

Technical Data Sheet

UGIMA®-X 4305

Chemical composition (%)	C	Si	Mn	Ni	Cr	Cu	Mo	P	S
	≤0.07	≤0.75	≤2.0	8.0 – 10.0	17.0 – 18.0	≤0.75	≤0.5	≤0.04	0.25 – 0.35

25-03-2019 – REV 00

General presentation:

UGIMA®-X 4305 is a stainless steel of highly improved machinability manufactured only by Ugitech. Its properties are identical to those of other 1.4305s except for its machinability, which is even better than that of UGIMA® 4305, the 1.4305 grade from Ugitech with already improved machinability.

- » UGIMA®-X 4305 is a stainless steel resulting from an improved production and control process in the UGIMA® population developed by Ugitech.
- » UGIMA®-X 4305 represents a technological advance which has advantages whatever the machining conditions, machinery or tools used; its machinability is optimal at high cutting conditions.

Compared to UGIMA® 4305, increases of 15% have been achieved in turning. This ranks it slightly ahead of UGIMA® 4305 HM, with fewer detrimental effects such as the cold cracking phenomenon thanks to its lower sulfur content.

Classification:

Improved Machinability Austenitic Stainless Steel with a high sulfur content.

Designation:

Material No.				
Europe – EN		USA – UNS	Japan – JIS	World – ISO
1.4305	X8CrNiS18-9	S30300	SUS303	4305-303-00-1 X10CrNiS18-9

Other material name				
USA	France	Germany	UK	Sweden
AISI	AFNOR	DIN	BS	S.S
303	Z8CNF 18-09	1.4305	303S31	2346

Standards	
EN	EN 10088-3
ASTM	ASTM A581/581M - ASTM A582/582M
AMS	AMS 5640 type 1 - AMS QQS 764 - SAE J405
JIS	JIS G 4303 - JIS G 4308

Mechanical properties:

Tensile data

	Yield stress	Tensile strength	Elongation	Reduction of Area
	Rp0.2% (MPa)	Rm (MPa)	A (%)	Z (%)
Solution annealed	250 – 350	570 – 650	50 – 65	60 – 75
Work-hardened by drawing	360 – 670	685 – 850	26 – 47	37 – 56

Limit values for information only; approximate ranges allowing for the different cold drawing rates it is possible to apply (cold drawing rate $\hat{\tau}$ = hardness and strength $\hat{\tau}$)

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Physical properties:

Temperature (°C)	Density	Elastic modulus	Thermal conductivity	Expansion coefficient From 20 to 200°C	Electrical resistivity	Specific heat
	(kg/dm ³)	(GPa)	(W/m.K)	(K ⁻¹)	(μΩ.mm)	(J/kg.K)
20	7.90	196	15.3	-	730	500
200	-	-	-	16.8 x10 ⁻⁶	-	-

(Indicative values)

Corrosion resistance:

UGIMA[®]-X 4305 has an excellent ability to withstand corrosion in many environments. Its corrosion resistance is typical of an austenitic steel and is similar to that of 4305 / 303 in every respect.

- » However, UGIMA[®]-X 4305 is not recommended for use in marine environments and highly oxidizing chemical environments.
- » In addition, as with all high sulfur content stainless steels, special care must be taken when using UGIMA[®]-X 4305 in acid or chloride environments that are liable to pitting and crevice corrosion; it should not be used where components are shaped in such a way as to form areas where corrosive products might collect and corrode.

Environment	Behavior
Nitric acid	Good
Phosphoric acid	Average
Sulfuric acid	Average
Acetic acid	Average
Sodium carbonate	Average
NaCl (Saline mist)	Average
Humidity	Good
Sea water	Restricted use

The use of UGIMA[®]-X 4305 is compatible with all the fluids, lubricants, oils and greases used in the machining industry. Optimum corrosion resistance is obtained where a surface is free from all residual machining oil or foreign particles (iron for example).

UGIMA[®]-X 4305 is pickled in the same way as 304 grade steel.

The decontamination of steels with a high sulfur content is not recommended owing to the complexity and cost of this operation; however, if this is necessary, the recommended decontamination / passivation process is as follows:

- » 1 volume 52% nitric acid (36° Baumé)
- » 1 volume water
- » at room temperature
- » short duration
- » wash carefully when the process is completed

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The corrosion resistance of a stainless steel depends on many factors related to the composition of the corrosive atmosphere (chloride concentration, presence or absence of oxidizing agents, temperature, pH, agitation or no agitation, and so on), as well as to the preparation of the material (surfaces free from metal particles, surface finish such as hardening, polishing, and so on). Precautionary measures should be taken for certain tests such as the saline mist test (ISO 9227): for example marking labels (that might cause corrosion run-outs and reduce the test resistance time) should not be used on the sample.

Heat treatment:

The heat treatment of UGIMA®-X 4305 consists of quenching the metal in water or air after keeping it for an extended period (at least half an hour) at a high temperature of between 1000 and 1100°C. This solution annealing heat treatment enables all traces of cold drawing to be removed whilst providing the steel with its lowest level of mechanical properties.

