
INTERNATIONAL STANDARD



814

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Vulcanized rubber — Determination of adhesion to metal — Two-plate method

Élastomères vulcanisés — Détermination de l'adhérence au métal — Méthode à deux plaques

First edition — 1974-06-15

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UDC 678.4/.8.063.029.5 : 669 : 620.179.4

Ref. No. ISO 814-1974 (E)

Descriptors : elastomers, vulcanized elastomers, composite materials, metal plates, test specimens, preparation of test pieces, tests, physical tests, adhesion tests.

Price based on 4 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 45 has reviewed ISO Recommendation R 814 and found it suitable for transformation. International Standard ISO 814 therefore replaces ISO Recommendation R 814-1968.

ISO Recommendation R 814 was approved by the Member Bodies of the following countries :

Argentina	Germany	Poland
Australia	Hungary	Spain
Austria	India	Sweden
Brazil	Israel	Switzerland
Canada	Italy	United Kingdom
Chile	Japan	U.S.A.
Colombia	Korea, Rep. of	U.S.S.R.
Czechoslovakia	Netherlands	Yugoslavia
France	New Zealand	

No Member Body disapproved the transformation of ISO/R 814 into an International Standard.

Vulcanized rubber — Determination of adhesion to metal — Two-plate method

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for determining the adhesion strength of rubber-to-metal bonds where the rubber part is assembled between two parallel metal plates.

The method is applicable primarily to test pieces prepared in the laboratory under standard conditions, such as may be used to provide data for the development of rubber compounds and control of methods of manufacture.

2 PRINCIPLE

Measurement of the force required to cause the rupture of a unit of standard dimensions, comprising rubber bonded to two parallel metal plates, the direction of the force being at 90° to the bonded surface.

3 APPARATUS

3.1 Tensile testing machine conforming to the requirements of national standards for verification of testing machines. It shall be capable of accurately registering, in newtons, the maximum force obtained during the test, and of maintaining the specified constant rate of separation of the jaws of 25 ± 5 mm/min.

NOTE — Inertia (pendulum)-type dynamometers are apt to give results which differ because of frictional and inertial effects. An inertialess (for example, electronic or optical transducer)-type dynamometer gives results which are free from these effects and is therefore to be preferred.

3.2 Fixtures for holding the test pieces in the testing machine, which permit accurate centring of the applied load during the test.

A suitable type of fixture is shown in figure 1.

