Technical Datasheet

CarTech® 303 Se Stainless

Identification

UNS Number

• S30323

Type Analysis

Single figures are nominal except where noted.

Carbon (Maximum)	0.12 %	**Manganese (Maximum)**	2.00 %
Phosphorus	0.120 to 0.170 %	**Silicon (Maximum)**	1.00 %
Chromium	17.00 to 19.00 %	**Nickel**	8.00 to 10.00 %
Selenium	0.15 to 0.35 %	**Iron**	Balance

General Information

Description

CarTech 303 Se stainless is a free-machining 18-8 chrome-nickel steel. Selenium, added to an 18-8 stainless steel that is ordinarily tough and difficult to machine, makes it so freely machinable that it can readily be handled on automatic screw machines at about 75% of the speed of C1212. This steel has displayed nongalling properties that make disassembly of parts easy and help to avoid scratching or galling in moving parts.

CarTech 303 Se stainless has somewhat better formability than Project 70® Stainless Type 303 and should be considered for applications which involve cold-forming operations.

CarTech 303 Se stainless has been used for parts that are fabricated by machining, grinding and polishing; for example, all types of screw machine products, valves, valve trim, etc. It is not recommended for vessels containing gases or liquids under high pressure.

Scaling

The safe scaling temperature for continuous service is 1600ºF (871ºC).

Corrosion Resistance

Annealed Carpenter Stainless Type 303 Se is resistant to atmospheric corrosion, foodstuffs, sterilizing solutions, many organic chemicals and dyestuffs, and a wide variety of inorganic chemicals.

Intergranular corrosion may be a problem if the material is heated between 800ºF (427ºC) and 1650ºF (899ºC) or cooled slowly through that range.

For optimum corrosion resistance, surfaces must be free of scale, lubricants, foreign particles, and coatings applied for drawing and heading. After fabrication of parts, cleaning and/or passivation should be considered.

Important Note: *The following 4-level rating scale is intended for comparative purposes only. Corrosion testing is recommended; factors which affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish and dissimilar metal contact.*

Nitric Acid	Moderate	Sulfuric Acid	Moderate
Phosphoric Acid	Moderate	Acetic Acid	Moderate
Sodium Hydroxide	Moderate	Salt Spray (NaCl)	Moderate
Sea Water	Restricted	Humidity	Excellent

Properties

Physical Properties

Specific Gravity	7.83

Density	0.2830	lb/in³
Mean Specific Heat (32 to 212°F)	0.1200	Btu/lb/°F
Mean CTE (32 to 1200°F)	10.4	x 10 -6 in/in/°F
Electrical Resistivity (70°F)	433.0	ohm-cir-mil/ft

Typical Mechanical Properties

Typical Room Temperature Mechanical Properties
1" (25.4 mm) round bar, annealed condition

0.2% Yield Strength		Ultimate Tensile Strength		% Elongation in 2" (50.8 mm)	% Reduction of Area	Brinell Hardness	Izod Impact Strength	
ksi	MPa	ksi	MPa				ft-lb	J
35	241	90	621	50	55	160	80	108

Heat Treatment

Annealing

Heat to 1850/2050ºF (1010/1121ºC) and quench in water. Brinell hardness approximately 160.

Hardening

Cannot be hardened by heat treatment. Upon being cold worked, Type 303 Se increases in strength and hardness.

Workability

Hot Working

Carpenter Stainless Type 303 Se can be forged, hot headed and upset successfully. After hot working, it should be annealed.

Forging

Heat uniformly to 2100/2300ºF (1149/1260ºC). Do not forge below 1700ºF (927ºC). Forgings can be air-cooled, but better corrosion resistance can be obtained by quenching small forgings in water directly after hammering. Large pieces should be annealed.

Cold Working

Carpenter Stainless Type 303 Se should be considered where free-machining grades are required for parts which involve some cold-forming operations.

Machinability

Carpenter Stainless Type 303 Se machines easily with a brittle chip. Grinding and polishing operations have been satisfactorily performed.

Following are typical feeds and speeds for Carpenter Stainless Type 303 Se.

