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Plastics — Polybutene-1 (PB-1) moulding and extrusion materials —

Part 1: Designation system and basis for specifications

Plastiques — Matériaux à base de polybutène-1 (PB-1) pour moulage et extrusion —

Partie 1: Système de désignation et base de spécifications

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Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This first edition of ISO 21302-1 cancels and replaces ISO 8986-1:2009, which has been technically revised to introduce a new designation system. The main changes compared to the previous edition are as follows:

— the order of the designation block number in designation and specification system has been changed;

— the code-letters used in data block 3 in positions 2 to 8 have been added, and the elevated heat performance is expressed in J;

— 190 °C/21,0 kg has been added to the sets of conditions which can be used for the measurement of the melt volume-flow rate (MVR); the test conditions for the MVR are specified: the test condition D (190 °C/2,16 kg), the test condition T (190 °C /5,0 kg), the test condition F (190 °C /10,0 kg) and the test condition G (190 °C /21,6 kg);

— the content of non-olefinic monomers with functional groups up to a maximum of 1 % by mass in polybutene-1 has been increased to 3 %;

— the MVR filing range and its corresponding code have been added.

A list of all parts in the ISO 21302 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Polybutene-1 (PB-1) moulding and extrusion materials —

Part 1:
Designation system and basis for specifications

1 Scope

This document establishes a system of designation for polybutene-1 (PB-1) thermoplastic materials which can be used as the basis for specifications. For the sake of simplicity, the designation polybutene-1 and the abbreviation PB are used in this document.

The types of polybutene plastics are differentiated from each other by a classification system based on appropriate levels of the designatory property melt volume-flow rate and on information about basic polymer parameters, intended application and/or method of processing, important properties, additives, colorants, fillers and reinforcing materials.

This document is applicable to all butene-1 homopolymers and to copolymers of butene-1 with a maximum content of other 1-olefinic monomers of less than 50 g/kg (mass fraction) and with a content of non-olefinic monomers with functional groups up to a maximum of 3 g/kg (mass fraction).

It applies to materials ready for normal use in the form of powder, granules or pellets, unmodified or modified by colorants, additives, fillers, etc.

It is not intended to imply that materials having the same designation give necessarily the same performance. This document does not provide engineering data, performance data or data on processing conditions which can be required to specify a material for a particular application and/or method of processing. If such additional properties are required, they are intended to be determined in accordance with the test methods specified in ISO 21302-2, if suitable.

In order to specify a thermoplastic material for a particular application or to ensure reproducible processing, additional requirements are given in data block 5 (see 4.1).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 21302-2, *Plastics — Polybutene-1 (PB-1) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Designation and specification system

4.1 General

The designation and specification system for thermoplastics is based on the following standardized pattern:

Designation						
Description block (optional)	Identity block					
	International Standard number block	Individual-item block				
		Data block 1	Data block 2	Data block 3	Data block 4	Data block 5

The designation consists of an optional description block, reading "Thermoplastics", and an identity block comprising the International Standard number and an individual-item block. For unambiguous coding, the individual-item block is subdivided into five data blocks comprising the following information:

— Data block 1: Identification of the plastic by its symbol PB in accordance with ISO 1043-1 and information about the polymerization process or composition of the polymer (see 4.2).

— Data block 2: Fillers or reinforcing materials and their nominal content (see 4.3).

— Data block 3: Position 1: Intended application or method of processing (see 4.4).

Positions 2 to 8: Important properties, additives and supplementary information (see 4.4).

— Data block 4: Designatory properties (see 4.5).

— Data block 5: For the purpose of specifications, a fifth data block may be added containing additional information.

The first character of the individual-item block shall be a hyphen. The data blocks shall be separated from each other by commas.

If a data block is not used, this shall be indicated by doubling the separation sign, i.e. by two commas (,,).

4.2 Data block 1

In this data block, after the hyphen, polybutene plastics are identified by the symbol PB, in accordance with ISO 1043-1, followed by a hyphen and a single code-letter giving additional information on the polymer as specified in Table 1.

Table 1 — Code-letters used for additional information in data block 1

Code-letter	Definition
H	Butene homopolymer.
B	Thermoplastic butene "block" copolymer having not more than 50 % by mass of another olefinic monomer (or monomers) having no functional group other than the olefinic group, copolymerized with butene.
R	Thermoplastic butene random copolymer having not more than 50 % by mass of another olefinic monomer (or monomers) having no functional group other than the olefinic group, copolymerized with butene.
Q	Blends of polymers with at least 50 % by mass of butene plastic H (homopolymer), B ("block" copolymer) and/or R (random copolymer).

