

**Ministry of Defence
Defence Procurement Agency, ADRP2
Abbey Wood
Bristol
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.

Aerospace Material Specification
VULCANIZED ETHYLENE-PROPYLENE RUBBERS
(FLUID RESISTANT)

NOTE 1. This specification is one of a series issued by the Procurement Executive, Ministry of Defence, either to meet a limited requirement not covered by an existing British Standard for aerospace material, or to serve as a basis for inspection of material, the properties and uses of which are not sufficiently developed to warrant submission to the British Standards Institution for standardization.

NOTE 2. It is one of a series of rubber specifications in which the material is classified by the base polymer employed.

NOTE 3. The tests employed in this specification are chosen for their reproducibility and ability to control the properties of the material. They are not intended to be simulated service tests, which, because of variability of test conditions, may be unsatisfactory for control purposes.

NOTE 4. The intended applications and the limitations of materials to this specification are given in Section 1 of the specification and are for guidance only. In case of doubt users are advised to confirm the suitability of the material for any given application.

NOTE 5. Further guidance on the choice of rubber for any particular purpose may be obtained from Appendix I of DR Mat Tech. Memo. No 7 "Rubber in Engineering Design" and SBAC TS No 97 - "Recommended Design Guide on Rubber Materials for Aerospace Application".

NOTE 6. Except where otherwise stated, the methods of test shall be as described in British Standard 903 - "Methods of Testing Vulcanized Rubber", the edition current at the date of tender or contract being intended.

SECTION 1

Scope

1.1 Scope

The materials covered by this specification are intended for the production of items such as sheets, mouldings and certain extrusions, mainly for sealing applications where good fluid resistance and low compression set are of prime importance. They can be used in contact with phosphate ester hydraulic fluids for continuous operation within the temperature range -60°C to 100°C or up to 130°C for intermittent periods and with silicone hydraulic fluids within the temperature range -60°C to 130°C for continuous operation or up to 160°C for intermittent periods.

For applications in contact with air they may also be considered for use within the temperature range -60°C to 120°C. They have excellent ozone resistance. They are unsuitable for use in contact with fuels, mineral oil based and diester oils and silicate fluids or greases derived from these.

NOTE. At ordinary temperatures and in the absence of hostile environments, e.g. when properly stored, these rubbers deteriorate only very slowly. However, the rate of deterioration increases markedly with increased temperature and the service life of a rubber therefore depends upon the operational temperature. Conversely, the maximum temperature at which a rubber may be used depends upon the useful life required.

1.2 Classification

Five different hardness values are covered (Grades 50, 60, 70, 80 and 90; Grade 50 being the softest) and the grade required must therefore be stated on all drawings and contracts. Where a nominal hardness other than those quoted is necessary, this can be specified and the basic requirements other than hardness shall be those specified for the grade embracing the proposed nominal hardness. If a tolerance is required which is tighter than those quoted (+5, -4), this should be specified but should not be less than ± 3 .

SECTION 2

Related documents

2. Reference is made in this document to the following:

- B.S. 903 - Methods of testing vulcanized rubber.
- B.S. 1449: Part 1 - Carbon steel plate, sheet and strip.

- B.S. 1470 - Wrought aluminium and aluminium alloys for general engineering purposes - plate, sheet and strip.
- B.S. 3734 - Schedule of tolerances for rubber products in solid rubber and ebonite.
- B.S. F69 - Packaging and identification of vulcanized rubber items.
- B.S. L70 - Sheet and strip of aluminium - copper - magnesium - silicon - manganese alloy (solution treated at room temperature).
- B.S. S511 - Deep drawing carbon steel sheet and strip.

Except where otherwise stated, the edition current at the date of tender, contract or order is intended.

SECTION 3

General requirements

3.1 Composition

The materials covered by this specification shall consist of an ethylene-propylene copolymer or an ethylene-propylene-diene terpolymer suitably compounded and cured to meet the requirements of Sections 4 and 5 of this specification. No factice, reclaim or ground vulcanized waste shall be used. All ingredients of the mix shall be of recognised rubber quality and shall be free from foreign matter.

3.2 Freedom from defects

The selection and processing of the ingredients shall be such that the mix is homogeneous and that the parts made from it shall be free from surface imperfections, blisters, porosity, inclusions and undispersed ingredients, and other defects which would impair satisfactory performance. It shall not show excessive bloom.

