BS 3HR 504:2011

BSI Standards Publication

AEROSPACE SERIES

Specification for nickel-chromium-titanium heat-resisting alloy bar and wire for rivets and rivets (Maximum diameter or minor sectional dimension 20 mm) (Nickel base, Cr 19.5, Ti 0.4)

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Contents

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

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 January 2011. It was prepared by Panel ACE/61/-/48, *Heat resisting alloys for aerospace purposes*, 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This standard supersedes BS 2HR 504:1973, which is withdrawn.

Information about this document

This is a full revision of BS HR 504. The principal change from the previous edition is that requirements are stated in tabular format in accordance with EN 4500-1 and EN 4500-3.

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 methods 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 nickel-chromium-titanium heat-resisting alloy supplied in the following forms and as rivets.

a) Bar: annealed, designation HR 504A.

b) Wire: annealed, designation HR 504B.

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 HR 100, *Procedure for inspection, testing and acceptance of wrought heat resisting alloys*

3 Technical requirements

Material to this standard shall conform to Table 1.

NOTE The format and symbols used in Table 1 are derived from EN 4500-1 and EN 4500-3.

Table 1 **Technical requirements for nickel-chromium-titanium heat-resisting alloy bar and wire for rivets and rivets**

1	**Material designation**			**BS HR 504**										
2	**Chemical composition %**	Element		C	Si	Mn	S	Co	Cr	Cu	Fe	Pb	Ti	Ni
		Min.		0.08	—	—	—	—	18.0	—	—	—	0.20	Base
		Max.		0.15	1.0	1.0	0.020	5.0	21.0	0.5	5.0	50 ppm	0.60	
3	**Method of melting**			Electric process										
4.1	**Form**			Bar (HR 504A)				Wire (HR 504B)			Rivets			
4.2	**Method of production**			—				—			Cold forged or machined from HR 504A or HR 504B stock			
4.3	**Limit dimension(s)**		mm	a or D > 8				a or D ≤ 8			a or D ≤ 20			
5	**Technical specification**			Sections 1 and 2 of BS HR 100				Sections 1 and 7 of BS HR 100			Sections 1 and 8 of BS HR 100			

6.1	**Delivery condition**			D > 8 mm: Annealed + machined or ground a > 8 mm: Annealed + chemically descaled				Cold worked + annealed + chemically descaled or bright annealed			Cold forged or machined + bright annealed			
	Heat treatment			θ = (1 050 °C ±10) °C / AC or WQ or at a suitable rate in a controlled atmosphere										
6.2	**Delivery condition code**			U										
7	**Use condition**			Delivery condition										
	Heat treatment			—										

								Characteristics						
8.1	**Test sample(s)**			Bar: See Section 2 of BS HR 100 Wire: See Section 7 of BS HR 100							See Section 8 of BS HR 100			
8.2	**Test piece(s)**			Bar: See Section 2 of BS HR 100 Wire: See Section 7 of BS HR 100							See Section 8 of BS HR 100			
8.3	**Heat treatment**			Use condition							Use condition			
9	**Dimensions concerned**		mm	a or D ≤ 8				8 < a or D ≤ 20			a or D ≤ 20			
10	**Thickness of cladding on each face**		%	—										
11	**Direction of test piece**			L							—			
12	**T**	**Temperature**	θ	°C	Ambient						Ambient			
13		**Proof stress**	$R_{p0.2}$	MPa	—			≥ 232			—			
14		**Strength**	R_m	MPa	≥ 690			≥ 620			—			
15		**Elongation**	A	%	≥ 25 (A_{50mm})			≥ 30			—			
16		**Reduction of area**	Z	%	—									
17	**Hardness**			HV ≤ 275				HBW ≤ 230 or HV ≤ 240			HBW ≤ 230 or HV ≤ 240			
18	**Shear strength**		R_c	MPa	—									
19	**Bending**		κ	—	—									
20	**Impact strength**				—									
21	**C**	**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)				[1)]									

Table 1 **Technical requirements for nickel-chromium-titanium heat-resisting alloy bar and wire for rivets and rivets** *(continued)*

36	**Reverse torsion test**	—	See Section 7 of BS HR 100		
		4	a or D ≤ 8 mm		
		5	Delivery condition		
		6	Round wire: Seven turns in each direction [1)]		
44	**External defects**	—	Bar: See Section 2 of BS HR 100	Wire: See Section 7 of BS HR 100	Rivets: See Section 8 of BS HR 100
51	**Macrostructure**	—	Bar: See Section 2 of BS HR 100	Wire: See Section 7 of BS HR 100	
95	**Marking**	—	Bar: See Section 2 of BS HR 100	Wire: See Section 7 of BS HR 100	
96	**Dimensional inspection**	—	Bar: See Section 2 of BS HR 100	Wire: See Section 7 of BS HR 100	
98	**Notes**	—	[1)] For other than round wire, the number of turns shall be agreed between the manufacturer 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.

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

EN 4500-3, *Metallic materials – Rules for the drafting and presentation of material standards – Part 3: Specific rules for heat resisting alloys* [1)]

[1)] Published as ASD-STAN Prestandard at the date of publication of this standard.

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