Technical Datasheet

CarTech® Trinamet® Stainless

Identification

U.S. Patent Number

- 8,017,071

UNS Number

- S42030

Type Analysis

Single figures are nominal except where noted.

Carbon (Maximum)	0.30 %	**Manganese (Maximum)**	1.00 %
Phosphorus (Maximum)	0.040 %	**Sulfur (Maximum)**	0.030 %
Silicon (Maximum)	1.00 %	**Chromium**	12.00 to 14.00 %
Molybdenum	1.00 to 3.00 %	**Copper**	2.00 to 3.00 %
Iron	Balance		

General Information

Description

CarTech Trinamet stainless is a hardenable martensitic stainless steel that combines improved corrosion resistance over Type 410 stainless with a hardness up to 53 HRC and improved formability over 17Cr-4Ni.

CarTech Trinamet can be hot worked, cold worked, machined and heat treated using similar equipment and methods used for Type 410 stainless steel.

Applications

CarTech Trinamet stainless was developed with the fastener industry in mind. Its combination of cold formability, corrosion resistance, and high heat treated hardness make it a good candidate for a variety of fastener applications including sheet metal screws, self-drilling construction fasteners, and other various bolts and fasteners exposed to atmospheric conditions.

Elevated Temperature Use

Trinamet stainless is not recommended for elevated temperature applications since corrosion resistance and toughness will be reduced if the alloy is heated above about 700/800ºF (371/427ºC) after hardening and tempering as recommended.

Corrosion Resistance

Laboratory tests have shown Trinamet stainless to have corrosion resistance similar to Type 304 and better than TrimRite® stainless and Types 410, 420, and 440 in 5% neutral salt spray for 200 hours (ASTM B117). For maximum corrosion resistance, parts must be free of scale, foreign particles, free iron and surface imperfections that can trap foreign material and contribute to pitting and crevice corrosion, especially in the presence of chlorides. The presence of any of these conditions will decrease the resistance to rusting in accelerated corrosion tests. Finished parts should be passivated.

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.*

Sodium Hydroxide	Moderate	Salt Spray (NaCl)	Good
Sea Water	Restricted		

Properties

Physical Properties

Specific Gravity	7.77	
Density	0.2806	lb/in³

Mean CTE	
77 to 212°F	5.81 x 10^{-6} in/in/°F
77 to 392°F	6.04 x 10^{-6} in/in/°F
77 to 572°F	6.24 x 10^{-6} in/in/°F
77 to 752°F	6.39 x 10^{-6} in/in/°F
77 to 932°F	6.55 x 10^{-6} in/in/°F
77 to 1112°F	6.66 x 10^{-6} in/in/°F
77 to 1292°F	6.35 x 10^{-6} in/in/°F

Typical Mechanical Properties

Typical Charpy V-Notch Impact Strength – Trinamet Stainless

0.800" (20.3 mm) Round Bar

Heat Treatment Condition	Impact Strength		Rockwell Hardness
	Ft.-lb.	J	
Annealed	34	46	HRB 93
Hardened	23	31	HRC 50

Annealed – 1615°F (880°C), 2 hours, furnace cool to 1290°F (700°C), air cool
Hardened – 1950°F (1065°C), 1 hour, oil quench + 400°F (204°C), 2 hours, air cool

Typical Room Temperature Mechanical Properties – Trinamet Stainless

0.160 in. (4.06 mm) round cold drawn wire, hardened 1900°F (1038°C) 1/2 hr., oil quenched + tempered 2 hrs., air cooled

Tempering Temperature		0.2% Yield Strength		Ultimate Tensile Strength		% Elongation in 4D	% Reduction of Area	Rockwell C Hardness
°F	°C	ksi	MPa	ksi	MPa			
350	177	195	1346	275	1898	16	50	53
400	204	188	1297	259	1787	16	48	52
500	260	173	1194	244	1684	13	56	50
600	316	186	1283	247	1704	16	55	49
700	371	190	1311	258	1780	15	53	50
1000	538	187	1290	245	1691	15	55	48
1100	593	159	1097	191	1318	19	57	38
1200	649	125	863	158	1090	18	54	32
1300	704	109	752	142	980	22	55	28

Heat Treatment

Annealing

Heat uniformly to 1350/1450°F (732/788°C) for two to four hours on heat, remove from furnace and cool to room temperature. The hardness will be approximately Rockwell B 95 or equivalent. For lowest hardness, Rockwell B 88/93, heat to 1615°F (880°C) one to two hours on heat, cool in the furnace at a rate not exceeding 50°F (28°C) per hour to 1200° F (650°C), and then remove from the furnace and air cool to room temperature.

Hardening

Trinamet stainless readily lends itself to heat treating in both batch and continuous types of heat treating furnaces. For the maximum attainable hardness of Rockwell C 49/52 the alloy should be heated to 1900/1950°F (1040/1065°C) and rapidly cooled to room temperature by quenching in oil or by forced air or gas cooling. Fifteen minutes on heat at 1900/1950°F (1040/1065°C) is generally adequate for screws, clips, pins, wire and other small parts. A longer time (up to a maximum of about one hour) is required for larger sections. When heat treating in a protective atmosphere, nitrogen or argon with a dew point no higher than –40°F (–40°C) is suggested. Dissociated ammonia is considered unsuitable because of the risk of nitriding the work and the resulting reduction in corrosion resistance.

Tempering

After hardening, parts should be tempered one to two hours at 350/400°F (177/204°C). When less than maximum hardness is required parts may be tempered up to 600°F (316°C).

Workability

Cold Working

The cold forming characteristics of Trinamet stainless in operations such as heading, thread rolling, slotting, extrusion, drawing and flattening are similar to Type 410 stainless.

Other Information

Descaling (Cleaning)

Prior to heat treating

In those cases where metal will not be removed from the surface of the part after heat treating by grinding, machining or some other method, it is imperative that the surface of the steel be cleaned to remove all foreign materials such as soap, oil, grease, coatings including copper, sulfur-bearing compounds and other substances which can react with the metal at a high temperature (e.g., hardening temperature).

Most lubricants and grease can be removed by tumbling or vibratory washing in 140ºF (60ºC) alkaline solution followed by water rinsing or cleaning in an organic solvent.

When stripping copper after cold heading, parts should be degreased and then stripped in 20% by volume nitric acid at 120/140ºF (49/60ºC) followed by a thorough water rinse.

After hardening

After hardening and tempering, parts in a finished condition should be passivated.

Forms Manufactured

- Bar
- Strip
- Wire
- Wire-Rod

Technical Articles

- Blade Alloys 101: What You Need to Know About the Alloys Used for Knife Blades
- New Stainless for Fasteners Combines Corrosion Resistance, High Hardness and Cold Formability

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