ValbrunaNordic

Free-Machining Austenitic Stainless Steel
EN 1.4305 – AISI T 303

A stainless austenitic steel

Typical analysis %	C max 0,10	Cr 18,0	Ni 9,0	S 0,25
Delivery condition	Solution annealed			

(Replaces SS 2346 –02)

Mechanical properties

Values for solution annealed condition to EN 10088 - 3

Tensile strength Rm	N/mm^2	500-750
Proof strength Rp02	N/mm^2	min 210
Elongation A5	%	min 35
Hardness	HB	Max 230

Cold-worked material:
The maximum HB-values may be raised by 100 HB or the Tensile strength value may be raised by 200 N/mm^2 and the Elongation value lowered to 20 % for bars ≤ 35 mm-

Characteristic temperatures

	Temperature °C
Solidification temperature	1400
Scaling temperature in air	850-900
Hot forming	1200-900
Solution annealing	1000-1100
Stress relief annealing (max 5h)	500
Use in pressure vessels	Not approved

Physical properties acc. to EN 10088

Temperature °C	20	100	200	400	600	800
Density kg/dm^3	7,9					
Modulus of elasticity E GPa	200	195	185	170	155	135
Mean coeff. of thermal expansion 20°C –Temp. $x10^{-6} \cdot K^{-1}$	-	17,0	17,5	18,5	19,0	19,5
SpecificThermal $W/m \cdot K$	15	15,5	17,5	20,0	22,5	25,5
Electrical Resistivity $\Omega \cdot mm^2/m$	0,70	0,75	0,80	0,95	1,05	1,15
Specific heat $J/kg \cdot K$	440	480	520	560	590	630

EN 1.4305 is a free-machining austenitic stainless steel. The excellent machinability is due to its sulphur content of between 0,15 - 0,30 %. It has good resistance to atmospheric corrosion and to many organic and inorganic chemicals.
It is non-magnetic in the annealed condition but may become slightly magnetic due to the introduction of martensite or ferrite at the cold-working or welding stages.

Design features

⇒ Relatively good corrosion resistance
⇒ Excellent machinability

Corrosion resistance

EN 1.4305 has relatively good resistance to atmospheric corrosion with some restrictions particularly regarding marine and coastal environments.
Also the grade has a good resistance to many (mildly corrosive) organic and inorganic chemicals. Somewhat less corrosion resistance compared to EN 1.4307 due to the addition of sulphur.
Residuals of cutting fluid must be removed by a degreasing process and the surface need to be passivated after machining, to achieve better corrosion resistance.

EN 1.4305 is sensitive to intergranular corrosion due to grain boundary precipitation of chromium carbides, which can occur in the temperature range 550 - 850°C.

The resistance to pitting and crevice corrosion is low to moderate. These types of corrosion typically occur in acidic, neutral or slightly alkaline solutions and in media with a low chloride content.

The grade **EN 1.4305** is susceptible to stress corrosion cracking. Critical service conditions, i.e. applications subjected to combinations of tensile stress, temperatures above about 50°C and solutions containing chlorides, should be avoided.

Heat treatment

Solution annealing

1000 - 1100ºC. Holding time at solution annealing temperature approx. 30 min., followed by rapid cooling in air or water.

Hardening

These grades can not be hardened by heat treatment. But they can be hardened by cold working.

Fabrication

Hot and cold forming

Hot forming should be carried out in the temperature range 1200-900°C. **EN 1.4305** is difficult to forge since high forging temperature is required and that implies a risk of over- heating and hot cracking. It is important that the entire workpiece has been exposed to a sufficiently high temperature. In the case of partial heating, or cooling that is too slow, hot working should be followed by solution annealing. Bending, pressing and other forming operations can be done in cold condition, but austenitic steels without sulphur has better cold forming properties.

Machining

EN 1.4305 is a Free-Machining Stainless Steel and is designed for further processing by machining. The steel is alloyed with 0,15 – 0,30 % sulphur which creates a considerable quantity of sulphides in the material. The sulphides improve the machinability, and particulary chip-breaking, but have the drawback of substantially degrading weldability, toughness, corrosion resistance and hot workability.

Welding

EN 1.4305 is designed to optimize machinability. The high sulphur content makes it susceptible to hot cracking during welding and as such welding of this steel is not recommended.

Surface finish

EN 1.4305 is available with ground, peeled and machined surface. It is not suited to polishing.

Stock standard

Please refer to our stock standard leaflet.

Technical support

VALBRUNA NORDIC AB will be helpful in giving further advice and recommendations concerning choice of material, cutting data, heat treatment, etc.

MATERIAL STANDARDS

EN 10088-3	Stainless steels - Semi-finished products, bars, rods, sections for general purposes
ASTM A 582	Standard Specification for Free-Machining Stainless Steel Bars