

303 UGIMA®

Technical Datasheet

Chemistry - Comparable Standard

Typical Analysis %	C	Si	Mn	P	S	Cr	Ni	Mo	Cu
Minimum					0.15	17.00	8.00		
Maximum	0.10	1.0	2.00	0.045		19.00	10.00	0.6	1.0

Description

303 UGIMA® is Ugitech's improved machining grade produced only by Ugitech. It is identical in every way to regular 303, except with respect to machinability.

303 UGIMA® represents the latest generation of Ugitech's popular UGIMA® family of high machinability grades. Through the use of new and beneficial modifications to the steel-making process, **303 UGIMA®** builds upon the proprietary UGIMA® manufacturing process to allow for excellent machinability across a wider range of operations and cutting conditions. When compared with older versions, **303 UGIMA®** is a technologically advanced product that will allow for superior machinability at both low and high speeds, in cam-driven and CNC machines, and with high-speed steel or carbide tooling. Machine shops using **303 UGIMA®** have experienced consistent success regardless of machine, operation, tooling, or cutting conditions. From lot to lot, **303 UGIMA®** is engineered to give the same high performance every time without surprise.

Shops have reported productivity increases of up to 100% over leading competitive machining grades, and increases of up to 40% over the original version of **303 UGIMA®**. Additional benefits include improved chip breakability, superior surface finish, increased tool life, and better interchangeability with standard type 303, regardless of the producer.

Applications

Fasteners
Shafts
Valve Bodies
Valves
Valve Trims
Fittings
Machined parts

-Not recommended for vessels containing liquid or gasses at high pressures

*Not recommended for extremely thin walls applications due to risk of cracking

Available Forms

Bars: Cold drawn, turned, ground, SMQ™
Shapes: Round, Hexagonal, Octagonal, Square, Wire

Mechanical Properties (Typical)

Bars ≤ 0.1574"

Tensile Strength	90-125 ksi (620 – 861 MPa)
Yield Strength (0.2%)	45 ksi (310 MPa) minimum
Elongation	25% minimum
Reduction of Area	50% minimum
Hardness	140 – 262 HB

Bars 0.15740" - ≤ 0.500"

Tensile Strength	90-125 ksi (620 – 861 MPa)
Yield Strength (0.2%)	45 ksi (310 MPa) minimum
Elongation	30% minimum
Reduction of Area	40% minimum
Hardness	140 – 262 HB

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Bars 0.500" – ≤ 0.750"

Tensile Strength	90-125 ksi (620 – 861 MPa)
Yield Strength (0.2%)	30 ksi (206 MPa) minimum
Elongation	25% minimum
Reduction of Area	40% minimum
Hardness	140 – 262 HB

Magnetic and Electrical Properties (Typical)

Magnetic Permeability
Non-magnetic in the full annealed condition. Permeability increases upon cold work such as drawing or machining.

Electrical Resistivity
29 μΩ - in (730 μΩ – mm) @ 68°F (20°C)

Bars 0.750" - ≤ 1" Cold Drawn Bars

Tensile Strength	90-125 ksi (620 – 861 MPa)
Yield Strength (0.2%)	30 ksi (206 MPa) minimum
Elongation	35% minimum
Reduction of Area	50% minimum
Hardness	140 – 262 HB

Characteristics

AISI 303	ASTM A484
UNS 30300	ASTM A581
EN 10088-3	ASTM A582
1.4305	ASTM F899
X8CrNiS18-8	AMS 5640 Type 1
SAE J405 No. 30303	ASTM A314
QQ-S-764B, Amend 2	ASTM A320 Class 1
MIL-S-862 (Chem)	

Bars > 1"

Tensile Strength	75-125 ksi (517 – 861 MPa)
Yield Strength (0.2%)	30 ksi (206 MPa) minimum
Elongation	35% minimum
Reduction of Area	50% minimum
Hardness	140 – 223 HB

The table on the following page, in conjunction with the recommendations below, provides a useful guideline for initial set-up. To realize the optimal potential of **303 UGIMA®**, contact your **Swiss Steel USA** application engineer. A review of your current set-up will allow for specific recommendations adapted to **303 UGIMA®**. All stainless steels are not created equal. Unlock the potential of **303 UGIMA®** as your competitive advantage.