Typical Machining Speeds and Feeds – Carpenter Stainless Type 303Se

The speeds and feeds in the following charts are conservative recommendations for initial setup. Higher speeds and feeds may be attainable depending on machining environment.

Turning—Single-Point and Box Tools

Depth of Cut (Inches)	High Speed Tools			Carbide Tools (Inserts)			
	Tool Material	Speed (fpm)	Feed (ipr)	Tool Material	Speed (fpm) Uncoated	Speed (fpm) Coated	Feed (ipr)
.150	M2	100	.015	C2	400	475	.015
.025	M3	120	.007		450	600	.007

Turning—Cut-Off and Form Tools

Tool Material		Speed (fpm)	Feed (ipr)						
			Cut-Off Tool Width (inches)			Form Tool Width (inches)			
High Speed Tools	Carbide Tools		1/16	1/8	1/4	1/2	1	1 ½	2
M2		85	.0015	.002	.0025	.002	.0015	.0015	.001
	C2	275	.004	.005	.007	.006	.005	.004	.003

Rough Reaming

High Speed		Carbide Tools		Feed (ipr) Reamer Diameter (Inches)					
Tool Material	Speed (fpm)	Tool Material	Speed (fpm)	1/8	1/4	1/2	1	1 ½	2
M7	85	C2	105	.005	.008	.013	.018	.022	.025

Drilling

Tool Material	Speed (fpm)	High Speed Tools: Feed (inches per revolution) Nominal Hole Diameter (inches)							
		1/16	1/8	1/4	1/2	3/4	1	1 ½	2
M7, M10	65-90	.001	.003	.006	.010	.014	.017	.021	.025

Die Threading

FPM for High Speed Tools				
Tool Material	7 or less, tpi	8 to 15, tpi	16 to 24, tpi	25 and up, tpi
M1, M2, M7, M10	8-15	13-24	22-32	32-38

Milling, End-Peripheral

Depth of Cut (inches)	High Speed Tools						Carbide Tools					
	Tool Material	Speed (fpm)	Feed (ipt) Cutter Diameter (in) 1/4	1/2	3/4	1-2	Tool Material	Speed (fpm)	Feed (ipt) Cutter Diameter (in) 1/4	1/2	3/4	1-2
.050	M2, M7	125	.001	.002	.004	.005	C2	340	.001	.002	.005	.007

Tapping

High Speed Tools	
Tool Material	Speed (fpm)
M1, M7, M10	20-45

Broaching

High Speed Tools		
Tool Material	Speed (fpm)	Chip Load (ipt)
M2, M7	20	.004

When using carbide tools, surface speed feet/minute (SFPM) can be increased between 2 and 3 times over the high-speed suggestions. Feeds can be increased between 50 and 100%.

Figures used for all metal removal operations covered are average. On certain work, the nature of the part may require adjustment of speeds and feeds. Each job has to be developed for best production results with optimum tool life. Speeds or feeds should be increased or decreased in small steps.

Additional Machinability Notes

When using carbide tools, surface speed feet/minute (SFPM) can be increased between 2 and 3 times over the high speed suggestions. Feeds can be increased between 50 and 100%.

Figures used for all metal removal operations covered are average. On certain work, the nature of the part may require adjustment of speeds and feeds. Each job has to be developed for best production results with optimum tool life. Speeds or feeds should be increased or decreased in small steps.

Weldability

Carpenter Stainless Type 303 Se is not recommended for welding. The high selenium and phosphorus contents may cause hot cracking, and when welding to a stainless steel with a lower selenium content, the weld may shift off center. If the alloy must be welded, consider AWS E/ER312 welding consumables with stringer beads using a minimum heat input and minimum base metal dilution.

Other Information

Applicable Specifications

- AMS 5640
- AMS 5641
- AMS 5738
- ASTM A582
- MIL-W-52263
- QQ-S-764

Forms Manufactured

- Bar-Hexagons
- Bar-Rounds
- Billet
- Wire
- Wire-Rod

Technical Articles

- A Designer's Manual On Specialty Alloys For Critical Automotive Components
- How to Passivate Stainless Steel Parts
- Passivating and Electropolishing Stainless Steel Parts

Edition Date: 5/17/13

Visit us on the web at www.cartech.com