International Standard 1872/1

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Plastics — Polyethylene (PE) and ethylene copolymer thermoplastics — Part 1: Designation

Plastiques — Thermoplastiques à base de polyéthylène (PE) et de copolymères d'éthylène — Partie 1: Désignation

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Foreword

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1872/1 was prepared by Technical Committee ISO/TC 61, *Plastics*.

It cancels and replaces International Standard ISO 1872-1972, of which it constitutes a technical revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Plastics — Polyethylene (PE) and ethylene copolymer thermoplastics — Part 1: Designation

1 Scope and field of application

1.1 This part of ISO 1872 establishes a system of designation for polyethylene (PE) thermoplastic materials which may be used as the basis for specifications.

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

a) conventional density,

b) melt flow rate

and information about intended application, method of processing, important properties, additives, colour, fillers and reinforcing materials.

1.3 This designation system is applicable to all ethylene homopolymers and to copolymers of ethylene having a maximum content of other 1-olefin 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, and to materials unmodified and modified by colorants, additives, fillers, etc.

This part of ISO 1872 does not apply to masterbatches or 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 or method of processing.

If such additional properties are required, they shall be determined in accordance with the test methods specified in ISO 1872/2, if suitable.

1.5 In order to specify a thermoplastic material for a particular application or reproducible processing, additional requirements may be coded in Data Block 5 (see clause 3).

2 References

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications.*

ISO 1043, *Plastics — Symbols and codes*

— *Part 1: Symbols for basic polymers and their special characteristics.* [1]

— *Part 2: Codes for designations of polymers by a data block system.* [1]

ISO 1133, *Plastics — Determination of the melt flow rate of thermoplastics.*

ISO 1183, *Plastics — Methods for determining the density and relative density (specific gravity) of plastics excluding cellular plastics.* [2]

ISO 1872/2, *Plastics — Polyethylene and ethylene copolymer thermoplastics — Part 2: Preparation of test specimens and determination of properties.* [3]

1) At present at the stage of draft. (Partial revision of ISO 1043-1978.)

2) At present at the stage of draft. (Revision of ISO 1183-1970.)

3) At present at the stage of draft.

3 Designation system

The designation system of thermoplastics is based on the following standardized pattern. [1)]

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

It 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 four data blocks comprising the following information:

— No. 1: Identification of the plastic by its symbol PE, according to ISO 1043/1.

— No. 2: Position 1: Intended application or method or processing (see 3.2).
Positions 2 to 4: Important properties, additives and supplementary information (see 3.2).

— No. 3: Designatory properties (see 3.3).

— No. 4: Fillers or reinforcing materials and their nominal content (see 3.4).

For the purpose of specifications, a fifth data block may be added containing additional information. The kind of information and its codes are not the subject of this part of ISO 1872.

The first character of the Individual Item Block shall be a hyphen. The four data blocks shall be separated from each other by a comma.

NOTE — 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 a hyphen, the plastic is identified by its symbol PE, according to ISO 1043/1.

3.2 Data Block 2

In this data block, information about intended application or method of processing is given in Position 1 and information about important properties, additives and colour in Positions 2 to 4. The codes are specified in table 1.

If information is presented in Positions 2 to 4 and no specific information is given in Position 1, the letter X shall be inserted in Position 1.

3.3 Data Block 3

In this data block, the range of the density is coded by two figures (see 3.3.1) and, after a hyphen, the melt flow rate is coded by one letter and three figures (see 3.3.2).

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

NOTE — Not all combinations of the values of the designatory properties may be provided by currently available materials.

1) See ISO 1043/2.

