



BSI Standards Publication

## AEROSPACE SERIES

**Specification for copper-  
aluminium-nickel-iron alloy  
rods, bars, sections, forging  
stock and forgings**

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 6, an inside back cover and a back cover.

## Foreword

### Publishing information

This British Standard is published by BSI and came into effect on 30 November 2009. It was prepared by Panel ACE/61-/16, *Copper and miscellaneous alloys*, under the authority of Technical Committee ACE/61, *Metallic materials for aerospace purposes*. A list of organizations represented on this committee can be obtained on request to its secretary.

### Supersession

This British Standard supersedes BS B 23:1991, which is withdrawn.

### Information about this document

This is a full revision of BS B 23 and introduces the following principal changes:

- a) requirements are stated in tabular format in accordance with EN 4500-1;
- b) for dimensional inspection of rods, bars and sections (Table 1, line 96), withdrawn BS 2874 has been replaced by BS EN 12163;
- c) for dimensional inspection of forging stock (Table 2, line 96), withdrawn BS 2872 has been replaced by BS EN 12165.

### Hazard warnings

**WARNING.** This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

### Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

### Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed either as a set of instructions or in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

### Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

## 1 Scope

This British Standard specifies requirements for copper-aluminium-nickel-iron alloy supplied in the following forms:

- a) rods, bars and sections: as manufactured, designation B 23A;
- b) forging stock: as manufactured, designation B 23B;
- c) forgings: as manufactured, designation B 23C.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

BS EN 12163, *Copper and copper alloys – Rod for general purposes*

BS EN 12165, *Copper and copper alloys – Wrought and unwrought forging stock*

## 3 Technical requirements

Material to this standard shall conform to Table 1 and Table 2.

*NOTE* The format and symbols used in Table 1 and Table 2 are derived from EN 4500-1.

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

1	Material designation		BS B 23									
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		—									
4.1	Form		Rods, bars and sections (B 23A)									
4.2	Method of production		Extruded and/or rolled, extruded and drawn, rolled and drawn or forged									
4.3	Limit dimension(s)	mm	—									
5	Technical specification		Sections 1 and 2 of BS B 100									

6.1	Delivery condition		As manufactured									
	Heat treatment		At the option of the manufacturer									
6.2	Delivery condition code		—									
7	Use condition		Delivery condition									
	Heat treatment		—									

## Characteristics

8.1	Test sample(s)		See Section 2 of BS B 100									
8.2	Test piece(s)		See Section 2 of BS B 100									
8.3	Heat treatment		Use condition									
9	Dimensions concerned	mm	6 ≤ a or D ≤ 18				18 < a or D ≤ 80				a or D > 80	
10	Thickness of cladding on each face	%	—									
11	Direction of test piece		L				L				L	
12	T	Temperature	θ	°C		Ambient				Ambient		
13		Proof stress	R <sub>p0.2</sub>	MPa		≥ 400				≥ 370		
14		Strength	R <sub>m</sub>	MPa		≥ 700				≥ 650		
15		Elongation	A	%		≥ 10				≥ 12		
16		Reduction of area	Z	%		—						
17	Hardness		188 ≤ HV ≤ 268 or 179 ≤ HBW ≤ 255									
18	Shear strength	R <sub>c</sub>	MPa		—							
19	Bending	κ	—		—							
20	Impact strength		—									
21	C	Temperature	θ	°C		—						
22		Time	h		—							
23		Stress	σ <sub>a</sub>	MPa		—						
24		Elongation	a	%		—						
25		Rupture stress	σ <sub>R</sub>	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		BS B 23									
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		—									
4.1	Form		Forging stock (B 23B)					Forging (B 23C)				
4.2	Method of production		Extruded and/or rolled, extruded and drawn, forged or cast					Forged from B 23B stock				
4.3	Limit dimension(s)	mm	—					—				
5	Technical specification		Sections 1 and 3 of BS B 100					Sections 1 and 4 of BS B 100				

6.1	Delivery condition		As manufactured					As manufactured				
	Heat treatment		At the option of the manufacturer					At the option of the manufacturer				
6.2	Delivery condition code		U					U				
7	Use condition		Delivery condition					Delivery condition				
	Heat treatment		—					—				

## Characteristics

8.1	Test sample(s)		See Section 3 of BS B 100					See Section 4 of BS B 100						
8.2	Test piece(s)		See Section 3 of BS B 100					See Section 4 of BS B 100						
8.3	Heat treatment		Use condition					Use condition						
9	Dimensions concerned	mm	—					—						
10	Thickness of cladding on each face	%	—					—						
11	Direction of test piece		L					L						
12	T	Temperature	$\theta$	°C	Ambient					Ambient				
13		Proof stress	$R_{p0.2}$	MPa	$\geq 350$					$\geq 350$				
14		Strength	$R_m$	MPa	$\geq 700$					$\geq 700$				
15		Elongation	A	%	$\geq 14$					$\geq 14$				
16		Reduction of area	Z	%	—					—				
17	Hardness		—					$188 \leq HV \leq 268$ or $179 \leq HBW \leq 255$						
18	Shear strength	$R_c$	MPa	—					—					
19	Bending	$\kappa$	—	—					—					
20	Impact strength		—					—						
21	C	Temperature	$\theta$	°C	—					—				
22		Time	h	—					—					
23		Stress	$\sigma_a$	MPa	—					—				
24		Elongation	a	%	—					—				
25		Rupture stress	$\sigma_R$	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 (continued)

44	External defects	—	Forging stock: See Section 3 of BS B 100	Forgings: See Section 4 of BS B 100
58	Forgeability	—	Section 3 of BS B 100	
		6	Compression at $900\text{ °C} \leq \theta \leq 950\text{ °C}$ to 20% of original length	
95	Marking	—	Forging stock: See Section 3 of BS B 100	Forgings: See Section 4 of BS B 100
96	Dimensional inspection	—	Forging stock: BS EN 12165 class A <sup>1)</sup>	Forgings: See Section 4 of BS B 100
98	Notes	—	<sup>1)</sup> Applicable to round forging stock. Dimensional tolerances to be applied to round forging stock outside the range given in BS EN 12165 and to forging stock of other shapes should be agreed between the supplier and the purchaser.	

## Bibliography

### Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 2872, *Specification for copper and copper alloy forging stock and forgings*<sup>1)</sup>

BS 2874, *Specification for copper and copper alloy rods and sections (other than forging stock)*<sup>1)</sup>

EN 4500-1, *Metallic materials – Rules for the drafting and presentation of material standards – Part 1: General rules*<sup>2)</sup>

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1) Referred to in the foreword only.

2) Published as ASD-STAN Prestandard at the date of publication of this standard.



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