Machinability

Due to the specific optimization of the entire oxide population in the grade, UGIMA®-X 4305 guarantees exceptional machinability performances, even for a 1.4305 grade. Such performances are provided especially in very high or severe cutting conditions.

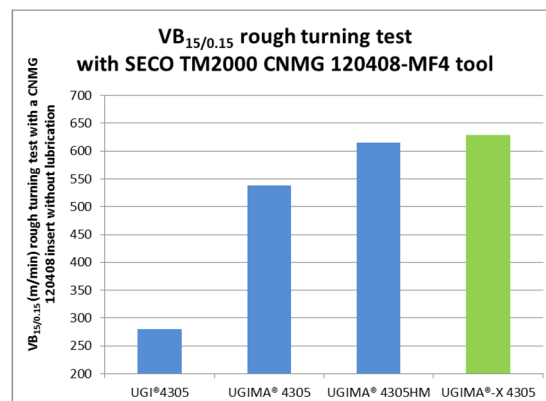
Its performance is based on very good chip breaking, increased tool service lives and very good surface finish after machining.

To obtain the maximum benefit from the potential of this grade, in terms of parts and working environment, contact our Technical Support Department.

Turning

VB_{15/0.15}:

In terms of tool insert wear (VB_{15/0.15} tests, representative of the potential rough turning productivity), the accessible cutting conditions of UGIMA®-X 4305 increase by nearly 15% compared with the already improved UGIMA® 4305; this therefore ranks it slightly higher than UGIMA® 4305HM but with less sulfur so fewer detrimental effects like the cold cracking phenomenon. The VB_{15/0.15} test results obtained with SECO TM2000 CNMG 120408-MF4 inserts are shown in the chart below.



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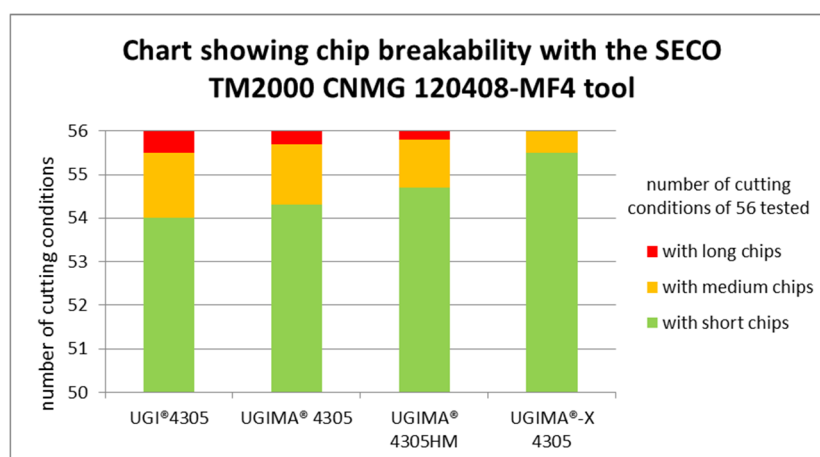
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Chip Breaking Zones (CBZ):

In terms of chip breakability (CBZ tests, representative of the ability of the metal to limit machine downtime due to chips becoming entangled around the tools), the number of short chip cutting conditions for UGIMA[®]-X 4305 is slightly increased compared to those obtained with the already improved UGIMA[®] 4305 and UGIMA[®] 4305HM. This is shown in the following chart, which indicates the number of machining conditions (average values from several tests) producing short, medium and long chips (among those tested*) for the SECO TM2000 CNMG 120408-MF4 turning insert for each stainless steel grade tested.



* the conditions tested are as follows: at a constant cutting speed (300 m/min), the feed rate "f" is varied from 0.1 mm to 0.4 mm/rev in increments of 0.05 mm/rev, and the cutting depth "a_p" is varied from 0.5 mm to 4 mm in increments of 0.5 mm; fifty-six conditions were tested using this method.

Welding:

Like all austenitic stainless steels with a high sulfur content, UGIMA[®]-X 4305 must be welded with care to avoid hot cracking phenomena occurring in the HAZ as well as in the WM (especially when no filler wire is used).

In arc welding (GMAW, GTAW, etc.), reducing the heat input can be very helpful in avoiding hot cracking phenomena by enabling faster cooling, which limits the sulfur segregation in the HAZ/WM responsible for hot cracking. If a welding filler wire is required, ER312 filler wire can be a good solution to lower the risk of hot cracking in the WZ.

Laser welding of UGIMA[®]-X 4305 is very difficult, as is the case for all the high-sulfur austenitic stainless steel grades like 1.4305. Laser welding should therefore be avoided if possible.

No heat treatment is required after welding.

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Available products

Product	Shape	Surface finish	Tolerance	Dimensions
Bar	Round	Rolled and descaled	12 to 13	22 to 130 mm
	Round	Turned and polished	9 to 11	22 to 130 mm
	Round	Drawn	8 to 9	1.8 to 55 mm
	Round	Ground	7 to 9	1.8 to 80 mm
	Hexagonal	Drawn	11	3 to 55 mm
Drawn wire	Round	Mat		1 to 14 mm

Other sizes: contact us

Applications:

- » General component production
- » Food-processing and agricultural industries
- » Decorating and household equipment
- » Building and construction, transport
- » Electronic equipment

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