Physical Properties (Typical)

Density	0.285 lbs/in ³ (7.9g/cm ³)
Modulus of Elasticity	28.5 x 10 ⁶ psi (515-655 MPA)
Thermal Conductivity @ 68°F (20°C)	8.8 Btu/ft/hr/°F (15.3 W/m/°C)
Mean Coefficient of Linear Expansion: 68-392°F (20-200°C)	9.3 x 10 ⁻⁶ in/in/°F (16.8 x 10 ⁻⁶ cm /cm/°C)

HSS Tooling

Coated Carbide Tools



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Machining Operations	Metallurgical Condition	Depth of cut or width (in.)	Cutting Speed SFPM	Feed (ipr)	Type of Tool	Cutting Speed SFPM	Feed (ipr)	Type of Tool
Turning	Cold Drawn	0.04	130-180	0.006-0.010	M2-M3 (T15)	360-1400	0.005-0.008	C7
		0.08	110-160	0.007-0.012		325-1250	0.006-0.010	C6
		0.12	90-140	0.008-0.018		260-1150	0.006-0.012	C6
	Annealed	0.04	140-190	0.006-0.010	425-1750	0.005-0.008	C7	
		0.08	120-170	0.007-0.012	325-1365	0.006-0.010	C6	
		0.12	100-150	0.008-0.018	520-1200	0.006-0.012	C6	
Forming & Grooving	Cold Drawn	0.08	120-160	0.003-0.005	M2-M3 (T15)	255-500	0.002-0.003	C6
		0.25	110-150	0.025-0.004		235-495	0.003-0.004	C6
		0.50	100-140	0.002-0.004		235-465	0.003-0.004	C6
		1.00	80-120	0.015-0.003		220-440	0.002-0.003	C6
		2.00	60-100	0.015-0.003		220-410	0.002-0.003	C6
	Annealed	0.08	130-170	0.003-0.005	270-595	0.003-0.004	C6	
		0.25	120-160	0.0025-0.004	255-560	0.003-0.004	C6	
		0.50	110-160	0.002-0.004	255-510	0.003-0.004	C6	
		1.00	90-130	0.0015-0.003	255-460	0.002-0.003	C6	
		2.00	70-110	0.0015-0.003	220-425	0.002-0.003	C6	
Shaking & Skiving	Cold Drawn	0.08	130-160	0.003-0.005	M2-M3 (T15)	245-500	0.002-0.003	C6
		0.25	120-150	0.0025-0.004		230-495	0.002-0.003	C6
		0.50	110-150	0.002-0.004		230-465	0.002-0.003	C6
		1.00	90-120	0.0015-0.003		210-440	0.002-0.003	C6
		2.00	80-110	0.0015-0.003		195-410	0.002-0.003	C6
	Annealed	0.08	140-170	0.003-0.005	260-595	0.002-0.003	C6	
		0.25	130-160	0.0025-0.004	245-560	0.002-0.003	C6	
		0.50	120-160	0.002-0.004	245-510	0.002-0.003	C6	
		1.00	100-130	0.0015-0.003	230-460	0.002-0.003	C6	
		2.00	90-120	0.0015-0.003	210-425	0.002-0.003	C6	
Cut-Off or Part-Off	Cold Drawn	0.04	110-140	0.002-0.004	M41 (T15)	245-650	0.002-0.003	C6
		0.08	100-130	0.002-0.003		195-595	0.002-0.003	C6
		0.12	90-120	0.002-0.003		180-420	0.002-0.003	C6
	Annealed	0.04	120-150	0.002-0.003	275-700	0.002-0.003	C6	
		0.12	110-140	0.002-0.003	245-670	0.002-0.003	C6	
		0.25	100-130	0.002-0.004	210-595	0.003-0.004	C6	

Machining Operations	Metallurgical Condition	Depth of cut or width (in.)	HSS Tooling			Coated Carbide Tools		
			Cutting Speed SFPM	Feed (ipr)	Type of Tool	Cutting Speed SFPM	Feed (ipr)	Type of Tool
Drilling	All	0.063	45-90	0.001-0.003	M2	160-480	0.0005-0.002	C5-C6 or
		0.125	60-95	0.003-0.011		185-540	0.002-0.004	C1-C2
		0.250	60-105	0.005-0.013		210-630	0.002-0.005	TiN Coated
		0.500	65-130	0.007-0.015		240-710	0.004-0.006	
		0.750	75-140	0.011-0.013		270-760	0.006-0.009	
Insert Drilling	All	0.50-0.75				150-550	0.0015-0.004	C7
		0.75-1.00				250-700	0.004-0.005	C6
		1.00-2.50				300-750	0.002-0.006	C5
Reaming	All	0.062	45-90	0.002-0.004	M2 (M42)	160-480	0.002-0.004	C5-C6 or C3
		0.125	60-95	0.004-0.008		185-540	0.004-0.008	TiN Coated
		0.250	60-105	0.007-0.016		210-630	0.007-0.016	
		0.500	65-130	0.015-0.025		240-710	0.015-0.025	
		0.750	70-140	0.015-0.030		270-760	0.015-0.030	
		1.000	80-140	0.020-0.030		280-760	0.020-0.030	
Tapping	All	All	35-55		M2-M7 TiN Coated			

