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(Superseding British Standard HR 201)

UDC 629.7 : 669.245'26'295'71.41 : 669.018.4

British Standard: Aerospace Series

Specification for

Nickel-chromium-titanium-aluminium heat-resisting alloy plate, sheet and strip

(Nickel base, Cr 19.5, Ti 2.2, Al 1.4)

NOTE 1. This specification complies with AECMA Recommendation Ni-P95-HT.

NOTE 2. Other forms of this alloy are covered by British Standards:

HR 1 Billets, bars, forgings and parts
HR 401 Seamless tubes
HR 601 Bolt material

NOTE 3. Although the issue number is not specified when reference is made to an Aerospace standard, it should be understood that the latest revision, as shown by a prefix number, is to be used.

1. INSPECTION AND TESTING PROCEDURE

This British Standard shall be used in conjunction with British Standard HR 100, Sections 1 and 5.

2. MANUFACTURE

Unless otherwise agreed between the manufacturer and the purchaser in accordance with British Standard HR 100, the material shall be manufactured by one of the following processes:

- (1) induction melted, and cast in air,
- (2) induction melted, vacuum refined and cast in air,
- (3) consumable electrode remelted.

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British Standards Institution · 2 Park Street · London W1A 2BS

Telephone 01-629 9000

Telex 266933

3. CHEMICAL COMPOSITION

The alloy shall contain:

Element	%	
	min.	max.
Carbon	0.040	0.10
Silicon	-	1.0
Manganese	-	1.0
Sulphur	-	0.015
Silver	-	0.0005 (5 p.p.m.)
Aluminium	1.0	1.8
Boron	-	0.008
Bismuth	-	0.0001 (1 p.p.m.)
Cobalt	-	2.0
Chromium	18.0	21.0
Copper	-	0.2
Iron	-	1.5
Lead	-	0.0020 (20 p.p.m.)
Titanium	1.8	2.7
Nickel	Remainder	

4. CONDITION

Unless otherwise agreed, the material shall be supplied in the appropriate condition stated below:

Thickness	Condition of supply
mm	
Up to and including 3	Cold rolled, softened and descaled
Greater than 3	Hot rolled, softened and descaled

5. HEAT TREATMENT

5.1 Softening treatment. The material shall be heated uniformly at a temperature within the range 1100 °C to 1150 °C for a maximum of 30 min, followed by cooling in a suitable medium.

5.2 Precipitation treatment. The material shall be heated at a temperature of 750 ± 10 °C for 4 h, followed by cooling in air.

6. MECHANICAL PROPERTIES

6.1 Mechanical tests. The mechanical properties obtained from test pieces selected, prepared and tested in accordance with the relevant requirements of British Standard HR 100 shall be as follows:

6.1.1 Tensile test at room temperature

Thickness	0.2 % Proof stress	Tensile strength	Elongation
mm	MPa (= N/mm ²)	MPa (= N/mm ²)	%
	min.	min.	min.
0.25 to 0.35	-	1030	15
Over 0.35 to 0.45	-	1030	20
Over 0.45 to 3.0	640	1030	25
Over 3.0 to 9.5	620	1000	20

NOTE. Information on SI units is given in BS 3763, 'The International System of units (SI)', and also BS 350, 'Conversion factors and tables'.

6.1.2 *Stress rupture test*. The test samples shall be selected from material at a stage prior to the manufacture of the plate sheet or strip and shall be:

- (1) solution treated at 1080 ± 10 °C for 8 h, followed by cooling in air;
- (2) precipitation treated at 700 ± 10 °C for 16 h, followed by cooling in air.

Temperature	Stress	Time to rupture
°C	MPa (= N/mm ²)	h
		min.
750	340	30

6.1.3 *Single bend test* (only applicable to sheet and strip). Each test piece shall be bent at room temperature, without cracking, through an angle of 180° over a former with a radius equal to the nominal thickness of the sheet or strip.

6.2 Hardness test

6.2.1 The hardness of material heat treated in accordance with 5.1 shall be not greater than 250 HV.

6.2.2 The hardness of material and test samples heat treated in accordance with 5.1 and 5.2 shall be not less than 280 HV.

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Contract requirements

Attention is drawn to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

Revision of British Standards

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference ACE/48 Draft for comment 72/35139 DC