D.T.D. 462

Ministry of Defence
Defence Procurement Agency, ADRP2
Abbey Wood
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BS34 8JH

OBSOLESCENCE NOTICE

All DTD specifications were declared obsolescent from 1st April 1999. All DTD 900 series approvals also lapsed at that time. The standards will no longer be updated but will be retained as obsolescent documents to provide for the servicing of existing equipment.

Further Guidance

The aim in declaring the specifications obsolescent is to recognise that the documents are not being updated and thus should be used with care by both purchaser and supplier. For example, a specification could contain valid technical information but may also contain type approval clauses that contradict procurement policy and/or use materials that do not comply with environmental legislation. The obsolescent specification can still be used as a basis for a purchase provided that the supplier and purchaser agree suitable changes to the specification within the purchase order/contract.
For the DTD 900 system, each specification has provided an MoD approved material and process. For these items, the declaration of obsolescence will constitute the termination of both the extant MoD approval and the continuing MoD assessment that had underpinned those approvals. Again, the technical content of the document remains valid and can be used by both purchaser and supplier as a basis for a contract but an acceptable (to the parties) approval/assessment procedure would be required.

MINISTRY OF AVIATION

D.T.D. 462

September, 1945
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Aircraft Material Specification

HIGH CHROMIUM ALLOY CAST IRON

(Suitable for piston ring pots)

(Centrifugally cast)

NOTE.-This specification is one of a series issued by the Ministry of Aviation, either to meet a limited requirement not covered by any existing British Standard for aircraft material or to serve as a basis for inspection of materials the properties and uses of which are not sufficiently developed to warrant submission to the British Standards Institution for standardisation.

1. Chemical composition

(a) The chemical composition of the pots shall be :

Total carbon	not less than 1.5 nor more than 2.0 per cent.
Silicon	not less than 0.5 nor more than 2.0 per cent.
Sulphur	not more than 0.12 per cent.
Phosphorus	not more than 0.5 per cent.
Manganese	not less than 0.4 nor more than 1.2 per cent.
Chromium	not less than 27 nor more than 34 per cent.

When the carbon content is within the range 1.75 to 2.0 per cent., the chromium content shall be within the range 30 to 34 per cent.

(b) The complete analysis of each cast of metal shall be supplied to the inspector.

(c) A " cast " shall be defined as :

(i) the product of one furnace melt;

(ii) the product of one crucible melt;

(iii) the product of a number of furnace or crucible melts where such are aggregated and mixed prior to casting;

(iv) where a continuous melting process is employed a cast shall be taken as the amount of metal tapped from the furnace equal to the capacity of that furnace, ; or

(v) as may be otherwise defined from time to time.

2. Freedom from defects

The castings shall be sound and free from harmful defects. They shall be within reasonable limits of the specified dimensions and be capable of being machined to the finished dimensions without leaving evidence of the cast surface. The discard end of all castings shall be examined by a method approved by the inspector to determine its freedom from cracks.

3. Heat treatment

All pots shall be heat treated by being heated between the temperatures of 900° and 1000°C, for the requisite period and cooled slowly to give the specified properties. No pots shall be reheat treated more than once.

4. Selection of samples for chemical analysis

(a) The sample for chemical analysis shall be taken either from the cast or from a pot representing the cast. 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 drilling or turnings for chemical analysis shall be taken from the metal which remains after the machining has been carried out. As an alternative the pot may be drilled parallel to the longitudinal axis in the centre of the thickness of the castings with a drill whose diameter is approximately equal to the thickness of the finished ring.

(b) If any sample fails to comply with the chemical composition specified in Clause 1 *(a)* above the inspector may make such arrangements with the manufacturer for increased testing as may be considered necessary.

5. Selection and preparation of test rings

(a) The inspector shall select at least one pot from each cast. Test rings shall be cut from each selected pot after heat treatment for the elasticity and transverse breaking tests specified in Clauses 6 and 7.

(b) The test rings shall be cut out at any point not less than $\frac{3}{4}$ in. from the end of the selected pot.

(c) Test rings shall not be hammered or further treated before being tested.

6. Elasticity test

(a) Diametral loading.— A test ring shall be machined from the pot as specified in Clause 4 so that the radial thickness is not less than $\frac{\text{diameter (uncut)}}{26}$, and a piece shall be cut out of the ring so as to leave a free gap of width not less than 2.75 nor more than 3 times the radial thickness.

