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ISO 17855-1

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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
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Foreword

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This first edition of ISO 17855-1 cancels and replaces ISO 1872-1:1993, which has been technically revised to introduce a new designation system.

ISO 17855 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*

Plastics — Polyethylene (PE) moulding and extrusion materials —

Part 1: Designation system and basis for specifications

1 Scope

1.1 This part of ISO 17855 establishes a system of designation for polyethylene thermoplastic material, 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) 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 17855 is applicable to all polyethylene homopolymers and to copolymers of ethylene having a content of other 1-olefinic monomers of less than 50 % (mass fraction) and a content of non-olefinic monomers with functional groups up to a maximum of 3 % (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.

This part of ISO 17855 does not apply to masterbatches or to EPM rubber. This part of ISO 17855 also does not apply to PE-UHMW. It should reference to ISO 11542-1 for PE-UHMW.

1.4 It is not intended to imply that materials having the same designation give necessarily the same performance. This part of ISO 17855 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 ISO 1872-2, 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*

ISO 1183-2, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method*

ISO 1183-3, *Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pyknometer method*

ISO 1872-2, *Plastics — Polyethylene (PE) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*

ISO 11542-1, *Plastics — Ultra-high-molecular-weight polyethylene (PE-UHMW) moulding and extrusion materials — Part 1: Designation system and basis for specifications*

3 Designation and specification system

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

Designation						
Designation 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 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-VLD, PE-LD, PE-LLD, PE-MD or PE-HD in accordance with ISO 1043-1 (see 3.1).

Data block 2: Fillers or reinforcing materials and their nominal content (see 3.2).

Data block 3: Position 1: Intended application or method of processing (see 3.3).

Positions 2 to 8: Important properties, additives and supplementary information (see 3.3).

Data block 4: Designatory properties (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 indentified by the symbol “PE-VLD, PE-LD, PE-LLD, PE-MD or PE-HD “, in accordance with ISO 1043-1.

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

Table 1 — Code-letters for fillers and reinforcing materials in data block 2

Code-letter	Material	Code-letter	Form
B	Boron	**B**	Balls, beads, spheres
C	Carbon[a]		
		D	Powder
		F	Fibre
G	Glass	**G**	Ground (ground fibres also)
		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 Standard. 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).

3.3 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 2.

Since many PE grades are used in multiple applications and processing techniques, only the primary application and/or processing method is given in position 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 2 — Code-letters used in data block 3

Code-letter	position 1	Code-letter	position 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
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	**X**	Crosslinkable
		Y	Increased electrical conductivity
		Z	Antistatic

3.4 Data block 4

3.4.1 General

In this data block, the density is represented by a 2-figure code-number (see 3.4.2) and melt mass-flow rate by a code-letter and a 3-figure code-number (see 3.4.3). 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 Not all the combinations of the values of designatory properties are provided by currently available polymers.

3.4.2 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 1133-1 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 1183-1or ISO 1183-2 or ISO 1183-3.

The possible values of density are divided into 13 ranges, each represented by a 2-figure code-number as specified in Table 3.

NOTE To materials which are modified by colorants and/or fillers, density for designation should be the density value of the polyethylene resins (base polymer).

Table 3 — Code-numbers used for density in data block 4

Code-number	Range of density at (23 ± 2) °C kg/m^3	Class
00	≤ 901	Polyethylene, very low density, PE-VLD
03	>901 but ≤ 906	
08	>906 but ≤ 911	
13	>911 but ≤ 916	Polyethylene, low density, PE-LD, or polyethylene, linear low density, PE-LLD
18	>916 but ≤ 921	
23	>921 but ≤ 925	
27	>925 but ≤ 930	Polyethylene, medium density, PE-MD
33	>930 but ≤ 936	
38	>936 but ≤ 940	
44	>940 but ≤ 948	Polyethylene, high density, PE-HD
50	>948 but ≤ 954	
57	>954 but ≤ 960	
62	>960	

3.4.3 Melt mass-flow rate

The melt mass-flow rate shall be determined in accordance with ISO 1133-1 under the test conditions specified in Table 4.