SECTION 4

Type approval of rubber compounds

4. Type approval

- 4.1** Before any particular rubber compound can be accepted as complying with the requirements of this specification, it shall have received type approval. To obtain such approval, the manufacturer (of the fully compounded stock) shall satisfy the Quality Assurance Authority that the compound will meet all the requirements of this specification.
- 4.2** The Quality Assurance Authority for material to this specification is:
- Director, Materials Quality Assurance (DMQA)
Headquarters Building,
Royal Arsenal East,
Woolwich, London SE18 6TD.
- 4.3** When applying for type approval the manufacturer shall submit the following:
- 4.3.1 Full details of the composition together with details of the standard vulcanizing conditions. This information will be treated as confidential.
- 4.3.2 A sample of the vulcanized material consisting of two sheets each in the form of a two-thickness test sheet, vulcanized at a temperature appropriate to the mix for a time appropriate to the thickness of the test sheet. No additional vulcanizing shall be given to the thicker portion of the test sheet. Each sheet shall be approximately 250 mm square, 2.00 ± 0.15 mm thick, with a section along one side 35-50mm wide and 6.30 ± 0.15 mm thick.
- If desired for the purpose of compression set tests, part of the 6.30mm thick section may be moulded in the form of cylindrical buttons conforming to the requirements of a Type 1 test piece as defined in B.S. 903: Part A6.
- When such buttons are moulded, the cavities shall be individually charged with pellets and not by the flow of excess mix from the remainder of the mould. No additional vulcanizing shall be given to the buttons. The minimum number of buttons moulded shall be nine and they shall be in a group at one end of the thick section.
- 4.3.3 Test results on a sample identical to the one submitted and prepared from the same batch of material.
- 4.3.4 The proposed value for nominal density and, if required, nominal hardness (see Clause 1.2).

