

Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests

ICS 83.060

National foreword

This British Standard reproduces verbatim ISO 188:1998 and implements it as the UK national standard, including Corrigendum August 2003. It supersedes BS 903-A19:1986 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/22, Physical testing of rubber, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Additional information

It is felt to be axiomatic that Clause 5 c) encompasses the recommendation that rubbers having different amounts of antioxidant should not be aged together.

In 10.2.1, and Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7 and Table 8, reference is made to a polymer type of EACM, which is, unfortunately, not defined. It is thought this is probably a reference to an ethyl acrylate and ethylene copolymer, which is symbolized in ISO 1629:1995 as AEM.

For the removal of doubt, 10.2.5 should be understood as referring to the “mean values of the changes in properties as defined in Clause 9”.

It is to be noted that the precision tables in Clause 10 include some values which do not conform to normal expectations, such as, for example, the extremely high values for percentage repeatability and reproducibility for “EACM” type rubbers aged at low air speeds compared with the same rubber type aged at high air speeds, and also cases where the percentage reproducibility (R), is actually lower than the percentage repeatability (r), such as in Table 1, Table 2, Table 3, Table 4, Table 6 and Table 7. For these reasons it is felt that it may be unwise to place too much reliance on the values in these precision tables, although the information does reveal that there can be a great deal of variability in test results on different polymers between laboratories.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the BSI Electronic Catalogue or of British Standards Online.

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Summary of pages

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Amendments issued since publication

Amd. No.	Date	Comments
14802 Corrigendum No. 1	26 November 2003	Changes to Table 7 and 8

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INTERNATIONAL STANDARD

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Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests

*Caoutchouc vulcanisé — Essais de résistance au vieillissement accéléré et
à la chaleur*



Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 188 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Physical and degradation tests*.

This third edition cancels and replaces the second edition (ISO 188:1982), which has been technically revised.

Annex A of this International Standard is for information only.

Introduction

Accelerated ageing and heat resistance tests are designed to estimate the relative resistance of rubber to deterioration with the passage of time. For this purpose, the rubber is subjected to controlled deteriorating influences for definite periods, after which appropriate properties are measured and compared with the corresponding properties of the unaged rubber:

The purpose of the accelerated ageing test may be to assess the deterioration of the rubber

- a) either during prolonged periods at normal or elevated temperatures in air;
- b) or during prolonged periods at elevated temperatures and at elevated oxygen pressure.

In accelerated ageing, the rubber is subjected to a test environment intended to produce the effect of natural ageing in a shorter time.

In the case of heat resistance tests, the rubber is subjected to prolonged periods at the same temperature as that which it will experience in service.

Three types of method are given in this International Standard, namely an air-oven method using a low air speed, an air-oven method using forced air ventilation and an oxygen pressure method.

The selection of the time, temperature and atmosphere to which the test pieces are exposed and the type of oven to use will depend on the purpose of the test and the type of polymer.

In the air-oven methods, deterioration is accelerated by raising the temperature and, in the oxygen pressure method, by increasing the oxygen concentration and the temperature. The degree of acceleration thus produced varies from one rubber to another and from one property to another.

Degradation can also be accelerated by air speed. Consequently, ageing with different ovens can give different results.

Consequences of this are:

- a) Accelerated ageing does not truly reproduce under all circumstances the changes produced by natural ageing.
- b) Accelerated ageing sometimes fails to indicate accurately the relative natural or service life of different rubbers; thus, ageing at temperatures greatly above ambient or service temperatures may tend to equalize the apparent life of rubbers which deteriorate at different rates in storage or service. Ageing at one or more intermediate temperatures is useful in assessing the reliability of accelerated ageing at high temperatures.
- c) Accelerated ageing tests involving different properties may not give agreement in assessing the relative lives of different rubbers and may even arrange them in different orders of merit. Therefore, deterioration should be measured by the changes in property or properties which are of practical importance, provided that they can be measured reasonably accurately.

Air-oven and oxygen pressure ageing should not be used to simulate natural ageing which occurs in the presence of either light or ozone when the rubbers are stretched.

To estimate lifetime or maximum temperature of use, tests can be performed at several temperatures and the results can be evaluated by using an Arrhenius plot. This method is described in ISO 11346.