Table 4 — Test conditions for determination of melt mass-flow rate

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

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

The possible values of melt mass-flow rate are divided into 15 ranges, each represented by a 3-figure code-number as specified in Table 5. The test conditions used shall be indicated by a single code-letter,as specified in Table 4, immediately preceding the code-number indicating the range.

Table 5 — Code-numbers used for melt mass-flow rate in data block 4

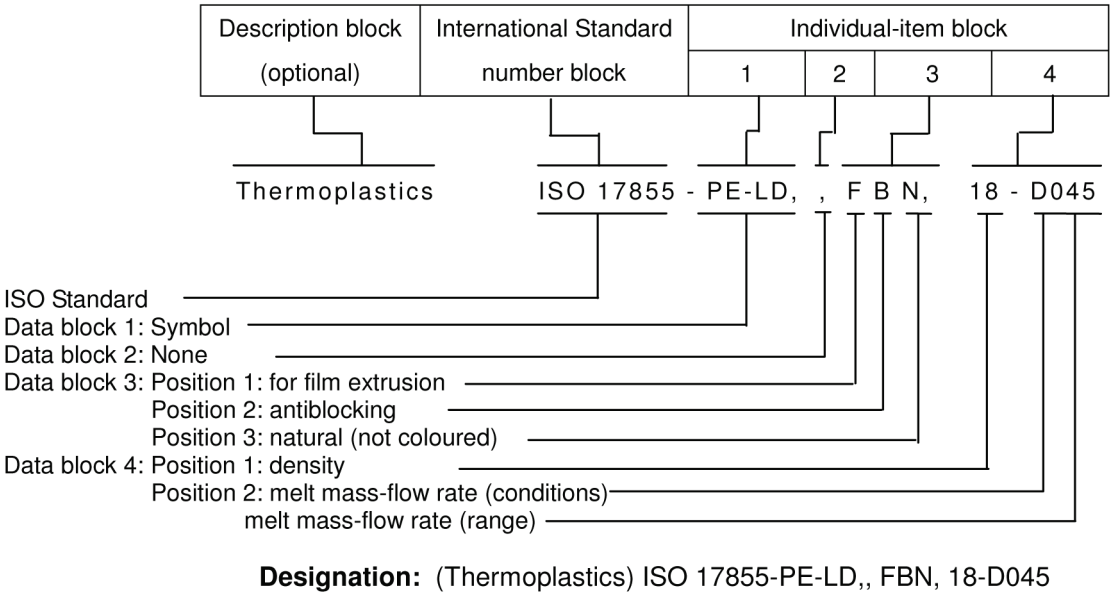
Code-number	Range of MFR g/10 min
000	≤ 0,10
001	> 0,10 but ≤ 0,20
003	> 0,20 but ≤ 0,40
006	> 0,40 but ≤ 0,80
012	> 0,80 but ≤ 1,5
022	> 1,5 but ≤ 3,0
045	> 3,0 but ≤ 6,0
090	> 6,0 but ≤ 12
200	> 12 but ≤ 25
400	> 25 but ≤ 50
600	> 50 but ≤ 75
800	> 75 but ≤ 100
900	> 100 but ≤ 130
910	> 130 but ≤ 160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

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.

