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Incorporating Corrigendum No. 1

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AEROSPACE SERIES

Specification for copper-zinc-aluminium-nickel-silicon alloy tube

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Amendments issued since publication

Date	Text affected
November 2014	C1. Correction to Table 1, line 9

Contents

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

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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This British Standard supersedes BS 2B 27:2002, which is withdrawn.

Information about this document

This is a full revision of BS 2B 27 and introduces the following principal changes:

a) requirements are stated in tabular format in accordance with EN 4500-1;

b) in line 33 of Table 1, reference to BS EN 10233 has been replaced by reference to Section **5** of BS B 100 and the test requirements added using the method indicated in EN 4500-1;

c) in line 41 of Table 1, reference to BS EN 10234 has been replaced by reference to Section **5** of BS B 100 and the test requirements added using the method indicated in EN 4500-1;

d) in line 54 (eddy current) of Table 1 (incorrectly identified as line 56 in BS 2B 27) the drilled hole sizes have been transferred to Section **5** of BS B 100;

e) in line 55 of Table 1, test pressure details have been replaced by reference to Section **5** of BS B 100 and the test requirements added using the method indicated in EN 4500-1;

f) in line 60 of Table 1, test details have been replaced by reference to Section **5** of BS B 100.

Text introduced or altered by Corrigendum No. 1 is indicated in the text by tags [C1] 〈C1]. Minor editorial corrections are not tagged.

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-zinc-aluminium-nickel-silicon alloy supplied in the form of tube.

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*

3 Technical requirements

3.1 Material to this standard shall conform to Table 1.

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

3.2 Dimensional tolerances shall conform to Table 2. Tolerances on wall thickness shall not vary from the nominal thickness by more than ±10%.

3.3 For the purposes of this standard, a batch shall be tube of the same outside diameter and wall thickness, manufactured by the same route and heat treated together.

Table 1 **Technical requirements for Cu-Zn-Al-Ni-Si alloy tube**

1	**Material designation**			**BS B 27**									
2	**Chemical composition %**	Element		Cu	Al	Ni	Si	Sn	Pb	Fe	Mn	Zn	Total impurities
		Min.		81.0	0.70	0.80	0.80	—	—	—	—	Rem	0.50 [1)]
		Max.		86.0	1.20	1.40	1.30	0.10	0.05	0.25	0.10		
3	**Method of melting**			—									
4.1	**Form**			Tube									
4.2	**Method of production**			Seamless drawn									
4.3	**Limit dimension(s)**		mm	$4 \leqslant D \leqslant 70$									
5	**Technical specification**			Sections 1 and 5 of BS B 100									

6.1	**Delivery condition**		Softened
	Heat treatment		—
6.2	**Delivery condition code**		—
7	**Use condition**		Delivery condition
	Heat treatment		—

Characteristics

8.1	**Test sample(s)**				See Section 5 of BS B 100
8.2	**Test piece(s)**				See Section 5 of BS B 100
8.3	**Heat treatment**				Use condition
9	**Dimensions concerned**			mm	[c1] $4 \leqslant D \leqslant 70$ [c1]
10	**Thickness of cladding on each face**			%	—
11	**Direction of test piece**				L
12	T	**Temperature**	θ	°C	Ambient
13	T	**Proof stress**	$R_{p0.2}$	MPa	$\geqslant 220$
14	T	**Strength**	R_m	MPa	$430 \leqslant R_m \leqslant 500$
15	T	**Elongation**	A	%	$\geqslant 40$
16	T	**Reduction of area**	Z	%	—
17	**Hardness**				$HV \leqslant 140$
18	**Shear strength**		R_c	MPa	—
19	**Bending**		κ	—	—
20	**Impact strength**				—
21	C	**Temperature**	θ	°C	—
22	C	**Time**		h	—
23	C	**Stress**	σ_a	MPa	—
24	C	**Elongation**	a	%	—
25	C	**Rupture stress**	σ_R	MPa	—
26	C	**Elongation at rupture**	A	%	—
27	**Notes** (see line 98)				[1)]

Table 1 **Technical requirements for Cu-Zn-Al-Ni-Si alloy tube** *(continued)*

33	**Flattening test**	—	See Section 5 of BS B 100
		2	One tube per batch
		6	Closed flat
		7	No cracks shall be visible without the use of magnifying aids. Slight cracking at the edges shall not be considered cause for rejection.
41	**Drift expanding test**	—	See Section 5 of BS B 100
		2	Both ends of each tube
		6	$\beta = (45 \pm 1)°$; expansion = 40%
		7	No cracks shall be visible without the use of magnifying aids. Slight cracking at the edges shall not be considered cause for rejection.
44	**External defects (visual)**	—	See Section 5 of BS B 100
54	**Tube leakage (eddy current test)**	—	See Section 5 of BS B 100
		7	The sorting limit shall be the smallest amplitude of the three signals produced by the hole or holes in the reference standard tube.
54	**Tube leakage (hydraulic pressure test)**	—	See Section 5 of BS B 100
		2	Each tube
		7	When subjected to the hydraulic pressure, or after release of the pressure, the tube shall not show defects such as leaks, cracks, pinholes or bulges.
55	**Distension test**	—	See Section 5 of BS B 100
		2	One tube per batch
		7	The test piece shall not exhibit any permanent deformation greater than 0.2% of the mean diameter and shall not exhibit any harmful defect.
60	**Bore test**	—	See Section 5 of BS B 100
95	**Marking**	—	See Section 5 of BS B 100
96	**Dimensional inspection**	—	See Table 2
98	**Notes**	—	[1)] Total impurities excludes Sn, Fe, Pb and Mn.

Table 2 **Dimensional tolerances for Cu-Zn-Al-Ni-Si alloy tube**

Nominal outside diameter (mm)	**Tolerance on outside diameter** (±mm)	
	Mean	**Ovality**
4	0.05	0.07
8	0.05	0.07
12	0.05	0.07
16	0.05	0.07
20	0.05	0.07
22	0.05	0.10
25	0.05	0.10
30 (thickness ⩽ 1)	0.07	0.15
30 (thickness > 1)	0.07	0.10
40 (thickness ⩽ 1.22)	0.07	0.20
40 (thickness > 1.22)	0.07	0.125
50 (thickness ⩽ 1.22)	0.10	0.25
50 (thickness > 1.22)	0.10	0.175
60 (thickness ⩽ 1.22)	0.125	0.40
60 (thickness > 1.22)	0.125	0.25
70	0.125	0.40
NOTE The tolerance on ovality indicates the amount by which the largest (or smallest) diameter, measured at any point on the tube, may depart from the mean diameter. It is not applicable to tubes with outside diameter:nominal thickness ratio of greater than 50.		

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 EN 10233, *Metallic materials – Tube – Flattening test* [1)]

BS EN 10234, *Metallic materials – Tube – Drift expanding test* [1)]

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

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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