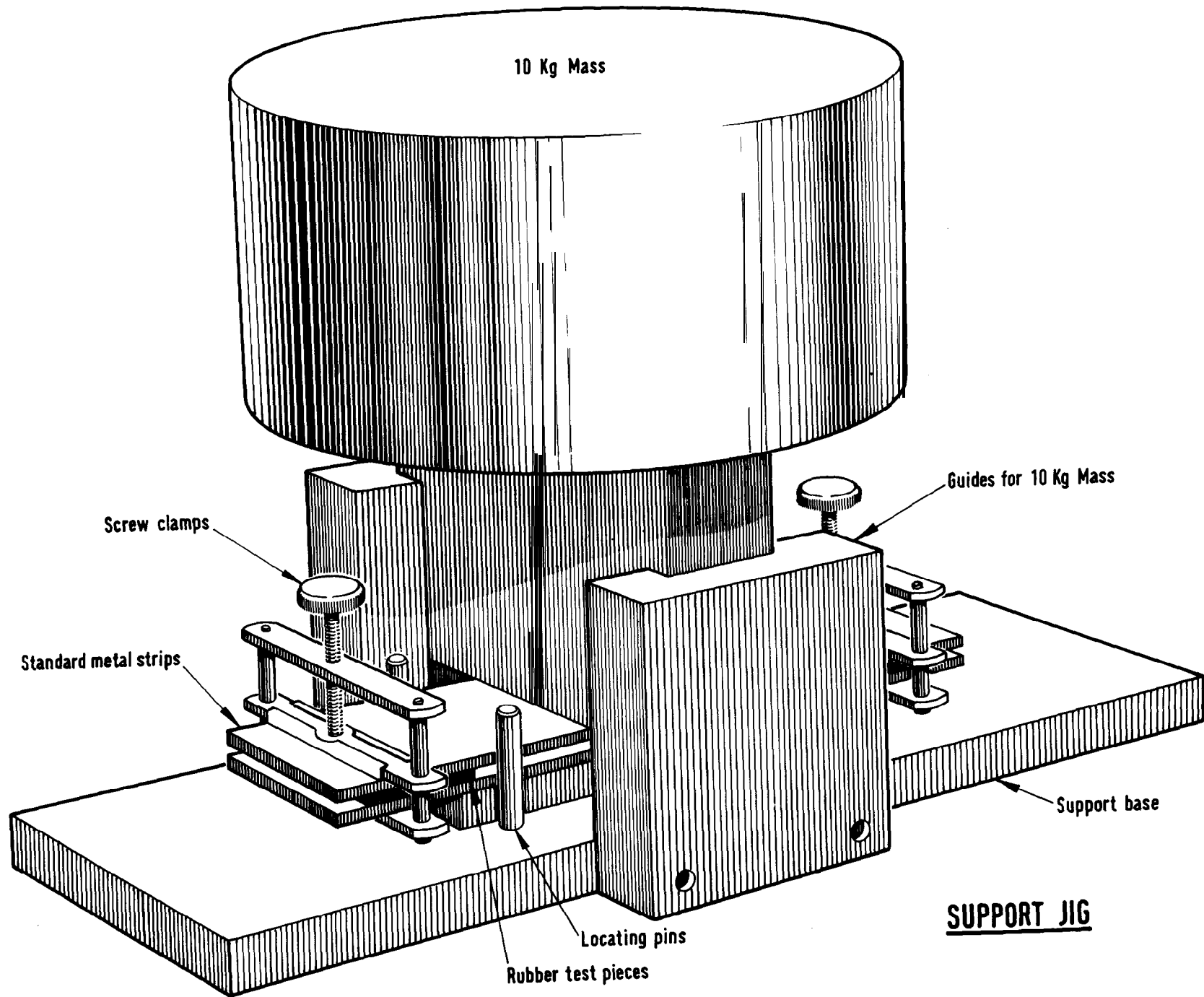
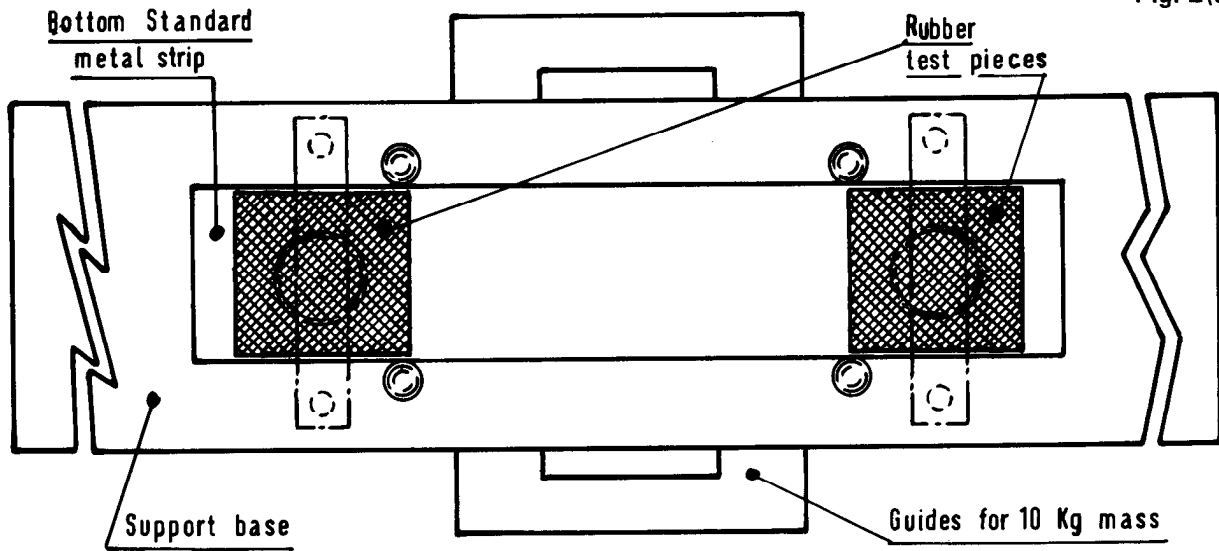


Fig. 1

Fig. 2(a)



