



METRIC AND INCH UNITS

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4 S. 82, February, 1969

(Superseding British Standard 3 S.82)

BRITISH STANDARDS INSTITUTION

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BRITISH STANDARD AEROSPACE SERIES SPECIFICATION FOR 4% NICKEL-CHROMIUM-MOLYBDENUM CASE-HARDENING STEEL

NOTE. The specified chemical composition, heat treatment and tensile properties comply with A.I.C.M.A. Recommendations FE. PL. 79 (for material heat treated to a tensile strength of 132/152 ht ar).

1. INSPECTION AND TESTING PROCEDURE

1.1 This British Standard shall be used in conjunction with the relevant sections of British Standard 3 S.100 as follows:

Bars for machining.	Sections One and Two
Billets and bars for forging.	Sections One and Five
Forgings.	Sections One and Six
Case hardened parts.	Sections One and Eight

1.2 Sulphur printing or deep etching tests. Samples shall be selected in accordance with British Standard 3 S. 100, Section One, 7.2.1.

1.3 Ultrasonic examination. Rolled billets and bars and, where applicable, forgings shall be subjected to ultrasonic examination to a standard to be agreed between the manufacturer and the purchaser*.

2. PROCESS OF MANUFACTURE

The material shall be manufactured by an electric process, unless otherwise agreed between the manufacturer and the purchaser in accordance with British Standard 3 S.100, Section One, 3.1.

3. CHEMICAL COMPOSITION

The steel shall contain:

Element	%	
	min.	max.
Carbon	0.12	0.18
Silicon	0.15	0.40
Manganese	0.25	0.55
Phosphorus	-	0.025
Sulphur	-	0.020
Chromium	1.0	1.4
Molybdenum	0.20	0.30
Nickel	3.8	4.3

4. SURFACE DRESSING

The material shall be overall dressed in accordance with the requirements of British Standard 3 S.100, Section One, 5.1.

*The purchaser is responsible for securing the concurrence of the parent design firm.

Price 4/- net

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5. CONDITION

5.1 The material shall be supplied in the appropriate condition stated below unless otherwise agreed between the manufacturer and the purchaser in which case the condition in which the material is to be supplied shall be stated on the order.

Designation	Material	Condition of supply
S.82B.	Black bars for machining	Softened
S.82D.	Bright bars for machining	Softened and subsequently cold drawn or cold rolled or machined or ground
S.82A.	Billets and bars for forging	Softened
S.82C.	Forgings	Softened

5.2 Parts shall be supplied finally heat treated.

6. FINAL HEAT TREATMENT

6.1 Except as provided for in 6.2 or unless otherwise agreed in accordance with the relevant section of British Standard 3 S.100, the final heat treatment shall be:

(1) Carburize the parts and blank carburize the mechanical test samples at a temperature between 880 °C and 930 °C.

(2) Refine at a temperature of 850 ± 10 °C and cool in air or oil.

(3) Harden by quenching in oil from a temperature of 760 ± 10 °C.

(4) Temper at a temperature of 190 ± 10 °C.

6.2 Alternatively to 6.1 (2) and (3) the material shall be hardened by quenching in oil from a temperature of 825 ± 10 °C.

7. MECHANICAL PROPERTIES

7.1 Tensile and impact tests. The tensile and impact properties obtained from test pieces selected and prepared in accordance with the relevant requirements of British Standard 3 S.100 shall comply with the following table. The values in hectobars are to be regarded as the standard:

0.2 % proof stress		Tensile strength				Elongation	Reduction of area	Izod * impact
hbar	tonf/in ²	hbar		tonf/in ²		%	%	ft lbf
min.	min.	min.	max.	min.	max.	min.	min.	min.
103	67	132	152	85	98	8	35	25

*Material to this specification may be expected to have a Charpy KCU value of not less than 5.

NOTE 1. These properties relate to test pieces heat treated at test piece size (see British Standard 3 S.100, Section One, 10.2).

NOTE 2. Conversion factors: 1 hbar = 10⁷ N/m² = 0.6475 tonf/in² = 1.02 kgf/mm². Information on SI units is given in BS 350, 'Conversion factors and tables', and PD 5686, 'The use of SI units'.

7.2 Hardness tests. The hardness of softened material shall be not more than 277 HB.

This British Standard, having been approved by the Aerospace Industry Standards Committee, was published under the authority of the Executive Board of the Institution on 28 February, 1969.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

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/15 Draft for comment 68/14699