INTERNATIONAL STANDARD

ISO 1872-1

Second edition
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Plastics — Polyethylene (PE) moulding and extrusion materials —

Part 1:
Designation system and basis for specifications

Plastiques — Polyéthylène (PE) pour moulage et extrusion —
Partie 1: Système de désignation et base de spécification

Reference number
ISO 1872-1:1993(E)

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 1872-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 9, *Thermoplastic materials*.

This second edition cancels and replaces the first edition (ISO 1872-1:1986), which has been brought into accordance with the revised frame text for designation standards.

ISO 1872 consists of the following parts, under the general title *Plastics — Polyethylene (PE) moulding and extrusion materials*:

— *Part 1: Designation system and basis for specifications*

— *Part 2: Preparation of test specimens and determination of properties*

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Plastics — Polyethylene (PE) moulding and extrusion materials —

Part 1:
Designation system and basis for specifications

1 Scope

1.1 This part of ISO 1872 establishes a system of designation for polyethylene thermoplastic material, which may be used as the basis for specifications.

1.2 The types of polyethylene plastic are differentiated from each other by a classification system based on appropriate levels of the designatory properties

a) density

b) melt mass-flow rate

and on information about the intended application and/or method of processing, important properties, additives, colorants, fillers and reinforcing materials.

1.3 This part of ISO 1872 is applicable to all polyethylene homopolymers and to copolymers of ethylene having a content of other 1-olefinic monomers of less than 50 % (*m/m*) and a content of non-olefinic monomers with functional groups up to a maximum of 3 % (*m/m*).

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

This part of ISO 1872 does not apply to masterbatches or to EPM rubber.

1.4 It is not intended to imply that materials having the same designation give necessarily the same performance. This part of ISO 1872 does not provide engineering data, performance data or data on processing conditions which may be required to specify a material for a particular application and/or method of processing.

If such additional properties are required, they shall be determined in accordance with the test methods specified in part 2 of this International Standard, if suitable.

1.5 In order to specify a thermoplastic material for a particular application or to ensure reproducible processing, additional requirements may be given in data block 5 (see clause 3, introductory paragraph).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1872. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1872 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1043-1:1987, *Plastics — Symbols — Part 1: Basic polymers and their special characteristics.*

ISO 1133:1991, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics.*

ISO 1183:1987, *Plastics — Methods for determining the density and relative density of non-cellular plastics.*

ISO 1872-2:1989, *Plastics — Polyethylene (PE) and ethylene copolymer thermoplastics — Part 2: Preparation of test specimens and determination of properties.*

3 Designation and specification system

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

<table>
<tr><th colspan="6">Designation</th></tr>
<tr><td rowspan="3">Description block
(optional)</td><td colspan="5">Identity block</td></tr>
<tr><td rowspan="2">International Standard number block</td><td colspan="4">Individual-item block</td></tr>
<tr><td>Data block 1</td><td>Data block 2</td><td>Data block 3</td><td>Data block 4</td><td>Data block 5</td></tr>
</table>

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 designation, the individual-item block is subdivided into five data blocks comprising the following information:

Data block 1: Identification of the plastic by its symbol PE in accordance with ISO 1043-1 (see 3.1).

Data block 2: Position 1: Intended application or method of processing (see 3.2).
Positions 2 to 8: Important properties, additives and supplementary information (see 3.2).

Data block 3: Designatory properties (see 3.3).

Data block 4: Fillers or reinforcing materials and their nominal content (see 3.4).

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 (,,).

3.1 Data block 1

In this data block, after the hyphen, polyethylene plastics are identified by the symbol "PE", in accordance with ISO 1043-1.

3.2 Data block 2

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 1.

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 1 — Code-letters used in data block 2

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 films	**F**	Special burning characteristics
G	General use	**G**	Pellets, granules
H	Coating	**H**	Heat ageing stabilized
K	Cable and wire coating	**K**	Metal deactivated
L	Monofilament extrusion	**L**	Light and 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	**X**	Crosslinkable
		Y	Increased electrical conductivity
		Z	Antistatic

3.3 Data block 3

In this data block, density is represented by a 2-figure code-number (see 3.3.1) and melt mass-flow rate by a code-letter and a 3-figure code-number (see 3.3.2). The two code-numbers are separated from each other by hyphens.

If a property 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 range limit because of manufacturing tolerances, the designation is not affected.

NOTE 1 Not all the combinations of the values of the designatory properties are provided by currently available polymers.

3.3.1 Density

The density shall be determined on a piece of melt-indexer extrudate.