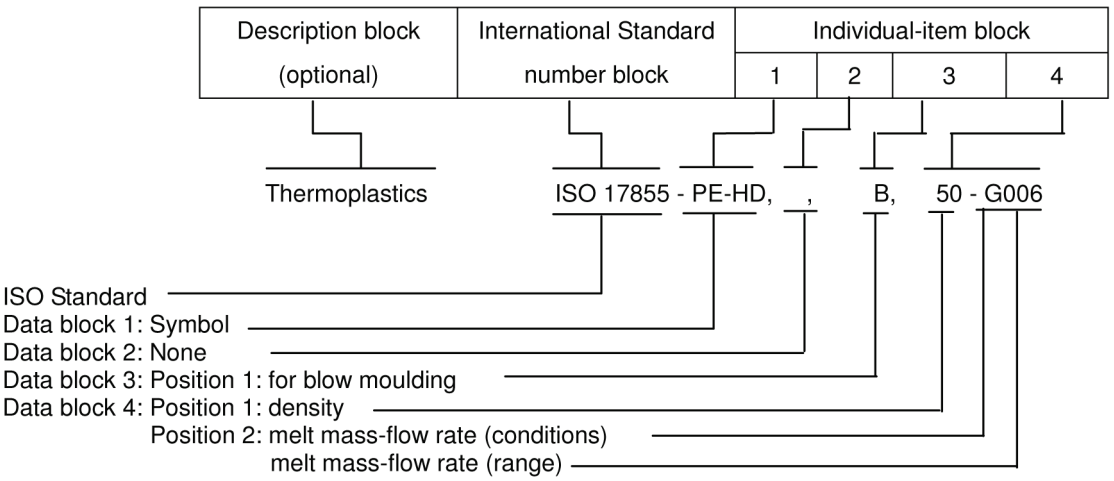
4 Examples of designations

4.1 A low density polyethylene thermoplastic material (PE-LD), 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:



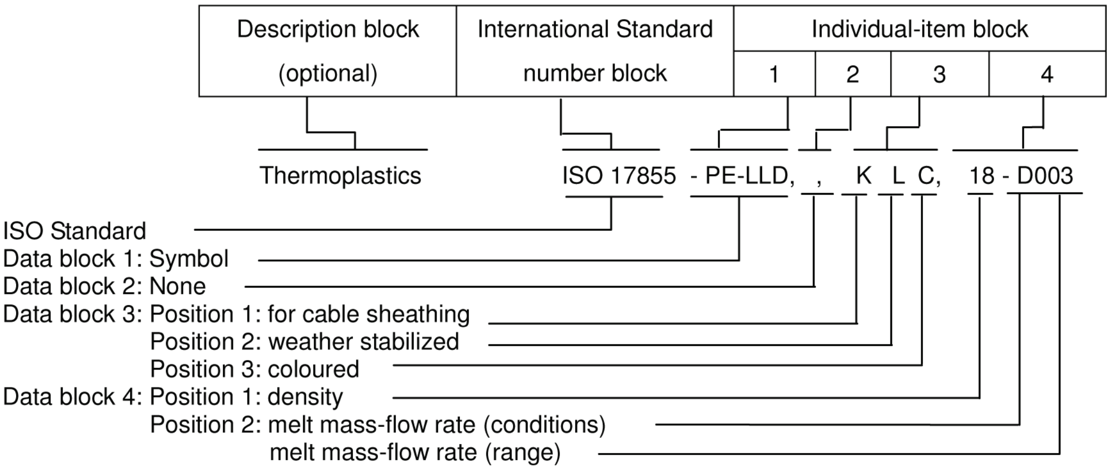
Designation: (Thermoplastics) ISO 17855-PE-LD,, FBN, 18-D045

4.2 A high density polyethylene thermoplastic material (PE-HD), intended 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:



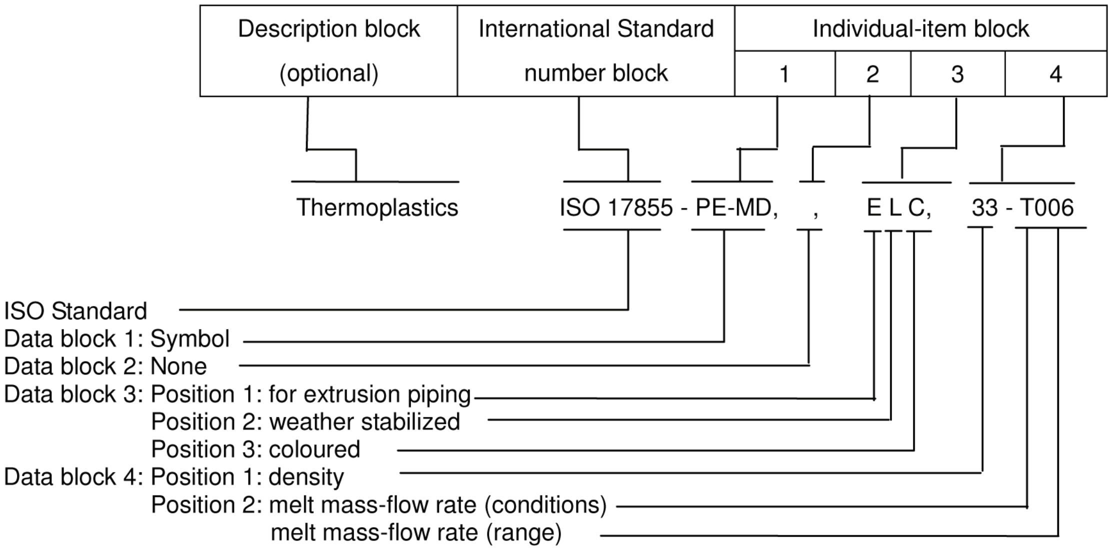
Designation: (Thermoplastics) ISO 17855-PE-HD,, B, 50-G006

