



BSI Standards Publication

AEROSPACE SERIES

Specification for nickel-chromium-cobalt-titanium-aluminium heat-resisting alloy cold drawn and solution treated wire for springs and springs (Nickel base, Cr 19.5, Co 18.0, Ti 2.5, Al 1.5)

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2011

ISBN 978 0 580 70383 6

ICS 49.025.99

The following BSI references relate to the work on this standard:

Committee reference ACE/61

Draft for comment 10/30215914 DC

Publication history

First published 1970

Second edition February 1973

Third (present) edition January 2011

Amendments issued since publication

Date	Text affected
-------------	----------------------

Contents

Foreword *ii*

1 Scope 1

2 Normative references 1

3 Technical requirements 1

Bibliography 4

List of tables

Table 1 – Technical requirements for nickel-chromium-cobalt-titanium-aluminium heat-resisting alloy cold drawn and solution treated wire for springs and springs 2

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*, 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This standard supersedes BS 2HR 502:1973, which is withdrawn.

Information about this document

This is a full revision of BS HR 502. 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-cobalt-titanium-aluminium heat-resisting alloy cold drawn and solution treated wire for springs (designation HR 502A) and springs.

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-cobalt-titanium-aluminium heat-resisting alloy cold drawn and solution treated wire for springs and springs

1	Material designation	BS HR 502								
2	Chemical composition %	Element	C	Si	Mn	S	Ag	Al	B	Bi
		Min.	—	—	—	—	—	1.0	—	—
		Max.	0.13	1.0	1.0	0.015	5 ppm	2.0	0.020	1 ppm
		Element	Co	Cr	Cu	Fe	Pb	Ti	Zr	Ni
		Min.	15.0	18.0	—	—	—	2.0	—	Base
Max.	21.0	21.0	0.2	1.5	20 ppm	3.0	0.15			
3	Method of melting	Induction melted, vacuum refined and cast in air or consumable electrode remelted.								
4.1	Form	Wire (HR 502A)								
4.2	Method of production	Cold drawn					Formed from HR 502A wire			
4.3	Limit dimension(s)	mm	D ≤ 8.0				D ≤ 8.0			
5	Technical specification	Sections 1 and 7 of BS HR 100					Sections 1 and 7 of BS HR 100			

6.1	Delivery condition	Cold drawn + solution heat treated				Formed + precipitation treated			
	Heat treatment	1050 °C ≤ θ ≤ 1100 °C ¹⁾				θ = (750 ± 10) °C / t = 4 h / AC ²⁾			
6.2	Delivery condition code	W				U			
7	Use condition	Delivery condition				Delivery condition			
	Heat treatment	—				—			

Characteristics

8.1	Test sample(s)	See Section 7 of BS HR 100				See Section 7 of BS HR 100			
8.2	Test piece(s)	See Section 7 of BS HR 100				See Section 7 of BS HR 100			
8.3	Heat treatment	Delivery condition	Reference (see line 29)			Use condition			
9	Dimensions concerned	mm	—	0.44 < D ≤ 0.99	0.99 < D ≤ 8.0	0.44 < D ≤ 0.99	0.99 < D ≤ 8.0		
10	Thickness of cladding on each face	%	—						
11	Direction of test piece	—		L		L			
12	Temperature	θ	°C	—		Ambient		Ambient	
13	Proof stress	R _{p0.2}	MPa	—		≥ 620		—	
14	Strength	R _m	MPa	—		≥ 1080		≥ 1080	
15	Elongation	A _{50mm}	%	—		≥ 15		≥ 15	
16	Reduction of area	Z	%	—					
17	Hardness	—							
18	Shear strength	R _c	MPa	—					
19	Bending	κ	—	—					
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	%	—					
27	Notes (see line 98)	1), 2)							

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.

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services

Tel: +44 845 086 9001

Email (orders): orders@bsigroup.com

Email (enquiries): cservices@bsigroup.com

Subscriptions

Tel: +44 845 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com



...making excellence a habit.™