

Technical Data Sheet

AISI-316L

General Presentation

AISI-316L is the standard molybdenum-bearing grade, second only to AISI-304 in importance among austenitic stainless steels. Because of the molybdenum, AISI-316L has better overall corrosion resistance than AISI-304, with particular resistance to pitting and crevice corrosion in chloride environments.

Classification

Austenitic stainless steel

Application

AISI-316L is used in food preparation equipment particularly in chloride environments, pharmaceuticals, marine applications, architectural applications, medical implants, including pins, screws and orthopedic implants like total hip and knee replacements, fasteners.

Processing

Solution Treatment (Annealing) - Heat to 1010-1120 °C and rapidly cool. Thermal treatment cannot harden these grades.

Forming

The most common hot working techniques can be used on AISI-316L. Optimal hot working temperatures should be between 1150 and 1260 °C, and should never be less than 930 °C. To achieve maximum corrosion resistance, post-work annealing should be performed.

AISI-316L can be used for most common cold working operations such as shearing, drawing, and stamping. Internal stresses should be removed with post-work annealing.

Weldability

Excellent weldability with and without filler metals using all standard fusion and resistance methods. For maximum corrosion resistance, heavy welded sections in AISI-316 require post-weld annealing. This is not necessary for 316L.

AISI-316L stainless steel is not generally oxyacetylene weldable.

Corrosion

Excellent in a variety of atmospheric environments and many corrosive media - more resistant than AISI-304 in general. Pitting and crevice corrosion are possible in warm chloride environments, as is stress corrosion cracking above about 60 °C. Potable water is considered resistant with up to 1000 mg/L chlorides at ambient temperatures, reducing to 500 mg/L at 60 °C.

The standard "marine grade stainless steel" is AISI-316, but it is not resistant to warm seawater. Surface corrosion of AISI-316 is visible in many marine environments as brown staining. This is especially common with crevices and a rough surface finish.

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Chemical Properties

Chemical properties of the alloy is given below (maximum values unless indicated otherwise).

Name	Number	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Mo (%)	Ni (%)	N (%)
X2CrNiMo17-2-2	1.4404	0,030	1,00	2,00	0,045	0,015	16,5 to 18,5	2,00 to 2,50	10,0 to 13,0	0,10

Mechanical Properties

The following table summarizes the mechanical properties at room temperature (minimum values).

Tensile S. (MPa), Rm	Yield S. (MPa), Rp 0,2	Elongation (%)	Elastic Modulus (GPa)
520-700	220	45	193

Some Physical Properties

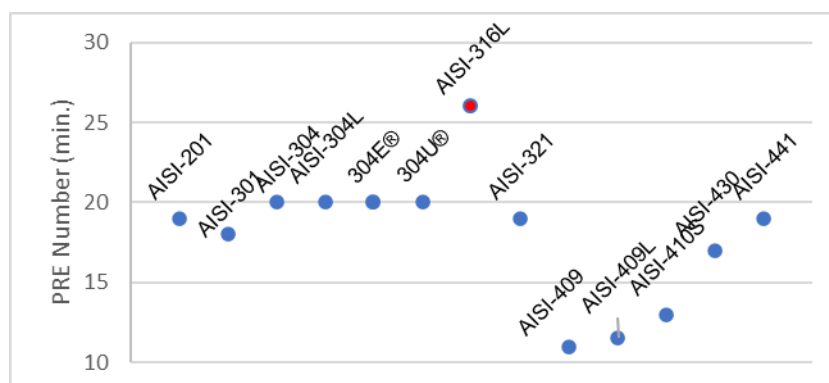
Thermal conductivity at 20 °C (W/(m.K))	Specific thermal capacity at 20 C° J/(kg.K)	Electrical resistivity at 20 °C (Ω.mm ² /m)
15	500	0,73

Comparison With Different Stainless Steel Grades

	AISI-304L	AISI-304	AISI-316L
% C + N	0.13	0.17	0.13
% Ni min. / max.	8.5 / 10.5	8.0 / 10.5	10.0 / 13.0
% Cr min. / max.	17.5 / 19.5	17.5 / 19.5	16.5 / 18.5
% Mo min. / max.	-	-	2.0 / 2.5

Corrosion Resistance

PRE value of each alloy is given on the graph below. AISI-316L is indicated with red dot on graph.



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Available Products

Process	Alloy Type	Alloy (AISI)	EN No.	Surface	Product Type	Range		
						thickness (mm)	width (mm)	length (cm)
Cold rolled + Solution annealed	Austenitic	201	1.4372	2B, 2D, 2H, 2J, 2C, NO:4, SB	Coil, strip, sheet, plate, disc	0,25-3	50-1300	20-600 or coil
		301	1.4310					
		304/304L	1.4301/1.4307					
		304E@/304U@	-					
		316L	1.4404					
	321	1.4541						
	Ferritic	409/409L	1.4512					
		410S	1.4000					
		430	1.4016					
		441	1.4509					

Geometrical Properties

The tolerances of thickness according to TS EN ISO 9445-2 Standard is given below (dimensions in millimeters).