4.3 A linear low density polyethylene thermoplastic material (PE-LLD), intended for cable sheathing (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:



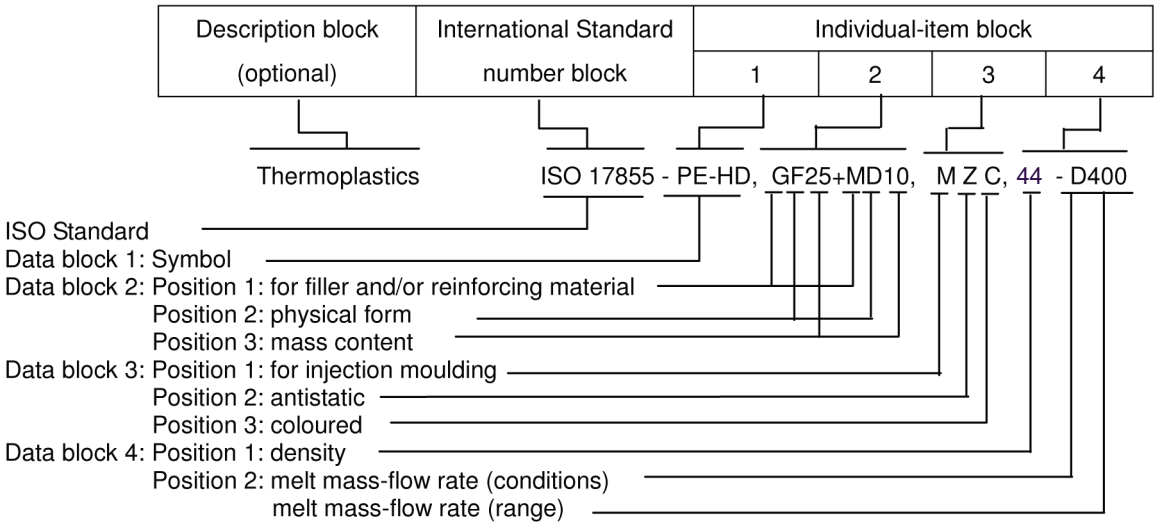
Designation: (Thermoplastics) ISO 17855-PE-LLD,, KLC, 18-D003

4.4 A medium density polyethylene thermoplastic material (PE-MD), intended for extrusion of pipe (E),weather stabilized (L), coloured (C), having a density (base polymer) of 935 kg/m^3 (33) and a melt mass-flow rate (MFR 190/5) (T) of 0,5 g/10 min (006), would be designated:



Designation: (Thermoplastics) ISO 17855-PE-MD,, ELC, 33-T006

4.5 A high density polyethylene thermoplastic material (PE-HD), intended for injection moulding (M), antistatic (Z), coloured (C), a mixture of 25 % glass fibres (GF) and 10 % mineral powder (MD), having a density (base polymer) of 946 kg/m^3 (44) and a melt mass-flow rate (MFR 190/2,16) (D) of 36 g/10 min (400), would be designated:



Designation: (Thermoplastics) ISO 17855-PE-HD, GF25+MD10, MZC, 44 -D400

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