

Technical Data Sheet

UGI® S302

Chemical analysis (%)

C	Si	Mn	Cr	Ni	Mo	N	P	S
0,05 - 0,15	≤ 1,0	≤ 2,0	16,0 – 19,0	6,0 – 9,5	≤ 0,80	≤ 0,11	≤ 0,045	≤ 0,015

03-04-2018 – REV 01

General presentation

UGI® S302 is the grade conventionally used to manufacture stainless steel springs. This grade offers good corrosion resistance and can be used at temperature levels close to 250°C. Springs in UGI® S302 have good fatigue strength and low relaxation compared with carbon steels.

For springs used in corrosive environments, UGI® S302 makes it possible to avoid the surface protection needed on carbon steel springs. To adapt to various cold transformation conditions, Ugitech has developed several versions of UGI® S302, such as UGI® S302-1, UGI® S302-2, and UGI® S302-6 to cover several CWH values (Cold Work Hardening factors). For applications which require high dynamic fatigue performances, a special grade is available on request: UGI® S302 HFS (HFS for High Fatigue Strength).

Classification

Austenitic stainless steel.

Designation

Material No.			United States		Japan
Europe			AISI	UNS	JIS
EN	DIN	ISO			
1.4310	1.4310	X9CrNi18-8	302	S30200	SUS302

Compatible with the following standards: EN 10088-3, EN 10270-3, ASTM A313, ASTM A959, ISO 6931-1 and AMS 5688.

Mechanical properties

Tensile data in solution annealed state

Temperature	Yield strength	Tensile strength	Elongation at break
T	YS0.2%	UTS	E _{5d}
(°C)	(MPa)	(MPa)	(%)
20°C	≥ 280	≥ 600	≥ 50

The mechanical properties obtained on cold-worked wires attain far higher Rp0.2 and Rm values which are given in the section on cold transformation.



Swiss Steel Group

Production sites: Ugitech SA
www.swisssteel-group.com

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Physical properties

Temperature	Density	Elastic modulus	Thermal conductivity	Expansion coefficient	Specific heat	Electrical resistivity
(°C)	(g/cm ³)	(GPa)	(W.m ⁻¹ .K ⁻¹)	K ⁻¹ .(x10 ⁻⁶)	(J.kg ⁻¹ .K ⁻¹)	(μΩ.cm)
20	7.9	200	15		500	78
100	7.9	194	16	16.5 (0 / 100°C)		83
250	7.9	183	18	17.5 (0 / 250°C)		90

The maximum service temperature for UGI® S302 should not exceed 250°C.

The grade's magnetic permeability (μ_r) is heavily influenced by cold transformation of the material. In the solution-annealed and non-cold-worked state, μ_r is less than 1.02, but in the cold-worked state with spring-wire properties, it can rise to a maximum of 10.

Corrosion resistance

UGI® S302 has good corrosion resistance in moderately corrosive environments. It is widely used in humid or aqueous environments with a limited chloride content. The use of UGI® S302 in marine environments should be avoided, especially in its drawn spring-wire version.

Hot transformation

UGI® S302 has good hot forgeability. Forging temperatures are between 900°C and 1100°C. Once forged, the parts must be cooled swiftly, i.e. chilled in water to avoid problems of sensitization of the grade to potential grain-boundary corrosion.



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Cold transformation

Drawing – Profiling

Like all high-carbon grade austenitic steels, UGI® S302 is hardened significantly during cold transformation. However, it has good ductility, with a potential reduction in cross section of up to 90% or more.

The spring-wire mechanical properties given in the following table in the delivery condition are therefore significantly higher than in the solution annealed state.

Nominal diameter (mm)	UTS range		YS 0.2
	Min. (MPa)	Max. (MPa)	Min. (MPa)
d ≤ 0.20	2200	2530	2010
0.20 < d ≤ 0.30	2150	2480	1960
0.30 < d ≤ 0.40	2100	2420	1920
0.40 < d ≤ 0.50	2050	2360	1870
0.50 < d ≤ 0.65	2000	2300	1830
0.65 < d ≤ 0.80	1950	2250	1780
0.80 < d ≤ 1.00	1900	2190	1740
1.00 < d ≤ 1.25	1850	2130	1690
1.25 < d ≤ 1.50	1800	2070	1640
1.50 < d ≤ 1.75	1750	2020	1600
1.75 < d ≤ 2.00	1700	1960	1550
2.00 < d ≤ 2.50	1650	1900	1510
2.50 < d ≤ 3.00	1600	1840	1460
3.00 < d ≤ 3.50	1550	1790	1420
3.50 < d ≤ 4.25	1500	1730	1370
4.25 < d ≤ 5.00	1450	1670	1320
5.00 < d ≤ 6.00	1400	1610	1280
6.00 < d ≤ 7.00	1350	1560	1230
7.00 < d ≤ 8.50	1300	1500	1190
8.50 < d ≤ 10.0	1250	1440	1140

These Rm values are in conformance with the standard mechanical strength range indicated in Euronorm EN 10270-3 for grade 1.4310 (NS). The Rp 0.2 values are given as an indication.

The UTS/YS_{0.2} ratio on spring wires in UGI® S302 is generally around 0.9.

The range of strength (UTS) values is generally contained

- within a manufacturing batch, at 100 MPa;
- within a packaging unit (cable drums, coils, rims) at 60 MPa.



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Bending – Forming

UGI® S302 is a grade that is ductile even in the cold-worked state: its suitability for forming and bending is very good. Since the ductile/fragile transition temperature is far lower than ambient temperature, fast strain rates are possible, which means it is possible to have high spring conformation rates.

Heat Treatment

Springs' mechanical strength can be increased up to 250 Mpa (depending on the diameter) by heat treatment performed on the springs. The YS_{0.2}/UTS ratio can increase by 5% after such a treatment.

Static treatment:

– Static treatment temp.: 350/425°C

Recommended duration 0.5 to 4 hours depending on batch size

Treatment in continuous oven:

– Heat treatment temp.: 25°C higher than in static treatment

Min. treatment duration: 3 minutes

Available products

Product	Shape	Finish	Sizes	
Wire rod	Round	Pickled	5.0 to 32	mm
Drawn wire	Round	Matt	0.2 to 1.0	mm
Bars	Round	Matt	1.0 to 15	mm
Rolled wire	Sections	Bright	2 to 70	mm ²

Other: please consult us

The UGI® S302 grade is produced using processes that comply with the Montreal rules concerning CFCs and with the European regulations on heavy metals.

Safety sheet available on request.

Applications

- Torsion bars, torsion springs
- Compression springs
- Draw spring



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