PLAN VIEW WITH CLAMPS, TOP STD. METAL STRIP & 10 Kg MASS REMOVED

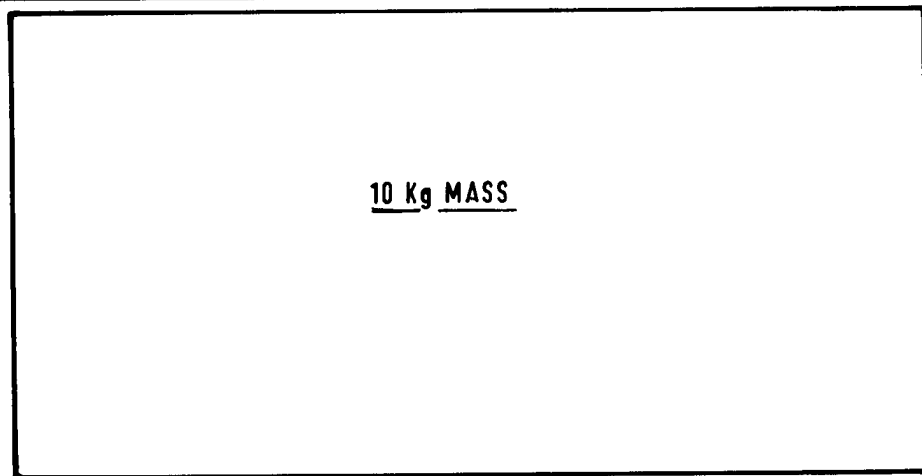
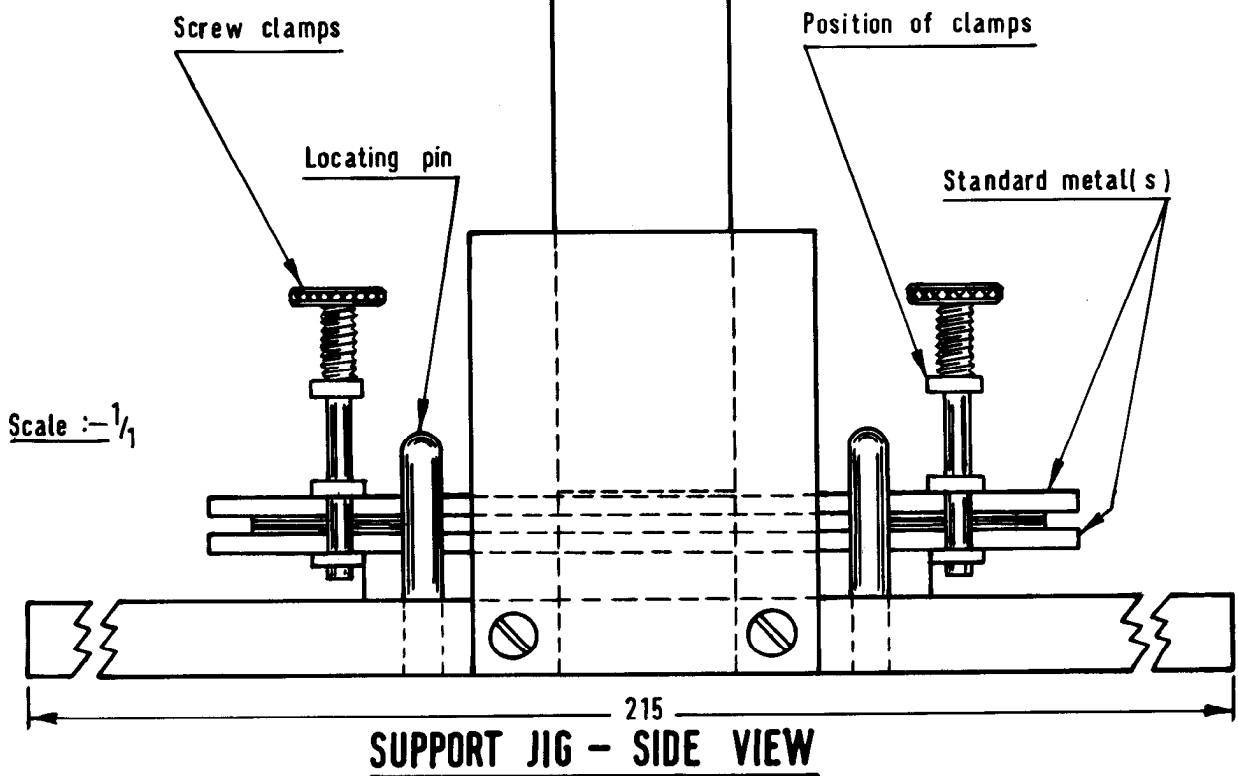