Specified thickness (t)	Special tolerances for a specified width of	
	$w \leq 1000$	$1000 < w \leq 1300$
$t < 0,30$	$\pm 0,030$	-
$0,30 \leq t < 0,40$	$\pm 0,030$	$\pm 0,035$
$0,40 \leq t < 0,50$	$\pm 0,035$	$\pm 0,035$
$0,50 \leq t < 0,60$	$\pm 0,035$	$\pm 0,035$
$0,60 \leq t < 0,80$	$\pm 0,040$	$\pm 0,040$
$0,80 \leq t < 1,00$	$\pm 0,040$	$\pm 0,050$
$1,00 \leq t < 1,20$	$\pm 0,050$	$\pm 0,055$
$1,20 \leq t < 1,50$	$\pm 0,055$	$\pm 0,060$
$1,50 \leq t < 2,00$	$\pm 0,065$	$\pm 0,070$
$2,00 \leq t < 2,50$	-	-
$2,50 \leq t < 3,00$	-	-

The tolerances on width for cold-rolled wide strip and sheet/plate cut from cold-rolled wide strip mill edges is given below (dimensions in millimeters).

Tolerances for a specified width of	
$600 \leq w < 1000$	$1000 \leq w \leq 2100$
+25 0	+30 0

The tolerances on sheet-plate cut from cold-rolled wide strip mill edges is given below (dimensions in millimeters).

Tolerance	
Length	Normal
≤ 1500	+5 /0

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- For thickness tolerances, EN/2 is in our productibility.
- The width tolerances are for slit edge materials.

Edge Wave, Flatness Tolerances

- According to standard h/l rate is 0.03 max.
- For clients with special requests on flatness we can produce EN/2.

Sheet/plate

- Minimum sheet length is 200 mm, maximum sheet length is 6000 mm.
- Minimum width is 425 mm, maximum width is 1300 (1500 mm is available for contract manufacturing).
- Producibile thicknesses are between 0,3 – 3 mm.
- The above mentioned min. and max. Values are machine manufacturability. Information should be obtained from planning for plate combinations.
- Sheets can be filmed.
- Sheets can be labeled.

Mandrel Dia. (mm)	Thickness (mm)		Width (mm)		Length (cm)		Mandrel Tonnage	Packet Tonnage
	Min.	Max.	Min.	Max.	Min.	Max.	Max.	Max.
503	0,5	3	425	1500	20	600	10	2,5

Strip

- Strip inner diameter is 508 mm.
- For thicknesses of 0.90 mm and above, the slitting process is combined as 50 mm*15mm. The strip outer diameter is a maximum of 1750 mm.
- For thicknesses below 0.90 mm, the slitting process is combined as 50 mm * 15 mm. Maximum roll weight should be 10 tons.
- Slitting is not performed in thicknesses below 0.30 mm thickness.
- Paper wrapping is not possible for strips under 350 mm width.
- For thicknesses over 1.80 mm, the slitting process should be asked to the planning department.
- Thin film coating can be done on the edge cutting.
- It is possible to label on the edge cut rolls.

Cutting Type	Mandrel Dia. (mm)		Thickness (mm)		Width (mm)	
	Entry	Exit	Min.	Max.	Min.	Max.
Edge Cutting	508 - 610	508 - 610	0,3	3	300	1280
Multi Slitting	508 - 610	508 - 610	0,6	3	40	-

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Subjected Certificates and Standards

Certificates:

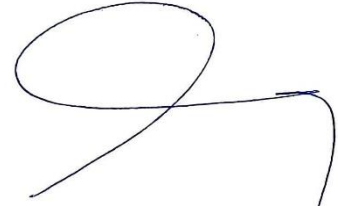
- TS EN ISO 9001:2015
- TS EN ISO/IEC 17025:2017
- TS EN ISO 9001:2015 EN AS 9100:2018
- IATF 16949:2016
- TS ISO 10002:2018
- 2014/68/EU: EN 764-5, section 4.2 and AD 2000-Merkblatt W0
- TS EN 10088-2:2014,
- 2001/95/EC General Product Safety Directive
- 1935/2004 EU Food Contact Regulations (EC)
- 98/79/EC In Vitro Diagnostics Medical Devices and Repealing Directive
- EU 2017/745 Medical Devices
- EU NO 305/2011 Construction Products Regulation
- 2011/65/EU Restriction of Hazardous Substances Directive ROHS
- 2016/26/EU, 2017/225/EU, 2018/35/EU REACH
- 2014/34/EU ATEX

Standards:

- TS EN 10088-2:2014,
- TS EN 10088-4:2013,
- TS EN 9445-2:2010,
- TS EN 10028-7:2016,
- TS 3157 EN ISO 3651-2:2000,
- ASTM A240/A240M-22b-2022,
- ASTM A480/A480M-22a-2022,
- ASME SA 240/SA 240M-2021,
- ASME SA 480/SA 480M-2021,
- ASTM A262,
- EN 764-5 Section 4.2,
- ISPM 15:2019 Fumigation



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