Table 1 — Codes used in Data Block 2

Code	Position 1	Code	Positions 2 to 4
A	Adhesives	A	Processing stabilized
B	Blow moulding	B	Antiblocking
C	Calendering	C	Coloured
		D	Powder; dry blend
E	Extrusion of pipes, profiles and sheet	E	Expandable
F	Extrusion of film and thin sheeting	F	Special burning characteristics
G	General use	G	Pellets, granules
H	Coating	H	Heat-ageing stabilized
K	Cable and wire coating		
L	Monofilament extrusion	L	Light and/or weather stabilized
M	Injection moulding		
		N	Natural (not coloured)
		P	Impact modified
Q	Compression moulding		
R	Rotational moulding	R	Moulding release agent
S	Powder coating or sintering	S	Lubricated
T	Tape manufacture	T	Improved transparency
X	No indication	X	Crosslinkable
Y	Textile yarns	Y	Increased electrical conductivity
		Z	Antistatic

3.3.1 Conventional density

For the purpose of this designation, the density shall always refer to the base polymer. The conventional density shall be determined on an extrudate from a melt indexer according to ISO 1133, prepared 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 to 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 according to ISO 1183.

NOTES

1 The standard test temperature of 23 °C (see ISO 544) has been adopted for this part of ISO 1872. For the guidance of those using 20 °C, the density of polyethylene decreases by approximately 0,6 kg/m³ for every 1 °C rise in temperature over the range from 20 to 23 °C.

2 The gradient column method described in ISO 1183 has been found to be rapid, convenient and sufficiently accurate.

The density is classified by ten cells and coded by two figures, as specified in table 2.

Table 2 — Cell codes and cell ranges for density in Data Block 3

Code	Density range kg/m³
14	< 916
18	> 916 to 921
23	> 921 to 925
27	> 925 to 930
33	> 930 to 936
40	> 936 to 942
45	> 942 to 948
50	> 948 to 954
57	> 954 to 960
62	> 960

3.3.2 Melt flow rate

The melt flow rate (MFR) shall be determined according to ISO 1133, condition No. 4, at a temperature of 190 °C with a load of 2,16 kg. For materials having a MFR less than 0,1 g/10 min when tested at the above condition, a load of 5,0 kg shall be used. When the MFR measured at this latter test condition is still less than 0,1 g/10 min, a load of 21,6 kg is recommended.

The test conditions used are coded by one letter, as specified in table 3, in front of the cell code. The MFR is classified by 11 cells and coded by three figures, as specified in table 4.

Table 3 — Code for test conditions used in determining melt flow rate (MFR)

Code	Temperature °C	Nominal load kg
D	190	2,16
T	190	5,00
G	190	21,6

Table 4 — Cell codes and cell ranges for melt flow rate (MFR) in Data Block 3

Code	MFR range g/10 min
000	≤ 0,10
001	> 0,10 to 0,20
003	> 0,20 to 0,40
006	> 0,40 to 0,80
012	> 0,80 to 1,5
022	> 1,5 to 3,0
045	> 3,0 to 6,0
090	> 6,0 to 12
200	> 12 to 25
400	> 25 to 50
700	> 50

3.4 Data Block 4

In this data block, the type of filler or reinforcing material is coded by one letter in Position 1 and its physical form by a second letter in Position 2 (see table 5), if requested. Subsequently (without space) the mass content may be given by two figures in Positions 3 and 4, as specified in table 6.

Mixtures of materials or forms may be indicated in parentheses by combining the relevant codes by the sign "+"; for example a mixture of 25 % (m/m) glass fibres (GF) and 10 % (m/m) mineral powder (MD) can be indicated by (G + M) in Position 1, (F + D) in Position 2 and (25 + 10) in Positions 3 and 4.

Table 5 — Coding system for fillers and reinforcing materials in Data Block 4

Code	Material (Position 1)	Code	Form (Position 2)
A	Asbestos		
B	Boron	B	Balls, beads, spheres
C	Carbon[1]		
		D	Powder; dry blend
		F	Fibre
G	Glass	G	Granules; ground
		H	Whisker
K	Chalk ($CaCO_3$)		
L	Cellulose[1]		
M	Mineral[1]; metal[2]		
S	Organic synthetic[1]	S	Scales; flakes
T	Talcum		
W	Wood[1]		
X	Not specified	X	Not specified
Z	Others[1]	Z	Others

1) These materials may be defined in Positions 5 and 6 of the data block, for example by chemical symbol or additional codes to be agreed upon.

2) Metal filler shall be identified by chemical symbol after the mass content; for example steel whiskers are specified as MH00FE.