

Methods of specifying

General purpose polyethylene materials for moulding and extrusion

Confirmed
May 2009

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Policy Committee (PRM/-) to Technical Committee PRM/32, upon which the following bodies were represented:

- British Cable Makers' Confederation
- British Plastics Federation
- British Telecommunications plc
- Ministry of Defence
- Packaging and Industrial Films Association
- Standards Association of Australia
- Telecommunications Cables Group of BCMC

This British Standard, having been prepared under the direction of the Plastics and Rubber Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 February 1992

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First published September 1961
Second edition December 1966
Third edition March 1976
Fourth edition February 1992

The following BSI references relate to the work on this standard:
Committee reference PRM/32
Draft for comment 88/36146

ISBN 0 580 20546 0

Amendments issued since publication

Amd. No.	Date	Comments

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Foreword

This British Standard has been prepared under the direction of the Plastics and Rubber Standards Policy Committee and was based on a draft produced by the British Plastics Federation. It was first published in 1961, revised in 1966, and revised again in 1976 when the scope was extended to include some ethylene copolymers for moulding and extrusion purposes and a classification system was introduced which was related to the International Organization for Standardization (ISO) publication ISO 1872:1972. This revision supersedes BS 3412:1976 which is withdrawn.

ISO 1872 has since been revised and issued in two Parts, ISO 1872-1:1986 and ISO 1872-2:1989.

In this British Standard, which remains related to both ISO 1872-1 and ISO 1872-2, the types of polyethylene materials not particularly for British Government Service contracts, are classified by means of two designatory properties, i.e. conventional density and melt flow rate. At the next revision the need to give methods for specifying types of materials particularly for British Government Service contracts will be assessed.

No attempt is made to specify all the properties of a polyethylene or ethylene copolymer that may be of importance in a particular application, and in many cases it will be necessary for the user to state his own special requirements in addition to those specified in this standard.

Methods of test, including methods for the preparation of test specimens, are also given. It is intended that all the methods of test will be published as BS 2782 methods identical with the corresponding ISO standards. However, at the present time, although method numbers have already been allocated, some BS 2782 methods have not yet been published and, until they are, the corresponding ISO standards should be used.

The properties of a polyethylene material may be changed by the incorporation of additives such as pigments and antistatic agents and therefore it is essential that the values quoted for selected properties are related to the material in the form in which it is supplied.

The thermal history and the internal stresses of the test specimens strongly influence the thermal and mechanical properties and resistance to environmental stress cracking but exert less effect on the electrical properties which mainly depend on the chemical composition of the moulding compound.

NOTE Properties determined according to the methods used in this British Standard will be not necessarily identical to those obtained using specimens of different dimensions and/or prepared by different procedures. The values obtained for the properties of a product depend on the compound, the shape, the test method and the morphology. The latter depends on the extrusion or moulding conditions, for example gating, pressure, temperature or injection rate. It is essential that any subsequent treatment should also be considered, for example, conditioning or annealing.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover 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.

Section 1. General

1.1 Scope

This British Standard gives a method for specifying the composition and property requirements of ethylene homopolymers and ethylene copolymers having a maximum content of other 1-olefin monomers of less than 50 % (*m/m*). In addition, those with a content of non-olefinic monomers with functional groups up to a maximum of 3 % (*m/m*) are specified in section 2 whilst those particularly for British Government Service contracts having in addition a content of non-olefinic monomers with functional groups up to a maximum of 30 % (*m/m*) are specified in section 3. This British Standard applies to materials ready for normal use in the form of powder, granules and to materials unmodified by colourants, additives, fillers, etc. It does not apply to masterbatches or to ethylene-propylene copolymer (EPM rubber).

NOTE The titles of the publications referred to in this standard are listed on page 15.

1.2 Definition

declared value

Typical physical value indicated for a material by a manufacturer or supplier.

1.3 Preparation of test specimens

The preparation of test specimens shall be in accordance with procedures described in Appendix A, i.e. either by compression moulding or injection moulding.

NOTE Compression moulding is the preferred method.

1.4 Conditioning of test specimens

Unless otherwise specified test specimens shall be conditioned at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and 50 % r.h. for at least 16 h prior to testing.

1.5 Reporting of test data

In addition to the values of the test data the following information shall be reported:

- a) form of material tested (powder, granules, pellets, specimen from a moulded part);
- b) moulding temperature;
- c) average cooling rate;
- d) details of any additional test conditions;
- e) the numbers and dates of the appropriate British Standard test methods.

Section 2. Ethylene homopolymer and copolymer materials having a maximum content of 1-olefin monomers of less than 50 % (*m/m*) and non-olefinic monomers with functional groups up to a maximum of 3 % (*m/m*)

2.1 Designation

2.1.1 The system given in 2.1.2 shall be used. The ethylene homopolymer and copolymer materials are classified according to their method of processing, their designatory properties, i.e. conventional density and melt flow rate, and supplementary information. The designation system is only intended to indicate a broad classification and in most circumstances specific values of the designatory properties and other characteristics will be required (see 2.2.2).

2.1.2 The designation shall consist of the following coded information, given in the following order and separated by a comma:

- the number and date of this British Standard, i.e. BS 3412:1992;
- identification of the plastics material, i.e. PE (polyethylene);
- the code as given in Table 1 corresponding to the intended application and method of processing;
- the code as given in Table 2 corresponding to additives and other supplementary information;
- designatory properties as coded in Table 3 and Table 4 separated by a hyphen.

NOTE Figure 1 gives an example of a complete designation.

Table 1 — Codes for the intended application and method of processing

Code	Intended application and method of processing
A	adhesives
B	blow moulding
B1	extrusion blow moulding
B2	injection blow moulding
C	calendering
E	extrusion
E1	extrusion of pipes
E2	extrusion of profiles
E3	extrusion of sheets
E4	extrusion of tubings
E5	coextrusion
F	extrusion of films
G	general use
H	coating
H1	powder coating
H2	dip coating
K	cable and wire coating
L	monofilament extrusion
M	injection moulding
Q	compression moulding
R	rotational moulding
S	sintering
T	tape manufacture
V	thermoforming
X	no indication
Y	textile yarns, spinning