BRITISH STANDARD

BS 4K 6: 1928

Incorporating Amendment Nos. 1 and 2

Specification for Aircraft Material

Cast iron piston ring pots — (Sand Cast and Chill Cast)

NOTE *The Association desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to comprise all the necessary provisions of a contract.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 and 2 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

Amd. No.	Date of issue	Comments
7333	January 1941	
3882	April 1982	Indicated by a sideline in the margin

This Specification was adopted by the Sectional Aircraft Committee on 12 September 1928, and approved on behalf of the Main Committee on 24 September 1928

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Obsolescent (by Amendment No. 2)

The need for the material covered by this British Standard has been reviewed and it has been decided that, in the interests of rationalization, it should be regarded as obsolescent. Its use for new designs is not therefore recommended. The standard will be withdrawn in due course.

1 Chemical Composition

a) The iron in the pots shall have the following composition:—

	Sand Castings	Chill Castings
Total Carbon	Not more than 3.5 per cent.	Not more than 3.5 per cent.
Combined Carbon[a]	Between 0.55 & 0.80 per cent.	Between 0.45 & 0.80 per cent.
Silicon	Not more than 1.8 per cent.	" 1.8 & 2.5 per cent.
Sulphur[a]	" " " 0.12 per cent.	Not more than 0.12 per cent.
Phosphorus	" " " 1.0 per cent.	" " " 1.0 per cent.
Manganese	Between 0.4 & 1.2 per cent.	Between 0.4 & 1.2 per cent.

At the option of the Manufacturer, chromium may be present up to 0.5 per cent in the iron used in the sand and chill castings.

[a] In cases of doubt the chemical determination of the Combined Carbon shall be made by the combustion method and that of the Sulphur by the gravimetric method.

b) The manufacturer shall supply, wherever possible, the analysis of the pots to the Inspector who may also take samples and have them analysed, the results to be available to the manufacturer.

c) Before samples for analysis are taken from any pot, the pot shall be turned down at the end which is to be sampled to a diameter approximately equal to that of the rough machined rings which are to be made therefrom. The drillings or turnings for chemical analysis shall be taken from the metal which remains after this machining has been carried out. As an alternative the pots may be drilled parallel to their axis in the centre of the thickness of the casting with a drill whose diameter is approximately equal to the thickness of the finished ring. The whole of the samples after drilling or turning shall be sieved in a 30 mesh sieve. The parts which pass the sieve and the parts which do not shall be weighed and proportionate parts taken for each determination.

d) The sample for chemical analysis shall be taken from one of the pots selected for mechanical test (see Clause **5**). Should this fail to come within the limits of chemical composition specified, a further two pots shall be taken from the same group, and if one of these fails the whole of the castings represented shall be rejected at the discretion of the Inspector, or he may direct further samples to be taken. If the second samples are satisfactory the whole of the pots shall be accepted.

2 Freedom from Defects

The pots shall be sound and free from blowholes and all surface and other defects. They shall be to the dimensions specified within reasonable limits and capable of being machined to the finished dimensions without leaving any evidence of the black surface.

In the case of chilled castings the outside diameter should be such that the whole of the chilled portion is removed by the rough machining operations on the pot.

3 Tensile Test

a) The following test shall be carried out in the presence of the Inspector and to his satisfaction.

b) A test ring cut from the pot, as specified in Clause **5**, to an approximately square section or to a section approximating to that of the finished ring shall be split and pulled apart in a testing machine by a load applied at opposite ends of the diameter which is at right angles to that through the gap. It must withstand a stress of at least 16 tons per square inch (25.20 kg. per mm^2.) before fracture, calculated by the use of the following formula:—

$$S = \frac{PD}{1200\ b\ t^2}$$

where S = Stress in tons per sq. in.

D = External diameter of the unsplit ring in inches.

P = Load in lb.

b = Width of ring in inches.

t = Radial Thickness of ring in inches.

4 Elastioity Test

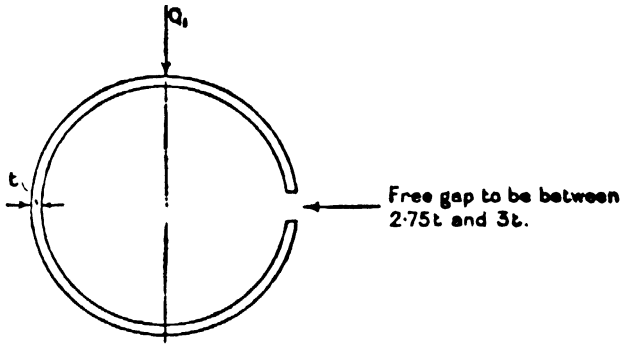
A test ring shall be machined from the pot, as specified in Clause **5**, to a thickness of not less than $\frac{\text{Diameter (uncut)}}{34}$ and a piece cut out of the ring so as to leave a free gap of not less than 2.75 t and not more than 3 t. The width (b) and the radial thickness (t) shall then be determined and a diametral load (Q_1) lb. sufficient to close the gap to less than 0.25 t shall be applied. The change in gap (δ_1) and the mean external diameter of the closed ring (d) shall be measured and shall be such that E_n, when calculated from the following formula, is not less than 15.5×10^6 lb. per sq. inch for rings under 6 inches in diameter and not less than 15×10^6 lb. per sq. inch for rings 6 inches in diameter and over.

$$E_n = \frac{5{\cdot}37 \left(\frac{d}{t} - 1\right)^3 Q_1}{b\delta_1}$$

The menu external diameter (d) of the ring in the closed position shall be calculated from the measurement of its circumference taken by means of a calibrated tape or such equivalent method.

Furthermore, in order to remove a degree of permanent set from the ring and thus obtain uniform and strictly comparable values of E_n, the change of gap shall be measured on a second test, *viz.*, after the ring has once been closed, allowed to open and again closed.

The manner of applying the lead Q_1 is illustrated by the following sketch:—



5 Selection and Preparation of Test Rings

a) Three pots shall be selected at random from each day's cast by the Inspector and one test ring shall be cut from each pot. Should any ring fail to fulfil the tests specified in Clauses **3** and **4** two other rings may be cut from the same pot and the test or tests repeated. If either of these test rings fail then the Inspector may a) reject all the pots represented by the day's cast or b) take one tensile and one elasticity test from each pot in the day's cast or c) make such other arrangements with the manufacturer for increased testing as he may consider necessary.

Test rings and samples for analysis for other than centrifugally cast pots shall be cut approximately from the middle of the length of the selected pot.

Test rings and samples for analysis for centrifugally cast pots shall be cut at any point not less than $\frac{1}{4}$ inch (6.35 mm.) from the end of the selected pot.

In no case shall the test ring be hammered or otherwise treated before testing.

6 Marking

All material passed by the Inspector shall be marked with a stamp bearing the Specification Number and the identification mark of the Inspector.

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