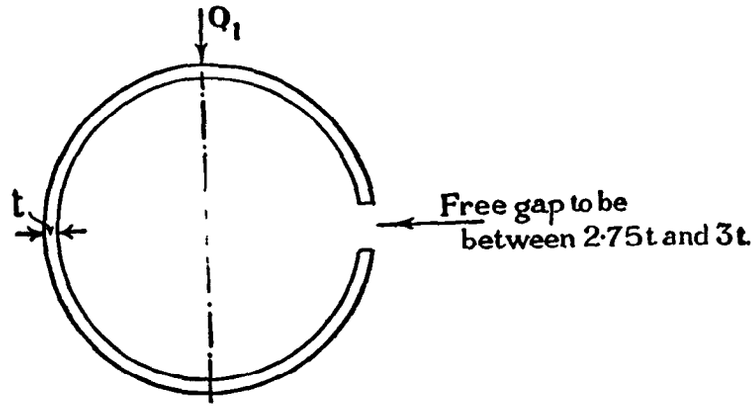
A diametral load sufficient to close the gap to less than 0.25 times the radial thickness shall be applied. The mean external diameter of the closed ring and the change in width of the gap shall be measured.

The E*n* value shall be determined by means of the following formula :

$$En = \frac{5{\cdot}37\left(\frac{d}{t} - 1\right)^3 Q}{b\,x}$$

where d = mean external diameter of the closed ring in inches.
t = radial thickness of the ring in inches.
Q = diametral load in pounds.
b = axial breadth of ring in inches.
x = change of width of gap in inches.

The manner of applying the load Q is illustrated in the following diagram:



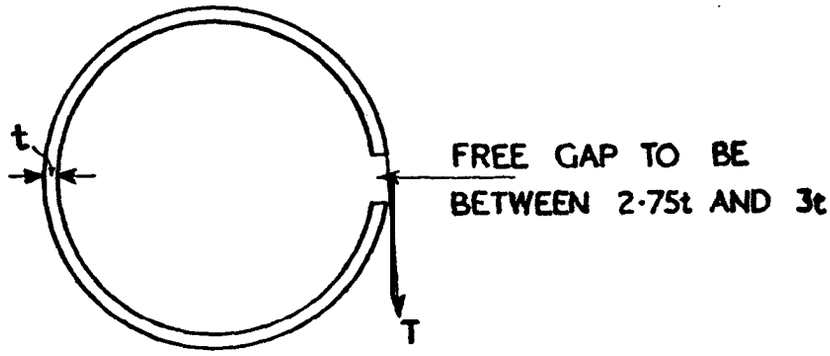
(b) Tangential loading.— A test ring shall be employed as specified in paragraph *(a)* above. The load to close the gap to the specified dimension shall be applied tangentially.

The E*n* value shall be determined by means of the following formula:

$$En = \frac{14{\cdot}14\left(\frac{d}{t} - 1\right)^3 T}{b\,x}$$

The definition of the terms is as given in paragraph *(a)* above except that T, the tangential load in part Q, the diametral load in pounds.

The manner of applying the load is illustrated in the following diagram:



(c) The E*n* value when determined by either of the above methods shall be not less than 28.0 x 10^6 lbs. per square inch.

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

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 width of gap shall be measured on a second test, viz. after the ring has once been closed, allowed to open and again closed.

(e) The diametral and the tangential loading methods are alternatives for acceptance purposes, but in cases of dispute the diametral method shall be regarded as the standard.

7. Transverse breaking strength

The following tests shall be carried out to the satisfaction of the inspector:

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 35 tons per square inch before fracture, calculated by the use of the following formula:—

$$S = \frac{PD}{1200\,bt^2}$$

where S = stress in tons per square inch.
D = external diameter of the unsplit ring in inches.
P = loads in pounds
b = axial breadth of ring in inches.
t = radial thickness of ring in inches.

8. Retests

Should any ring fail to fulfil the test requirement specified in Clauses 6 and 7 the inspector may reject all the pots in the same cast represented by that test ring or at the request of the manufacturer adopt either of the following procedures :

(i) select for test from the same cast, two further pots, one of which must be the pot from which the original test sample was taken unless that pot has been withdrawn by the manufacturer. From each pot one ring shall be machined for each test which failed. These further rings must pass the tests specified in Clauses 6 and 7, whichever is applicable ;

(ii) allow the cast to be reheat treated in accordance with Clause 3 and retested in accordance with Clauses 6 and 7.

9. Hardness tests

(a) All pots shall have a Brinell hardness of not less than 285 nor more than 341. Pots with a hardness value outside the range shall be rejected, or at the option of the manufacturer be reheat treated in accordance with Clause 3 and retested.

(b) The Brinell hardness determination shall be carried out according to British Standard 240. In all tests the value of P/D*i* shall be 30 and the load and ball arranged accordingly.

(c) The hardness test shall be taken on the middle of a pot section when not less than three-quarters of an inch discard has been machined away.

(d) All hardness determinations made on pots from one cast shall be made under the same conditions of test.

10. Identification

All castings passed by the inspector shall be stamped with the mark of the inspector and such other marking as will ensure full identification of the material. All stamping shall be done where it is least liable to be detrimental to the casting.

Approved for issue,

N. J. L. MEGSON,

Director of Materials Research and Development (Air).

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