
Stainless Steel 302HQ Grade Data Sheet

Grade 302HQ

Grade 302HQ is a specialised wire grade with very wide usage for manufacture of stainless steel fasteners. The inclusion of 3% copper in the composition reduces the cold work hardening rate substantially compared to Grade 304. 302HQ is standard for manufacture of self-tapping screws and light machine screws; it is also used for some bolts, set screws, rivets and specialised fasteners. It has now totally replaced Grades 384 and 305 for cold heading applications, copper being a lower cost alternative to their high nickel contents.

The designation 302HQ is not standardised – ASTM specifications list the grade as UNS S30430, and alternative designations for the same grade include "XM-7", "304Cu" and "304HQ". The standard specification for stainless steel fasteners, ISO 3506, includes 302HQ as an acceptable composition for fastener grade "A2"; it is commonly produced in strength grades A2-70 and A2-80.

The stable austenitic structure makes 302HQ non-magnetic, even after substantial cold work, and results in excellent toughness, even down to cryogenic temperatures.

Corrosion Resistance

Equal to or exceeding that of Grade 304. Subject to pitting and crevice corrosion in warm chloride environments, and to stress corrosion cracking above about 50°C. 302HQ is considered resistant to potable water with up to about 200mg/L chlorides at ambient temperatures, reducing to about 150mg/L at 60°C.

Heat Resistance

Good oxidation resistance in intermittent service to 870°C and in continuous service to 925°C. Continuous use of Grade 302HQ in 425-860°C range is usually safe (free of carbide precipitation) as the grade has a very low carbon content.

Heat Treatment

Solution Treatment (Annealing)

Heat to 1010-1120°C and cool rapidly. This grade cannot be hardened by thermal treatment.

Welding

Use Grade 308L rods or electrodes. Excellent weldability by all standard fusion methods, both with and without filler metals. Because of its applications this grade is not often welded. Exceptions are resistance butt welding to join wires together during wire manufacture, and when the grade is used to make stud welding fasteners. 302HQ is not specifically listed in AS 1554.6.

Machining

302HQ is rarely machined, because of its form and likely products. The grade always has very low sulphur content as this aids formability, but unfortunately this also reduces machinability. Machining is certainly possible.

An Improved Machinability version of Grade 302HQ is produced, having a very high machinability. This version has a slightly higher sulphur content and is also calcium treated. This Improved Machinability grade (referred to as Ugima 4567) is available only to special order, but should be considered as an option where an "18/8" type grade needs to be both heavily cold formed and extensively machined.

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Cold Work Hardening

302HQ has the lowest work hardening rate of any of the common austenitic stainless steels. This results in a tensile strength increase of approximately 8MPa/%Ra (8MPa increase in tensile strength for each 1% reduction of area of cold work - this data from wire drawing). Even after substantial cold work this grade remains essentially non-responsive to a magnet.

For some high strength cold headed fasteners, a slightly higher work hardening rate will be needed, so grade 304 or 304L (or the specialist grade 304M) will need to be used instead of 302HQ; these have work hardening rates varying between about 10 and 12.5MPa/%RA.

Typical Applications

All severe cold heading applications, including self-tapping screws, roofing bolts, machine screws, bolts, set screws, blind rivets.

Specified Properties

These properties are specified for grade S30430 wire in ASTM A493; wire is the only commonly available form for this grade. Properties of finished fasteners are covered by other specifications, such as ISO 3506-1 and 3506-3.

Composition Specification (%)

Grade		C	Mn	Si	P	S	Cr	Mo	Ni	Cu
302HQ	min.	-	-	-	-	-	17.0	-	8.0	3.0
	max.	0.03	2.00	1.00	0.045	0.030	19.0	-	10.0	4.0

Mechanical Property Specification

Grade	Tensile Strength (MPa) max.	Yield Strength 0.2% Proof (MPa)	Elongation (% in 50mm)	Hardness	
				Rockwell B (HR B)	Brinell (HB)
302HQ annealed	605	-	-	-	-
302HQ lightly drawn	660	-	-	-	-

Above values from ASTM A493 for diameters 2.5mm and above. Higher strengths can be produced by heavy cold work - this may be required for certain applications.

Physical Properties (Typical values in the annealed condition)

Grade	Density (kg/m ³)	Elastic Modules (GPa)	Mean Coefficient of Thermal Expansion			Thermal Conductivity		Specific Heat 0-100°C (J/kg.K)	Electrical Resistivity (nΩ.m)
			0-100°C (µm/m/°C)	0-315°C (µm/m/°C)	0-538°C (µm/m/°C)	at 100°C (W/m.K)	at 500°C (W/m.K)		
302HQ	7900	193	17.2	17.8	18.8	16.3	21.5	500	720

Grade Specification Comparison

Grade	UNS NO	Euronorm		Swedish SS	Japanese JIS
		No	Name		
302HQ	S30430	1.4567	X3CrNiCu18-9-4	-	SUS XM7

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Possible Alternative Grades

Grade	Why it might be chosen instead of 302HQ
304, 304L or 304M	A higher work hardening rate can be tolerated - or is needed.
316L	Higher resistance to pitting and crevice corrosion is required in chloride environments; the higher work hardening rate of 316L is acceptable.
430	A lower cost is required, and the reduced corrosion resistance of 430 is acceptable.

Limitation of Liability

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