Heat Treatment

The heat treatment (annealing) that gives **303 UGIMA®** its optimum properties includes heating in the range of 1850°F - 2000°F (1010°C - 1095°C), followed by rapid cooling with forced air or water quenching

Forging (Hot Working)

303 UGIMA® is not a forging grade. However, if forging is required, the following conditions are recommended:

Heat in range of 2200°F - 2370°F (1180°C - 1280°C)

Minimum forge temperature 1900°F (1040°C)

Hardenability (Cold Working)

Not hardenable by heat treatment. Strength and hardness increases upon cold work such as drawing and forming.

Corrosion Resistance

The corrosion resistance of a stainless steel depends on many factors related to the composition of the corrosive environment, pH, temperature, velocity, agitation, crevices, deposits, dissimilar metal contact, metallurgical condition, as well as the preparation of the surface. The table here is for comparative purposes only and illustrates the performance in different environments. Consult your **Swiss Steel USA** metallurgist to discuss your application.

Optimum corrosion resistance requires that parts be smooth and free from surface contamination such as cutting fluid and foreign particles. Under these conditions, part will be passive in air. Due to complexity and cost, passivation of **303 UGIMA®** should be avoided. However, if passivation is required, the following treatment is recommended: solution 20-50% nitric acid. Alkaline degreasing / surface neutralization with sodium hydroxide. Treatment: Immerse for 25-40 minutes followed by thorough rinsing to remove all residual solution.

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Environment	Behavior
Nitric Acid	●●●○
Humidity	●●●○
Phosphoric Acid	●●○○
NaCl (Saline Mist)	●●○○
Sulfuric Acid	●●○○
Seawater	●○○○
Acetic Acid	●●○○
Petroleum	○○○○ Restricted

It is important to note, maintaining corrosion resistance at weld zones will require cleaning and passivation.

Machinability

The key to **303 UGIMA®** lies in the production process, which combines the proprietary **UGIMA®** technology with new and beneficial modifications to the steel-making process. This combination allows for superior machinability across a wider range of operations and cutting conditions. A special steel making practice eliminates the hard and abrasive inclusions that reduce machinability. The **UGIMA®** technology replaces the hard and abrasive oxide phases with highly specific inclusions that actually benefit machinability. The inclusions are soft and malleable at machining temperatures due to their lower melting points, and coat the cutting tools with a "solid" lubrication to reduce friction and heat. The **UGIMA®** manufacturing process, in combination with the advanced steel-making practices that distinguish the **303 UGIMA®** grade, ultimately result in better tool life, improved surface finish, and excellent chip control regardless of your machine, operation, tooling, or cutting conditions. Bottom line oriented shops recognize that **303 UGIMA®** does not machine like other type 303 products.

The table values are initial suggestions and can vary depending on machine and cutting conditions.

The use of coated tools increases the tool life by 20 % to 50 % using the same cutting parameters, or it increases the cutting conditions (speed) by 10 % to 15 % using the same tool wear.

Tooling grades in parenthesis denotes alternate tool material choice.

Drill speeds were developed using 118 ° including angle drills. Increase speeds 10 - 20 % with the use of 140 ° angle drills.

Drill cutting conditions are valid for hole depths up to 4 times diameter.

Machining speeds and feeds apply to highly rigid equipment. Reductions may be necessary on cross slide operations or less rigid equipment.

When using C1, C2 or C3 carbides, reduce speeds by 25 - 40%.

303 UGIMA® is not recommended for thin wall applications due to potential cracking.

The machining data presented within all tables and graphs represent typical working ranges based on field and laboratory research. Results will vary based on parts to be produced, equipment and tooling utilized, personnel operating the equipment and customer please contact **Swiss Steel USA** Technical Support at the Corporate Office: +1 800 323 1233.

Welding

As with any sulfur bearing austenitic stainless steel, the welding of **303 UGIMA®** should be avoided since the high sulfur content can result in hot cracking. This is particularly true for welding processes where no filler metal is used (except for friction welding). If welding is required, AWS E312/ER312 is recommended as filler metal. It should be noted that perfect welds are very difficult to obtain, especially in Heat Affected Zones (HAZ) where hot cracking is difficult to avoid. No heat treatment is necessary after welding.

General Note

All statements regarding the properties or utilization of the materials or products mentioned are for the purpose of description only. Guarantees regarding the existence of certain properties or a certain utilization are only valid if agreed upon in writing.

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