
		Thickness	Width	Thickness	Width
1D	Hot rolled, heat treated, pickled			5.00-130.00	400-3200
1G	Ground			10.00-29.99	400-3200

# 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
<b>Typical</b>	<b>0.02</b>		<b>18.1</b>	<b>8.1</b>			
ASME II A SA-240	≤0.030	≤2.00	17.5-19.5	8.0-12.0		≤0.10	
ASTM A240	≤0.030	≤2.00	17.5-19.5	8.0-12.0		≤0.10	
ASTM A666	≤0.030	≤2.00	18.0-20.0	8.0-12.0		≤0.10	
EN 10028-7	≤0.030	≤2.00	17.5-19.5	8.0-10.5		≤0.10	
EN 10088-2	≤0.030	≤2.0	17.5-19.5	8.0-10.5		≤0.10	
EN 10088-3	≤0.030	≤2.00	17.5-19.5	8.0-10.5		≤0.10	
EN 10088-4	≤0.030	≤2.0	17.5-19.5	8.0-10.5		≤0.10	
IS 6911	≤0.030	≤2.00	17.5-19.5	8.0-12.0	≤0.70	≤0.10	
IS 6911	≤0.030	≤2.00	17.5-19.5	8.0-12.0	≤0.70	≤0.10	

## Corrosion resistance

Core 304L/4307 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 304L/4307 may suffer from uniform corrosion in strong mineral acids and hot strong alkaline solutions. More detailed information on the corrosion properties of Core 304L/4307 can be found in Outokumpu's Corrosion Tables published in the [Outokumpu Corrosion Handbook](#) and on [www.outokumpu.com](http://www.outokumpu.com).

Due to its low carbon content, the risk of sensitisation for intergranular corrosion after welding sheets up to 6 mm thick is strongly reduced when compared to other austenitic CrNi standards grades with normal carbon content.

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, and crevice geometry, if applicable. For a short period of time, for instance during cooking of food in stainless steel dishes, Core 304L/4307 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 304L/4307.

Core 304L/4307 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. Prior cold deformation of the structure under load increases the risk of stress corrosion cracking.

Core 304L/4307 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).

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

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

Pitting Resistance Equivalent (PRE) is calculated using the following formula:  $PRE = \%Cr + 3.3 \times \%Mo + 16 \times \%N$

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 information on corrosion resistance properties in different environments, [use the online corrosion tables](#).

# Mechanical properties

It can be used at low temperatures down to -196 °C/384.8 °F even in welded structures. Moderate strengths can be reached at elevated temperatures (~550 °C/1022 °F).. Temperatures for excessive scaling are close to 850 °C/1562 °F.

Cold rolled coil and sheet	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 1 mm)</b>	<b>295</b>	<b>325</b>	<b>650</b>	<b>70</b>				
ASME II A SA-240	≥ 170		≥ 485				≤ 201	
ASTM A240	≥ 170		≥ 485			≤ 92HRB	≤ 201	
EN 10028-7	≥ 220	≥ 250	520 - 700	≥ 45				
EN 10088-2	≥ 220	≥ 250	520 - 700	≥ 45				
EN 10088-4	≥ 220	≥ 250	520 - 700	≥ 45				
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	

Hot rolled coil and sheet	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 4 mm)</b>	<b>290</b>	<b>345</b>	<b>620</b>	<b>50</b>			<b>175</b>	
ASME II A SA-240	≥ 170		≥ 485				≤ 201	
ASTM A240	≥ 170		≥ 485				≤ 201	
EN 10028-7	≥ 220	≥ 250	520 - 700	≥ 45				
EN 10088-2	≥ 220	≥ 250	520 - 700	≥ 45				
EN 10088-4	≥ 220	≥ 250	520 - 700	≥ 45				
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	

Hot rolled quarto plate	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical (thickness 15 mm)</b>	<b>260</b>	<b>300</b>	<b>580</b>	<b>55</b>				
ASME II A SA-240	≥ 170		≥ 485			≤ 92HRB	≤ 201	
ASTM A240	≥ 170		≥ 485			≤ 92HRB	≤ 201	
EN 10028-7	≥ 200	≥ 240	500 - 700	≥ 45				
EN 10088-2	≥ 200	≥ 240	500 - 700	≥ 45				
EN 10088-4	≥ 200	≥ 240	500 - 700	≥ 45				
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	
IS 6911	≥ 170		≥ 485			≤ 92HRB	≤ 201	

Wire rod	R <sub>p0.2</sub> MPa	R <sub>p1.0</sub> MPa	R <sub>m</sub> MPa	Elongation <sup>1)</sup> %	Impact strength J	Rockwell	HB	HV
<b>Typical</b>	<b>280</b>	<b>320</b>	<b>580</b>	<b>55</b>				

<sup>1)</sup>Elongation according to EN standard:

A<sub>80</sub> for thickness below 3 mm.

A for thickness = 3 mm.

Elongation according to ASTM standard A<sub>2</sub> or A<sub>50</sub>.



# Physical properties

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

Density kg/dm <sup>3</sup>	Modulus of elasticity GPa	Thermal exp. at 100 °C 10 <sup>-6</sup> /°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 304L/4307 can be readily formed and fabricated using a full range of cold forming operations. It can be used in heading, drawing, and bending. Any cold forming operations will increase the strength and hardness of the material and may leave it slightly magnetic. Work hardening is accentuated by the partial transformation of the austenite phase of the material to hard martensite.

### Hot forming

Hot forming can be carried out in the 850 °C–1150 °C/1562 °F–2120 °F range. For maximum corrosion resistance, forging should be annealed at 1050 °C/1922 °F and rapidly cooled in air or water after hot forming operations.

### Welding

Core 304L/4307 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 304L/4307 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 containing Core 304L/4307 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.

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.

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

# Standards & approvals

Core 304L/4307 is often double certified as EN 1.4301/1.4307, ASTM Type 304/304L.

Standard	Designation
ASME SA-240M Code Sect. II. Part A	TYPE 304L / UNS S30403
ASTM A240/A240M	TYPE 304L / UNS S30403
ASTM A666	TYPE 304L / UNS S30403
EN 10028-7, PED 2014/68/EU	1.4307
EN 10088-2	1.4307
EN 10088-3	1.4307
EN 10088-4	1.4307
IS 6911, AMENDMENT NO. 2	ISS 304 S2; ISS 304L

[Download Outokumpu manufacturing site certificates and approvals.](#)

## Contacts & Enquiries

Contact your nearest sales office

[www.outokumpu.com/contacts](http://www.outokumpu.com/contacts)

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