The sample, uncoloured and unfilled, is extruded from a standard melt indexer at 190 °C in accordance with the method described in ISO 1133 under suitable conditions in order to obtain a strand of suitable length, free of voids, with a smooth surface. After being cut off, the strand is allowed to fall on a cool metal plate. It is subsequently annealed by immersing it in 200 ml of boiling water in a beaker, boiled for 30 min, and allowed to cool for 1 h by keeping the beaker and contents in the laboratory atmosphere. The density of the specimen is then determined within 24 h in accordance with ISO 1183.

The possible values of density are divided into 10 ranges, each represented by a 2-figure code-number as specified in table 2.

Table 2 — Code-numbers used for density in data block 3

Code-number	Range of density at 23 °C ± 2 °C kg/m³
00	⩽ 901
03	> 901 but ⩽ 906
08	> 906 but ⩽ 911
13	> 911 but ⩽ 916
18	> 916 but ⩽ 921
23	> 921 but ⩽ 925
27	> 925 but ⩽ 930
33	> 930 but ⩽ 936
40	> 936 but ⩽ 942
45	> 942 but ⩽ 948
50	> 948 but ⩽ 954
57	> 954 but ⩽ 960
62	> 960

3.3.2 Melt mass-flow rate

The melt mass-flow rate shall be determined in accordance with ISO 1133 under the test conditions specified in table 3.

Table 3 — Test conditions for determination of melt mass-flow rate

Code-letter	Temperature °C	Nominal load kg
E	190	0,325
D	190	2,16
T	190	5,00
G	190	21,6

Set of conditions T is used only for materials having an MFR less than 0,1 g/10 min when tested under set of conditions D. Set of conditions G is used only for materials having an MFR < 0,1 g/10 min when tested under set of conditions T. Set of conditions E is used only for materials having an MFR > 100 g/10 min when tested under set of conditions D.

The possible values of melt mass-flow rate are divided into 11 ranges, each represented by a 3-figure code-number as specified in table 4. The test conditions used shall be indicated by a single code-letter, as specified in table 3, immediately preceding the code-number indicating the range.

Table 4 — Code-numbers used for melt mass-flow rate in data block 3

Code-number	Range of MFR g/10 min
000	$\leqslant$ 0,10
001	> 0,10 but $\leqslant$ 0,20
003	> 0,20 but $\leqslant$ 0,40
006	> 0,40 but $\leqslant$ 0,80
012	> 0,80 but $\leqslant$ 1,5
022	> 1,5 but $\leqslant$ 3,0
045	> 3,0 but $\leqslant$ 6,0
090	> 6,0 but $\leqslant$ 12
200	> 12 but $\leqslant$ 25
400	> 25 but $\leqslant$ 50
700	> 50

NOTE 2 Melt mass-flow rate (MFR) will be replaced by melt volume-flow rate (MVR) at the next five-year revision of this part of ISO 1872.

3.4 Data block 4

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 5. Subsequently (without a space), the mass content may be given by a 2-figure number in positions 3 and 4.

Table 5 — Code-letters for fillers and reinforcing materials in data block 4

Code-letter	Material	Code-letter	Form
B	Boron	**B**	Balls, beads, spheres
C	Carbon[1)]		
		D	Powder
		F	Fibre
G	Glass	**G**	Ground (ground fibres also)
		H	Whiskers
K	Calcium carbonate		
L	Cellulose[1)]		
M	Mineral[1)2)], metal [1)]		
S	Synthetic organic[1)]	**S**	Scales, flakes
T	Talc		
W	Wood		
X	Not specified	**X**	Not specified
Z	Others[1)]	**Z**	Others[1)]

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

2) Mineral fillers should be designated more precisely if a symbol is available, e.g. "E", "P".

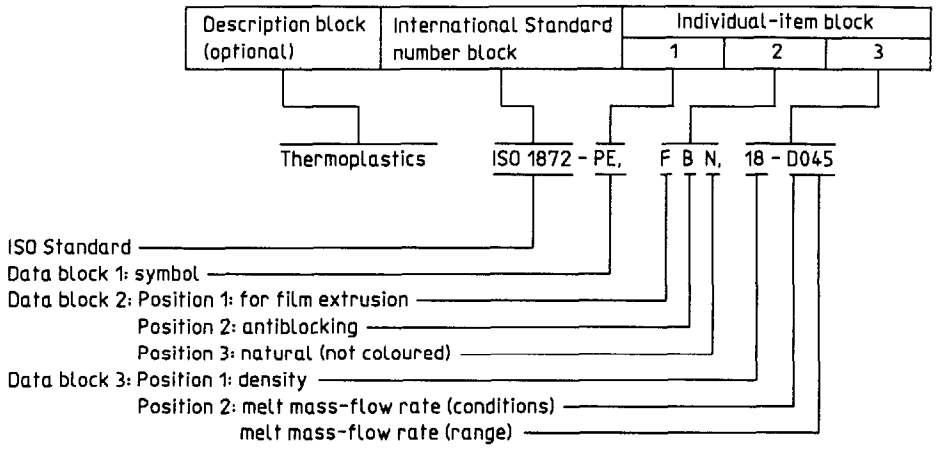
Mixtures of materials and/or forms may be indicated by combining the relevant codes using the sign "+" and placing the whole between parentheses. For example, a mixture of 25 % glass fibres (GF) and 10 % mineral powder (MD) would be indicated by (GF25+MD10).