4.3 Data block 2

In this data block, the type of filler and/or reinforcing material is represented by a single code-letter in position 1 and its physical form by a second code-letter in position 2, the code-letters being as specified in Table 2. Subsequently (without a space), the mass content may be given by a two-figure number in positions 3 and 4.

Table 2 — Code-letters for fillers and reinforcing materials in data block 2

Code-letter	Material	Code-letter	Form
B	boron	**B**	beads, spheres, balls
C	carbon[a]		
		D	powder
		F	fibre
G	glass	**G**	ground
		H	whiskers
K	calcium carbonate		
L	cellulose[a]		
M	mineral[a], metal[a]		
S	synthetic, organic[a]	**S**	scales, flakes
T	talc		
W	wood		
X	not specified	**X**	not specified
Z	others[a]	**Z**	others[a]

[a] These materials may be further defined by their chemical symbol, for example, or additional symbols defined in the relevant International Standards. In the case of metals (M), it is essential to indicate the type of metal by means of its chemical symbol.

Mixtures of materials and/or forms may be indicated by combining the relevant codes using the sign "+" and placing the whole between parentheses. For example, a mixture of 25 % glass fibres (GF) and 10 % mineral powder (MD) would be indicated by (GF25+MD10).

4.4 Data block 3

In this data block, information about the intended application and/or method of processing is given in position 1 and information about important properties, additives and colour in positions 2 to 8. The code-letters used are specified in Table 3.

If information is presented in positions 2 to 8 and no specific information is given in position 1, the letter X shall be inserted in position 1.

Table 3 — Code-letters used in data block 3

Code-letter	Position 1	Code-letter	Positions 2 to 8
		A	Processing stabilized
B	Blow moulding	**B**	Antiblocking
C	Calendering	**C**	Coloured
		D	Powder
E	Extrusion of pipes, profiles and sheets	**E**	Expandable
F	Extrusion of film	**F**	Special burning characteristics
G	General purpose	**G**	Pellets, granules
H	Coating	**H**	Heat ageing stabilized
J	Cable and wire insulating	**J**	Elevated heat performance
K	Cable and wire sheathing	**K**	Metal deactivated
L	Monofilament extrusion	**L**	Light or weather stabilized
M	Injection moulding	**M**	Nucleated
		N	Natural (no colour added)
		P	Impact modified
Q	Compression moulding		
R	Rotational moulding	**R**	Mould release agent
S	Sintering	**S**	Lubricated
T	Tape manufacture	**T**	Improved transparency
X	No indication		
		Y	Increased electrical conductivity
		Z	Antistatic

4.5 Data block 4

4.5.1 General

In this data block, the range of the melt volume-flow rate (MVR) is represented by a three-figure code-number (see 4.5.2).

If the MVR value falls on or near a range limit, the manufacturer shall state which range will designate the material. If subsequent individual test values lie on, or on either side of, the limit because of manufacturing tolerances, the designation is not affected.

NOTE Not all values of MVR are necessarily provided by currently available polymers.

4.5.2 Melt volume-flow rate

The melt volume-flow rate shall be determined as specified in ISO 21302-2 under the test conditions specified in Table 4.

Table 4 — Test conditions used for the determination of melt volume-flow rate

Code-letter	Temperature °C	Nominal load kg
D	190	2,16
T	190	5,0
F	190	10,0
G	190	21,6

Set of conditions F shall be used only for materials having an MVR less than 0,1 cm^3/10 min when tested under set of conditions D.

Set of conditions G shall be used only for materials having an MVR less than 0,1 cm^3/10 min when tested under set of conditions F.

The possible values of melt volume-flow rate are divided into 15 ranges, each represented by a three-figure code-number as specified in Table 5. The test conditions used shall be indicated by a single code-letter, selected from Table 4, immediately preceding the code-number.

Table 5 — Ranges of melt volume-flow rate in data block 3

Code-number	Range of melt volume-flow rate cm^3/10 min
000	≤0,10
001	>0,10 but ≤0,20
003	> 0,20 but ≤0,40
006	>0,40 but ≤0,80
012	>0,80 but ≤1,5
022	>1,5 but ≤3,0
045	>3,0 but ≤6,0
090	>6,0 but ≤12,0
200	>12,0 but ≤25,0
400	>25,0 but ≤50,0
600	>50,0 but ≤75,0
800	>75,0 but ≤100,0
900	>100,0 but ≤130,0
910	>130,0 but ≤160,0
920	>160

4.6 Data block 5

Indication of additional requirements in this optional data block is a way of transforming the designation of a material into a specification for a particular application. This shall be done for example by reference to a suitable national standard or to a standard-like, generally established specification.