

Technical Data Sheet

AISI-409

General Presentation

AISI-409 is a ferritic stainless steel that has been titanium-stabilized. AISI-409 is almost exclusively used in automotive exhaust systems, despite being a general-purpose chromium stainless steel. Its applications include those where mechanical properties and corrosion resistance are more important than appearance, particularly at high temperatures, and where some weldability is required. In some ASTM specifications (notably the flat rolled specification ASTM A240M), the generic AISI-409 has been replaced by several "sub-grades" designated S40910, S40920, and S40930. These are stabilized to varying degrees with titanium, niobium, or both titanium and niobium.

Classification

Ferritic stainless steel

Application

It is widely used in high temperature applications, medical devices, building materials, chemistry, food industry, agriculture, ship components. It also applies to food, beverage packaging, kitchen supplies, trains, aircraft, conveyor belts, vehicles, bolts, nuts, springs, and screen.

Processing

Heat to 790-900°C and air cool. This grade cannot be hardened by thermal treatment.

Forming

Cold forming with a small degree of deformation is simple at temperatures above room temperature. Avoid sharp bending parallel to the rolling direction. Plates with greater thicknesses and/or degrees of deformation should be preheated to temperatures ranging from 200 to 400°C. If necessary, hot forming at 700 to 900°C may be required. Hot forming or annealing colors after welding or scaling reduce corrosion resistance. Pickling (pickling solution), grinding, or sand blasting are required to remove these. Only iron-free tools are permitted for these operations. Machining of unalloyed carbon steels with comparable respectively corresponding strength is identical.

Weldability

Welded easily, but a pre-heat of 150-260°C is recommended. Although AISI-409 or AISI-430 electrode or filler rods can be used, AS 1554.6 pre-qualifies welding AISI-409 with AISI-309 rods or electrodes. These austenitic fillers produce a more ductile weld. Post-weld annealing at 760-815°C improves weld ductility. Welding thin sections does not require post-weld annealing. Automotive exhaust tubing is typically welded without the use of filler metal (autogenously). To reduce grain growth effects, all welding must be performed with the least amount of heat input.

Corrosion

AISI-409 resists atmospheric and exhaust gas corrosion. A light surface rust will form in most atmospheres; this rust retards further corrosion but makes the surface undesirable for decorative applications. The corrosion resistance is about the same as that of the 12% chromium martensitic grades such as 410, and inferior to the 17% chromium grade AISI-430.

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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 (%)	Ni (%)	N (%)	Ti (%)
X2CrTi12	1.4512	0,030	1,00	1,00	0,040	0,015	10,5 to 12,5	-	-	[6x(C+N)] to 0,65

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)
380-560	210	25	190

Some Physical Properties

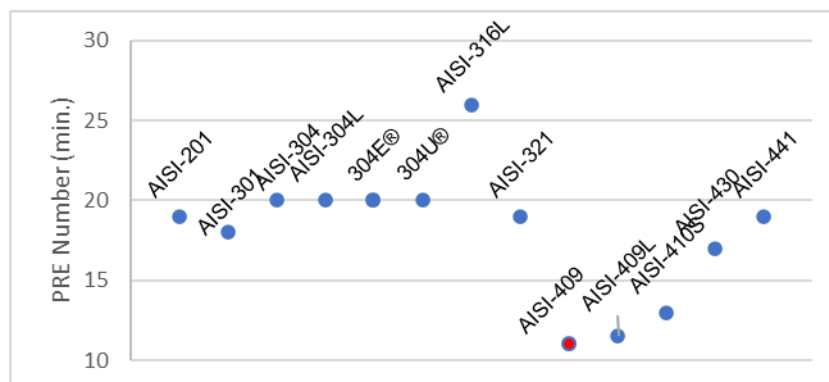
Thermal conductivity at 20 °C (W/(m.K))	Specific thermal capacity at 20 °C J/(kg.K)	Electrical resistivity at 20 °C (Ω.mm ² /m)
25	460	0,60

Comparison With Different Stainless Steel Grades

	AISI-409	AISI-430	AISI-410S
% C + N	0.030	0.08	0,08
% Cr min. / max.	10.5 / 12.5	17.5 / 19.5	12.0 / 14.0
% Mo min. / max.	-	-	-

Corrosion Resistance

PRE value of each alloy is given on the graph below. AISI-409 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
	Entry	Min.	Max.	Min.	Max.	Min.	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:

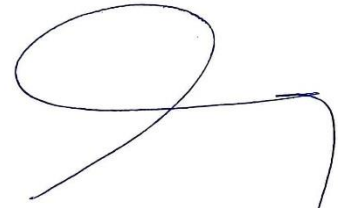
- TS EN ISO 9001:2015
- TS EN ISO/IEC 17025:2017
- TS EN ISO 9001:2015 EN AS 9100:2018
- IATF 16949:2016
- TS ISO 10002:2018
- 2014/68/EU: EN 764-5, section 4.2 and AD 2000-Merkblatt W0
- TS EN 10088-2:2014,
- 2001/95/EC General Product Safety Directive
- 1935/2004 EU Food Contact Regulations (EC)
- 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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