

Specification for

**Copper-aluminium-
nickel-iron alloy rods,
sections, forging stock
and forgings**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Aerospace Standards Policy Committee (ACE/-) to Technical Committee ACE/16, upon which the following bodies were represented:

British Non-ferrous Metals Federation
Copper Development Association
Ministry of Defence
Society of British Aerospace Companies Ltd.

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Foreword

This British Standard has been prepared under the direction of the Aerospace Standards Policy Committee and is a conversion and revision of MoD (PE) Specification DTD 197A, which it supersedes.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies the inspection and testing procedures, chemical composition, heat treatment and mechanical properties for a copper-aluminium-nickel-iron alloy supplied in the form of rods (bars), sections, forging stock and forgings.

2 References

This standard makes reference to the following standards publications:

BS B 100, *Procedure for inspection, testing and acceptance of wrought copper alloys*¹⁾.

BS 2872, *Specification for copper and copper alloy forging stock and forgings*.

BS 2874, *Specification for copper and copper alloy rods and sections (other than forging stock)*.

BS 5555, *Specification for SI units and recommendations for the use of their multiples and of certain other units*.

BS 5775, *Specification for quantities, units and symbols*.

BS 5775-0, *General principles*.

BS EN 2500, *Instructions for the drafting and use of metallic material standards*.

BS EN 2500-1, *General requirements*¹⁾.

3 Technical requirements

3.1 Material to this standard shall comply with the technical requirements specified in Table 1 for bars, rods and sections and Table 2 for forging stock and forgings. All material supplied shall comply with the requirements appropriate to its dimensions and condition as specified in the standards given in line 5 of Table 1 or Table 2.

3.2 Symbols and units in Table 1 and Table 2 shall be interpreted in accordance with BS 5555, BS 5775-0 or BS EN 2500-1.

¹⁾ In preparation.

Table 1 — Technical requirements for Cu-Al-Ni-Fe alloys bars, rods and sections

1 Material designation		CuAl10Ni5Fe4											
2	Chemical composition %	Element	Al	Ni	Fe	Sn	Pb	Mn	Si	Zn	Total impurities	Cu	
		min.	8.5	4.0	4.0	—	—	—	—	—	—	Base	
		max.	11.0	5.5	5.5	0.10	0.05	0.50	0.2	0.40	0.5 (excluding Mn)		
3 Method of melting		—											
4 Form Method of production Limit dimensions (mm)		Bars, rods, and sections Extruded and/or rolled, extruded and drawn, rolled and drawn or forged											
5.1 Technical specification		Sections 1 and 2 of BS B 100											
5.2 Dimensional standard		BS 2874(1)											
6.1 Delivery condition and heat treatment		As manufactured At the option of the manufacturer											
6.2 Delivery condition code		—											
7 Use condition and heat treatment		Delivery condition —											
Characteristics													
8 Sampling Test piece Heat treatment		Delivery condition											
9 Dimensions concerned		mm	$6 \leq (a \text{ or } D) \leq 18$				$18 < (a \text{ or } D) \leq 80$				$(a \text{ or } D) > 80$		
10 Thickness of cladding on each face		%	—										
11 Direction of sample		L				L				L			
12		Temperature	θ	°C		Ambient temperature							
13		Proof stress	$R_{p0.2}$	MPa		≥ 400				≥ 370		≥ 320	
14		Strength	R_m	MPa		≥ 700				≥ 650		≥ 650	
15		Elongation	A	%		≥ 10				≥ 12		≥ 12	
16		Reduction of area	Z	%		—							
17 Hardness		$188 \leq HV \leq 268$ ($179 \leq HB \leq 255$)											
18 Shear Strength		R_c	MPa		—								
19 Bending		k	—										
20 Impact strength		—											
21		Temperature	θ	°C		—							
22		Time	h		—								
23		Stress	σ_a	MPa		—							
24		Elongation	a	%		—							
25		Rupture stress	σ_R	MPa		—							
26		Elongation at rupture	A	%		—							
97 Designation		B 23 A											
98 Notes		1) Material group III tolerances shall apply. For round rods, normal tolerances shall apply unless close tolerances are specified on the order. NOTE The dimensional tolerances for rods larger than the size ranges given in BS 2874 should be agreed between the supplier and the purchaser.											

Table 2 — Technical requirements for Cu-Al-Ni-Fe alloy forging stock and forgings

1		Material designation		CuAl10Ni5Fe4								
2	Chemical composition %	Element	A1	Ni	Fe	Sn	Pb	Mn	Si	Zn	Total impurities	Cu
		min.	8.5	4.0	4.0	—	—	—	—	—	—	Base
		max.	11.0	5.5	5.5	0.10	0.05	0.50	0.2	0.40	0.5 (excluding Mn)	
3	Method of melting		—									
4	Form Method of production Limit dimensions (mm)		Forging stock Extruded and/or rolled, extruded and drawn, forged or cast						Forging			
5	5.1 Technical specification		Sections 1 and 3 of BS B 100						Sections 1 and 4 of BS B 100			
	5.2 Dimensional standard		BS 2872(1)						Section 4 of BS B 100			
6	6.1 Delivery condition and heat treatment		As manufactured									
			At the option of the manufacturer									
	6.2 Delivery condition code		—									
7	Use condition and heat treatment		Delivery condition —									
Characteristics												
8	Sampling Test piece Heat treatment		Forged test sample						Forging			
9	Dimensions concerned		mm	—								
10	Thickness of cladding on each face		%	—								
11	Direction of sample		L						L			
12	Tensile	Temperature	θ	°C	Ambient temperature							
13		Proof stress	$R_{p0.2}$	MPa	≥ 350							
14		Strength	R_m	MPa	≥ 700							
15		Elongation	A	%	≥ 14							
16		Reduction of area	Z	%	—							
17	Hardness		—						188 \leq HV \leq 268 (179 \leq HB \leq 255)			
18	Shear Strength		R_c	MPa	—							
19	Bending		k	—								
20	Impact strength		—									
21	Creep	Temperature	θ	°C	—							
22		Time		h	—							
23		Stress	σ_a	MPa	—							
24		Elongation	a	%	—							
25		Rupture stress	σ_R	MPa	—							
26		Elongation at rupture	A	%	—							
27	NOTES (See line 98).											

Table 2 — Technical requirements for Cu-Al-Ni-Fe alloy forging stock and forgings

1 Material designation		CuAl10Ni5Fe4										
2	Chemical composition %	Element	Al	Ni	Fe	Sn	Pb	Mn	Si	Zn	Total impurities	Cu
		min.	8.5	4.0	4.0	—	—	—	—	—	—	Base
		max.	11.0	5.5	5.5	0.10	0.05	0.50	0.2	0.40	0.5 (excluding Mn)	
3 Method of melting		—										
4 Form Method of production Limit dimensions (mm)		Forging stock Extruded and/or rolled, extruded and drawn, forged or cast							Forging			
58 Forgeability		The test piece shall, when heated to $900\text{ }^{\circ}\text{C} \leq \theta \leq 950\text{ }^{\circ}\text{C}$, withstand compression to 20 % of its original length										
97 Designation		B 23 B							B 23 C			
98 Notes		1) The diameters of round forging stock shall be those applicable to alloy group B of BS 2872. NOTE The dimensional tolerances to be applied to round forging stock outside the range given in BS 2872 and to forging stock of other shapes should be agreed between the supplier and the purchaser.										

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