3.5 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.

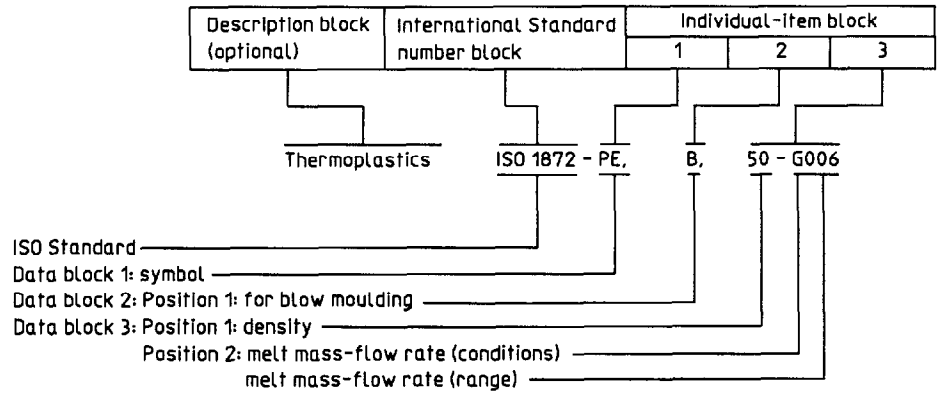
4 Examples of designations

4.1 A polyethylene thermoplastic material (PE), intended for extrusion of film (F) with antiblocking (B) and natural (not coloured) (N), having a density of 918 kg/m^3 (18) and a melt mass-flow rate (MFR 190/2,16) (D) of 3,5 g/10 min (045), would be designated:



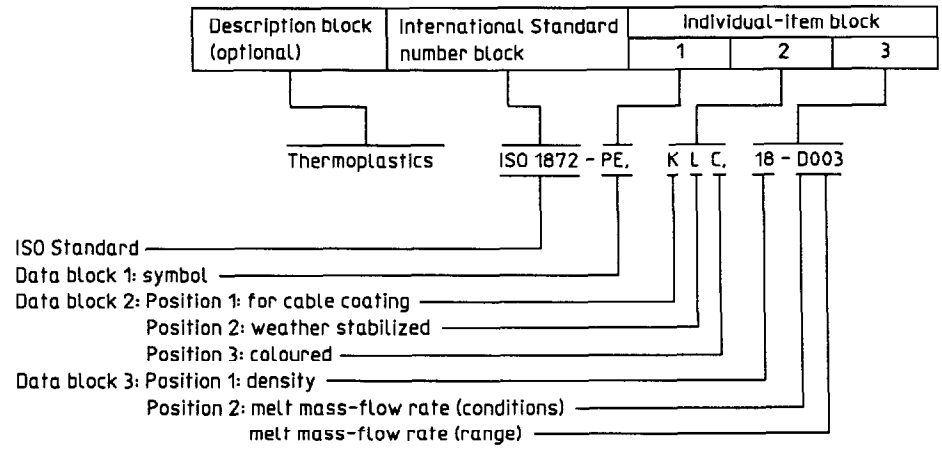
Designation: (Thermoplastics) ISO 1872-PE,FBN,18-D045

4.2 A polyethylene thermoplastic material (PE) for blow moulding (B) without special additives and having a density of 952 kg/m^3 (50) and a melt mass-flow rate (MFR 190/21,6) (G) of 0,5 g/10 min (006), would be designated:



Designation: (Thermoplastics) ISO 1872-PE,B,50-G006

4.3 A polyethylene thermoplastic material (PE), intended for cable coating (K), weather stabilized (L), coloured (C), having a density (base polymer) of 920 kg/m^3 (18) and a melt mass-flow rate (MFR 190/2,16) (D) of 0,22 g/10 min (003), would be designated:



Designation: (Thermoplastics) ISO 1872-PE,KLC,18-D003

UDC 678.742.2:003.62

Descriptors: plastics, thermoplastic resins, moulding materials, extrusion materials, polyethylene, designation.

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