

SigmaChip C1 **DATA SHEET**

TYPICAL APPLICATIONS

Repetition and machined components including:

Transformer and circuit-breaker terminals

Welding equipment

Shafts	Nozzles	Cable glands
Connectors	Threaded items	Studding
Turned parts	Plumbing	Pneumatics
Studs	Pins	Washers
Nuts	Bolts	Bushings

PRODUCT ATTRIBUTES

Excellent free machining properties, especially on automatics

Very high machinability index of 80 (C101 index 20)

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

Superior production techniques to allow correct dispersal of free machining agent with maximum consistency

Product sourced from mills with ISO 9000 quality systems

Very high conductivity

Good corrosion resistance and ability to accept surface treatments

Good scrap value

CUSTOMER BENEFITS

Greatly reduced machining times and superior component performance

Guarantee of highest quality giving increased component confidence

Can replace C101 components with little loss of conductivity

Excellent aesthetics

Recycle value of process scrap

Cost benefits at end of component life cycle

PRODUCT DESCRIPTION

SigmaChip C1 is a premium quality high performance free machining C111 sulphur copper alloy specifically engineered to reduce through cost on repetition component production. SigmaChip C1 has electrical conductivity 93% that of standard grade C101 with vastly superior machining properties (machinability index 4 times that of C101). Smiths SigmaChip C1 alloy is specifically chosen for its excellent consistency from batch to batch, ensuring that optimum machining parameters can be maintained. The product is deoxidised and is free from risk of hydrogen embrittlement.

TECHNICAL DESCRIPTION

SigmaChip C1 is a derivative alloy of grade C111 and will meet all recognised standards appertaining to C111.

ISO CuSP BS C111 CEN CW114C

TYPICAL MECHANICAL PROPERTIES

Tensile Strength	N/mm ² (Rm)	270-350
0.2% Proof Strength	N/mm ² (Rp0.2)	230-320
Elongation	% (5.65√A)	5-15
Brinell/Vickers Hardness	HB/HV	80-110

TYPICAL PHYSICAL PROPERTIES

Elastic Modulus	kN/mm ²	98
Coefficient of Linear Thermal Expansion	1/K	17x10 ⁻⁶
Thermal Conductivity	W/m.K	347
Annealing temperature	°C	400-650
Stress relieving temp.	°C	225-275
Melting Range	°C	1067-1079
Electrical Conductivity	%IACS	93

CONDUCTIVITY

SigmaChip C1 has electrical conductivity 93% that of pure copper.

TOLERANCES (mm)

Diameter	Tolerance
>4 ≤12	±0.05
>12 ≤25	±0.08
>25 ≤50	±0.12
>50 ≤80	±0.18

NOMINAL COMPOSITION %

Cu + S	S
99.80 min	0.30-0.60

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

SURFACE TREATMENT

SigmaChip C1 readily accepts many surface treatments for aesthetic or further wear and corrosion resistance. The most frequently used treatments are listed.

Bright dipping	Use proprietary bright dip solution.
Polishing	Use conventional polishing techniques and compounds according to 80-110 VPN surface hardness.
Plating	Conventional nickel and chromium plating techniques can be used.
Lacquering	A variety of proprietary clear surface finishes can be applied to ensure SigmaChip C1 retains its lustre. For maximum longevity we strongly recommend the use of a specialist corrosion inhibiting copper coating appropriate to application.

CORROSION RESISTANCE

SigmaChip C1 has good natural corrosion resistance in both indoor and outdoor conditions. The surface will slowly form a dark protective oxide barrier in indoor conditions, whilst rainwater and the atmosphere in outdoor conditions will generate the familiar green 'patina', which is also protective. The free machining sulphur agent in SigmaChip C1 will accelerate the speed of oxide layer formation.

FABRICATION

Soldering	Very Good
Brazing	Good
Welding	Not recommended
Bending	Poor

MACHINING

SigmaChip C1 has very good machinability and produces short, fine chips that are easily removed from the work area. Surface finish and tolerances are very good.

SigmaChip C1 has a machinability index of about 80, compared with a figure of 20 for grade C101, which is difficult to machine. The use of SigmaChip C1 in place of C101 will reduce machining times dramatically, whilst giving improved tool life.

TURNING

Tool:	HSS	
	ROUGHING	FINISHING
Cutting speed sm/m:	90-200	90-200
Feed mm/rev:	0.15-0.5	0.07-0.4
Cut mm:	1-3	0.4-0.75
Tool:	CARBIDE	
	ROUGHING	FINISHING
Cutting speed sm/m:	120-300	150-450
Feed mm/rev:	0.4-0.65	0.15-0.4
Cut mm:	1.1-3	0.4-0.75

DRILLING

Tool:	HSS
Cutting speed sm/m:	60-150
Feed mm/rev:	0.005-0.075

The machinability index and machining parameters are reproduced by kind permission of the Copper Development Association.

The single source for all your engineering materials.

12 Material Centres throughout the UK.

- ▶▶ Biggleswade Select
Tel: 01767 604704
Fax: 01767 600466
- ▶▶ Biggleswade Metal Centre
Tel: 01767 604604
Fax: 01767 315271
- ▶▶ Birmingham Metal Centre
Tel: 0121 327 5511
Fax: 0121 327 4060
- ▶▶ Bristol Metal Centre
Tel: 0117 971 2800
Fax: 0117 971 6300
- ▶▶ Chelmsford Metal Centre
Tel: 01245 466664
Fax: 01245 465916
- ▶▶ Ferndown Metal Centre
Tel: 01202 893755
Fax: 01202 893712
- ▶▶ Horsham Metal Centre
Tel: 01403 261981
Fax: 01403 241820
- ▶▶ Leeds Metal Centre
Tel: 0113 277 6887
Fax: 0113 271 0226
- ▶▶ London Metal Centre
Tel: 020 7241 2430
Fax: 020 7254 9608
- ▶▶ Norwich Metal Centre
Tel: 01603 789878
Fax: 01603 788973
- ▶▶ Nottingham Metal Centre
Tel: 0115 925 4801
Fax: 0115 925 5370
- ▶▶ Tyneside Metal Centre
Tel: 0191 469 5428
Fax: 0191 495 0116

www.smithmetal.com

SMITHS METAL CENTRES are the exclusive UK distributors for SigmaChip C1 high technology free machining copper – for further information on how SigmaChip C1 can reduce your through-cost contact your local metal centre. We have 16 strategically placed Metal Centres to guarantee the most competitive TOTAL service package in the UK.

All information in this data sheet is based on appropriate testing and is stated to the best of our knowledge and belief. It is presented apart from contractual obligations and does not constitute any guarantee of properties or of processing or application possibilities in individual cases. Our warranties and liabilities are stated exclusively in our terms of trading.

SigmaChip is a registered trade mark of Smiths Metal Centres.