

SigmaChip S3 DATA SHEET

TYPICAL APPLICATIONS

Repetition and engineering components including:

Gears	Valve blocks	Spindles
Shafts	Nozzles	Cable glands
Pipe unions	Threaded items	Studding
Turned parts	Plumbing	Pneumatics
Hydraulics	Pins	Decorative
Bearings	Bolts	Washers
Nuts	Bushings	

PRODUCT ATTRIBUTES

Excellent free machining properties, especially on automatics

Very high uniformity of diameter, concentricity, surface finish and straightness

Superior production techniques to allow use of calcium as an inclusion modifier

Advanced use of calcium as an inclusion modifier to provide superior free machining properties to traditional sulphur only 303 grades

SigmaChip S3 fully meets all requirements of 1.4305/303S31 specification

Product sourced from mills with ISO 9000 quality systems

Very good corrosion resistance 18/8 type stainless steel

Good mechanical properties

Excellent surface finish

CUSTOMER BENEFITS

Greatly reduced machining times, minimal machining problems and superior component performance with reduced tool wear

Further reduced machining times over traditional free machining grades, combined with excellent consistency of machinability

Ability to use a superior and more cost effective product than standard 303 specification whilst fully meeting ALL appropriate internationally recognised technical standards

Guarantee of highest quality giving increased component confidence

Suitable for corrosive environments. SigmaChip S3 has equivalent corrosion resistance to standard grade 303S31

Suitable for high strength applications

Very good component aesthetics

PRODUCT DESCRIPTION

SigmaChip S3 is a premium quality calcium injected 303S31 (1.4305) derivative austenitic grade stainless steel with exceptional machinability and very high corrosion resistance. The exceptional free machining properties over traditional 303 grades can significantly reduce production costs in the manufacture of repetition components, particularly on automatic lathes, by reducing machining times and minimising tool wear. The innovative and advanced use of calcium as an inclusion modifier during the melting process, combined with the correct sulphur level, ensures the material achieves far superior machinability compared with normal sulphur only based grades whilst providing excellent consistency from batch to batch.

TECHNICAL DESCRIPTION

SigmaChip S3 is a 303S31 (1.4305) derivative alloy with added calcium. It fully meets the 303S31 (1.4305) requirements in all respects. Comparable international standards include:

Euronorm 1.4305	AFNOR Z8CNF18 09
DIN X10CrNiS18 9	AISI/SAE 303
UNI X10CrNiS18 09	SS2346
F 3508	

TYPICAL MECHANICAL PROPERTIES

		As rolled	Cold drawn
Tensile Strength	N/mm ²	500/700	650/850
0.2% Proof Stress	N/mm ²	240/300	350/500
Elongation	% (5.65√A)	>40	>25
Brinell Hardness	HB	140/190	190/255

TYPICAL PHYSICAL PROPERTIES

Elastic Modulus	kN/mm ²	196
Coefficient of Linear Thermal Expansion	1/K	18.7x10 ⁻⁶
Thermal Conductivity	W/m.K	14.6
Electrical Resistivity	μΩ Cm	72
Softening Temperature	°C	950-1100
Melting Range	°C	1400-1440

NOMINAL COMPOSITION %

	C	Mn	Si	S	P
Min				0.15	
Max	0.10	2.00	1.00	0.35	0.045
	Cr	Ni	Mo	Cu	Ti
Min	17.00	8.00			
Max	19.00	10.00		1.00	

CUT TO SIZE CAPABILITY

Every Smiths Metal Centre has at least one automatic power bandsaw for immediate requirements and has access within the Smiths group to thirty power saws including a fully automated magazine feed CNC rod blanking line. We can economically cut from one off blanks to the largest production run – for immediate or JIT deliveries.

CUT TO SIZE BILLETS	mm
Tolerance	±0.3

CORROSION RESISTANCE

SigmaChip S3 is an austenitic 18/8 type stainless steel and therefore has a high resistance to corrosive attack, leading to its ready use in applications such as food, dairy, domestic, hospital and brewery equipment, and many other processing environments. When the most severe forms of chemical attack are expected, particularly in the chemical and petrochemical industries where corrosive media containing chlorides may be involved, we recommend the use of a molybdenum alloyed austenitic stainless steel such as our calcium injected free machining 316 grade.

TOLERANCES (mm)

Diameter	Finish	ISO tolerance
>3 ≤ 25	Bright drawn	h9
>25 ≤ 76	Smooth turned and polished	h10
>76	Turned/peeled	k12/k16

FABRICATION

Welding:	Generally not recommended, however, SigmaChip S3 can be welded
Polishing:	Standard mechanical methods such as grinding, abrasive belting and cold rolling can be used without difficulty. Electro polishing can be successfully undertaken with a sulphuric-phosphoric acid solution electrolyte.
Bending:	SigmaChip S3 has similar bendability to other 18/8 type stainless steels.

MACHINING

The exceptional machinability of SigmaChip S3 is conferred by the advanced calcium injection process. Machinability and tool life are dramatically improved over traditional 303 grades and, with an improved chip form, the swarf is easier to clear from the work area. This improvement is shown up most dramatically when looking at a typical high quality volume roughing operations. We particularly recommend the use of coated carbide tools with SigmaChip S3, where significantly higher cutting speeds can be used. Tables of tool life are included at high cutting speeds to show the improved machinability of SigmaChip S3.

TURNING

High quality volume production

Tool:	CARBIDE
Cutting speed mtr/min:	270
Traditional 303 cutting speed:	110
Feed mm/rev:	0.40
Cut mm:	3

Potential tool life advantage over traditional grade 303 at high cutting speeds:

Speed:	mtr/min	225	250	275	300
Tool life (min): SigmaChip S3		60	28	14	8
Tool life (min): Standard grade 303		28	15	10	6

Tool life can be dramatically increased – at 225 mtr/min tool life is doubled!

Tool:	COATED CARBIDE
Cutting speed mtr/min:	320
Traditional 303 cutting speed:	210
Feed mm/rev:	0.40
Cut mm:	3

Potential tool life advantage over traditional grade 303 at very high cutting speeds:

Speed:	mtr/min	350	400	450
Tool life (min): SigmaChip S3		64	33	20
Tool life (min): Standard grade 303		20	10	7

These figures show that tool life can be tripled under arduous conditions.

The parameters for finishing are dependent on the CLA finish required.

DRILLING

Tool: HSS – 2 rakes to reduce axial load

Diameter (mm)	Feed (mm/rev)	Cutting speed (mtr/min)
3	0.06-0.07	15
6	0.09-0.10	18
12	0.10-0.20	18

Where possible we recommend the use of coated carbide drills, which will give significantly improved results over HSS drills.

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