Dimensions in millimetres

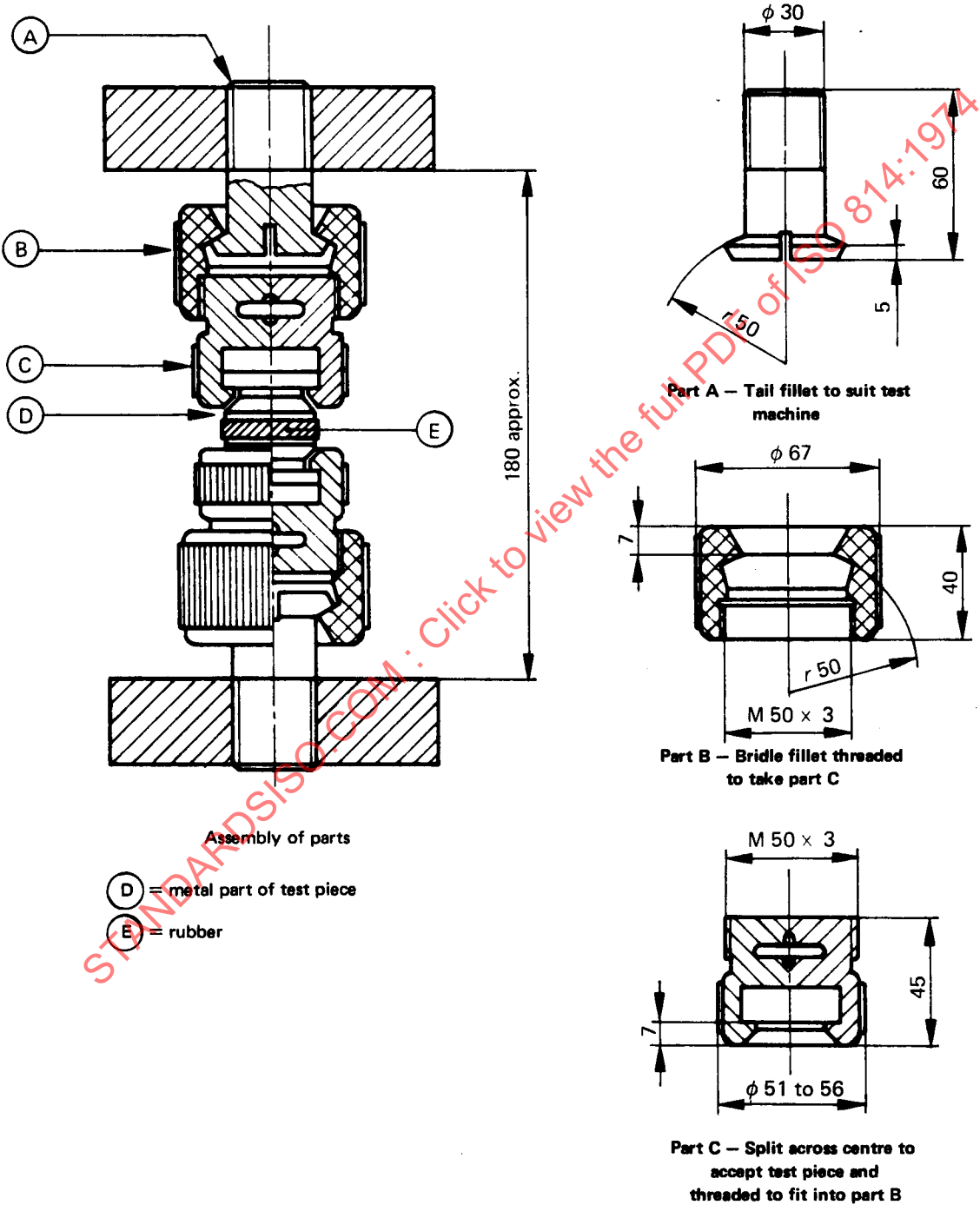


FIGURE 1 — Test fixtures for holding rubber-to-metal bond test pieces

4 TEST PIECE

4.1 Dimensions

The standard test piece shall consist of a rubber cylinder $3 \pm 0,1$ mm thick and of diameter between 35 and 40 mm known to the nearest 0,1 mm, having its circular ends bonded to the faces of two metal plates of equal diameter. The diameter of the metal plates shall be approximately 0,08 mm less than that of the rubber cylinder.

The thickness of the metal plates shall not be less than 9 mm. A typical test piece is shown in figure 2.

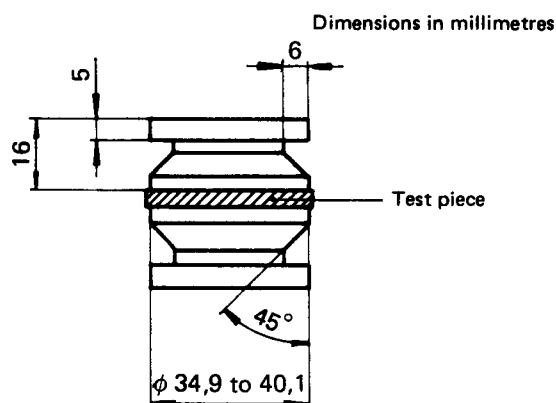


FIGURE 2 — Example of standard test piece

4.2 Preparation

4.2.1 Circular metal parts of the standard dimensions shall be prepared from rolled carbon steel bar. Other metals may be used provided that the parts are in conformity with the essential dimensions. The smooth metal parts shall be prepared and treated in accordance with the adhesion system under investigation.

4.2.2 Unvulcanized rubber discs shall be cut using a circular die of such size that a limited amount of flash is obtained on moulding. The surface of the rubber to be bonded to the metal shall be treated in accordance with the method being investigated.

4.2.3 The rubber discs and metal end pieces shall then be assembled for vulcanization in the mould. The mould shall be constructed so that the rubber projects beyond the edges of the metal end pieces by approximately 0,04 mm in order to prevent tearing of the rubber by the edge of the metal during test.

4.2.4 During the preparation of the test piece, great care shall be taken to keep the exposed surfaces of the rubber and metal free from dust, moisture and foreign matter. The surfaces shall not be touched by hand during assembly.

4.2.5 Vulcanization shall then be carried out by heating in the mould under pressure for a definite time at a controlled temperature in a suitable vulcanizing press. The time and temperature of vulcanization shall be in accordance with the system being investigated.

4.2.6 At the conclusion of the cure, great care shall be taken in removing the test pieces from the mould to avoid subjecting the bonded surfaces to undue stress before the test pieces have cooled.

4.3 Number

Four test pieces should be tested.

4.4 Conditioning

4.4.1 The test pieces shall be conditioned for at least 16 h at a standard laboratory temperature ($23 \pm 2^\circ\text{C}$ or $27 \pm 2^\circ\text{C}$) immediately before test, the same temperature being used throughout any one test or series of tests intended to be comparable.

4.4.2 The time between vulcanization and testing shall not exceed 6 days.

5 PROCEDURE

5.1 Mount the test piece in the test machine. Extreme care is necessary in centring and adjusting the test piece so that the tension is uniformly distributed over the cross-section during the test.

5.2 Apply tension by separating the jaws at a constant rate of 25 ± 5 mm/min until the test piece breaks. Record the maximum force.

6 EXPRESSION OF RESULTS

6.1 Adhesion value

The adhesion shall be calculated by dividing the maximum force by the cross-sectional area of the test piece. It shall be expressed in meganewtons per square metre.

6.2 Adhesion failure symbols

- a) R indicates that the failure is in the rubber.
- b) RC indicates that the failure is at the interface between the rubber and the cover cement.
- c) CP indicates that the failure is in the interface between the cover cement and the prime cement.
- d) M indicates that the failure is at the interface between the metal and the prime cement.

7 TEST REPORT

The test report shall include the following :

- a) all four test results, expressed in accordance with clause 6;
- b) a description of the type of failure, expressed in accordance with 6.2, with expression of percentage failure of each type present;
- c) a description of the method of securing the adhesion, and whether the test piece was prepared in the laboratory or taken from a production part;
- d) date of vulcanization;
- e) date of test;
- f) time and temperature of vulcanization;
- g) temperature of test;
- h) metal used, if other than the specified steel.

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