

Type 303

UNS S30300

A free-machining austenitic stainless steel suitable for automatic screw machining applications.

Description

Type 303 is a fully resulfurized free-machining austenitic stainless steel melted and processed to maximize machinability. It should be considered where extensive machining is required and some sacrifice in corrosion resistance compared to Type 304 can be tolerated.

Type 303 is nonmagnetic in the annealed condition but may become slightly magnetic as a result of cold working.

Specifications

Type 303 meets AMS 5640, ASTM A 581, A 582, QQ-S-764, and MIL-S-862 specifications.

Product Forms Available

Bar
Wire Rod
Billets
Plate

Corrosion Resistance

Type 303 is resistant to mildly corrosive environments but is inferior to Type 304 because of its high sulfur content. For optimum corrosion resistance, it is recommended that Type 303 be chemically treated to remove sulfides from the final surface of the parts.

Heat Treatment Annealing

Type 303 should be heated to 1900°F minimum and water quenched or rapidly cooled by other means.

Hardening

Type 303 cannot be hardened by heat treatment.

Mechanical Properties

Table 1

	Typical
Tensile Strength, ksi	85
0.2% Yield Strength, ksi	45
Elongation in 2 inches, pct.	50
Reduction in Area, %	55
Hardness, Rockwell B	180

Chemical Composition, wt. pct.

Table 2

	Type 303
Carbon	0.15 max
Manganese	2.00 max
Phosphorus	0.20 max
Sulfur	0.30 min*
Silicon	1.00 max
Chromium	17.0-19.0
Nickel	8.0-10.0

*Outokumpu Stainless Type 303 contains 0.30% minimum sulfur for best machinability, substantially higher than the 0.15% minimum required by ASTM.

Physical Properties

Table 3

Density, lb/in ³	0.285
Modulus of Elasticity, psi	29 x 10 ⁶
Linear Expansion, 68-212°F, /°F	9.4 x 10 ⁻⁶
Thermal Conductivity, Btu/ft hr°F	8.7
Heat Capacity, Btu/lb°F	0.12
Electrical Resistivity, w -inch	27.6 x 10 ⁻⁶

Welding

Type 303 is not recommended for applications requiring welding. However, if welding is necessary, AWS E312 filler metal may be considered.

Machinability

Outokumpu Stainless Type 303 is easily machined and produces small brittle chips. Type 303 may be

machined at high speeds with deep cuts and heavy feeds and still give acceptable tool life.

Table 4 suggests some speeds and feeds for various machining operations on Type 303.

Workability Cold Working

The cold formability of Type 303 is reduced by its high sulfur content. Bending with a generous bend radius may be considered for Type 303. When cold forming is required, Type 304 should be considered.

Hot Working

The high sulfur content, added for machinability, is detrimental to hot workability. If hot forming is necessary, an alternate grade such as Type 304 should be considered. When forging is necessary, it should be done in the 1800-2200°F range, and should be followed by annealing at 1900°F minimum and

Machinability

water quenching or rapid cooling by other means.

Technical Support

Outokumpu Stainless, Inc. assists users and fabricators in the selection, qualification, installation, operation, and maintenance of Type 303. Technical personnel, supported by the research laboratory of Outokumpu Stainless, can draw on years of field experience with Type 303 to help you make the technically and economically correct materials decision.

Outokumpu Stainless is prepared to discuss individual applications and to provide data and experience as a basis for selection and application of Type 303.

Outokumpu Stainless works closely with its distributors to ensure timely availability of Type 303 in the forms, sizes, and quantities required by the user. For assistance with technical questions and to obtain top quality Type 303, call Outokumpu Stainless, Inc. at 1-800-833-8703.

Table 4

	High Speed Tooling		Carbide Tooling		Depth, Width or Diameter of Tool (in.) (dia/in)
	Speed (sfm)	Feed (in/rev)	Speed (sfm)	Feed (in/rev)	
Turning	115	0.015	375	0.025	0.005-0.200
	135	0.005	600	0.007	0.002-0.004
Cut-Off	90	0.0015	275	0.002	1/16
	100	0.0025	325	0.004	1/4
Forming	100	0.0020	375	0.003	1
	100	0.0015	350	0.002	2
Drilling	70	0.006	—	—	1/4
	85	0.010	700	0.005	1/2
	100	0.020	800	0.007	1-2
Reaming	90	0.005	—	—	1/4
	90	0.015	—	—	1-2
End Milling	130	0.003	300	0.004	1/2
	130	0.006	350	0.009	1-2
Tapping +	10	—	—	—	7 threads/in
Threading	40	—	—	—	25 threads/in

Outokumpu Stainless is a core business within Outokumpu, a dynamic metals and technology group operating worldwide and marketing its metals, metal products, technology and services to customers in a wide range of industries.



Outokumpu Stainless, Inc., 425 North Martingale Road, Suite 1600, Schaumburg, IL 60173-2218 USA
Tel. 1-800-833-8703 Fax 1-800-545-8617 stainless.info@outokumpu.com