Fig. 2(b)



APPENDIX I

Method for the determination of hardness

- (i) Hardness measurements required for test (a) of Table 1 shall be made by Method N of B.S. 903: Part A26 using one specimen of the thicker part of the test sheet specified in Clause 4.3.2 superimposed upon the thinner part of the same test sheet.
- (ii) For the determination of the change in hardness required for tests (f)(ii) and (g)(i) of the Table, the measurements shall be carried out, before and after ageing, by Method N of B.S. 903: Part A26 using two specimens plied together, of the thinner part of the test sheet specified in Clause 4.3.2.

APPENDIX II

Method for the determination of compression set

Compression set measurements shall be made by Method A of B.S. 903: Part A6, using Type 1 test pieces from the thicker part of the test sheet specified in Clause 4.3.2. The test pieces shall be lubricated.

The time of test shall be 24 hours and the temperature during the compression period shall be $100^{\circ} \pm 1^{\circ}\text{C}$.

APPENDIX III

Method for the determination of resistance to fluids

Measurements shall be made after immersion in tri-n-butyl phosphate test fluid of density 0.975 to 0.976 Mg/m^3 , refractive index 1.424 to 1.425, and acidity 0.15% max measured as H_3PO_4 . The temperature of the fluid shall be 100°C and the period of immersion 48 hours.

- (i) Volume change measurements shall be made by the volumetric method of B.S. 903: Part A16, para 7.3.
- (ii) Hardness change measurements shall be made as described in Appendix I.
- (iii) Change in tensile strength and elongation at break shall be determined using the method described in B.S. 903: Part A16, para 10.1 using Type 2 dumb-bell test pieces.

APPENDIX IV

Method of test for freedom from adhesion to and corrosion of metals

During the preparation of the test pieces and metals and throughout the procedure all test pieces and prepared metals shall be handled with medical fingercots and polypropylene forceps to avoid surface contamination.

Two test pieces approximately 20mm square cut from the thinner part of the test sheet specified in Clause 4.3.2 shall be cleaned with cotton wool pads moistened with acetone. The test pieces shall be allowed to dry and then stored in a desiccator for a minimum period of 24 hours at $23 \pm 2^{\circ}\text{C}$ prior to testing. Two metal strips, one of aluminium alloy to B.S. L70 or B.S. 1470 HS15 and the other of mild steel to B.S. S511 or B.S. 1449: Part 1B Type CR3/FF, each approx 100mm long by 25mm wide and having a minimum thickness of 8mm in order to withstand the clamping force without deflection, shall be prepared immediately prior to the test as follows:

- (i) Thoroughly scour with $53\mu\text{m}$ (300 mesh) pumice powder on a cotton wool pad wetted with distilled water until a matt surface is obtained.
- (ii) Wash away the powder with distilled water.
- (iii) Rinse the metal strips with acetone and allow to dry.

The two rubber test pieces shall be taken from the desiccator and placed between the prepared surfaces of the two metal strips. The metal/rubber/metal sandwich shall be placed in the assembly jig (Fig 1) and a mass of 10kg applied (Figs 2a and 2b). The Hoffmann screw clamps, one at each end of the sandwich, shall be tightened with just sufficient force to maintain the clamping force when the 10kg mass is removed.

The assembled sandwich shall be placed in an air oven at $125 \pm 1^{\circ}\text{C}$ for 168 hours. The assembly shall then be removed from the oven, allowed to cool to room temperature ($23 \pm 2^{\circ}\text{C}$) and the clamps removed.

The assembly shall be carefully parted and the test pieces removed from the metal surfaces. The parted assembly shall be left on a wooden bench for 24 hours at room temperature ($23 \pm 2^\circ\text{C}$) in an atmosphere free from corrosive fumes, e.g. in a balance room. At the end of this period the metal surfaces shall be examined for corrosion and pitting, and adhesion of the test pieces to the metals. Adhesion shall be considered to have occurred if particles of the test pieces remain adhered to the metal surfaces.

Approved for issue,

N. L. PARR,

Director of Research-Materials.

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First Published 1978

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ISBN 0 11 771638 3