INTERNATIONAL STANDARD

ISO 14910-1

Second edition
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Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion —

Part 1: Designation system and basis for specification

Plastiques — Élastomères thermoplastiques à base de polyester/ester et polyéther/ester, pour moulage et extrusion —

Partie 1: Système de désignation et base de spécification

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 14910-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This second edition cancels and replaces the first edition (ISO 14910-1:1997), which has been technically revised.

ISO 14910 consists of the following parts, under the general title *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion*:

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

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

Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion —

Part 1: Designation system and basis for specification

1 Scope

This part of ISO 14910 establishes a system of designation for thermoplastic polyester/ester and polyether/ester elastomers, which may be used as the basis for specifications.

The types of thermoplastic polyester/ester and polyether/ester elastomer are differentiated from each other by a classification system based on appropriate levels of the designatory properties

a) hardness;

b) melting temperature;

c) tensile/flexural modulus of elasticity;

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

This part of ISO 14910 is applicable to all thermoplastic polyester/ester and polyether/ester elastomers. It applies to materials ready for normal use in the form of powder, granules or pellets, unmodified or modified by colourants, fillers or other additives.

It is not intended to imply that materials having the same designation give necessarily the same performance. This part of ISO 14910 does not provide engineering data, performance data or data on processing conditions which might 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 14910-2, if suitable.

In order to specify a thermoplastic polyester/ester or polyether/ester elastomer for a particular application or to ensure reproducible processing, additional requirements may be given in data block 5 (see 3.1 and 3.6).

2 Normative references

The following referenced documents are indispensable for the application 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 14910-2, *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion — Part 2: Preparation of test specimens and determination of properties*

ISO 18064, *Thermoplastic elastomers — Nomenclature and abbreviated terms*

3 Designation system

3.1 General

The designation system for thermoplastics is based on the following standardized pattern.

Designation		
		Identity block
Description block (optional)	**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 abbreviated term (TPC), in accordance with ISO 18064, and information on the alternating hard and soft segments in the main chain (see 3.2).

— Data block 2: Position 1: Intended application and/or method of processing (see 3.3).
Positions 2 to 8: Important properties, additives and supplementary information (see 3.3).

— Data block 3: Designatory properties (see 3.4).

— Data block 4: Fillers or reinforcing materials and their nominal content (see 3.5).

— Data block 5: For the purpose of specifications, a fifth data block containing additional information may be used (see 3.6). The kind of information and the code-letters used are not the subject of this part of ISO 14910.

The first character of the individual item block shall be a hyphen.

The five data blocks shall be separated from each other by a comma.

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

Terminal commas may be omitted.

3.2 Data block 1

In this data block, after the hyphen, the thermoplastic elastomer is identified as follows.

The prefix TP is followed by a letter representing the category of the thermoplastic elastomer, as given in ISO 18064. For copolyester thermoplastic elastomers, the prefix TP is followed by the letter C.

Copolyester thermoplastic elastomers consist of a block copolymer of alternating hard segments and soft segments, the chemical linkages in the main chain being ester and/or ether. The "TPC" group is sub-categorized into groups according to the linkages in the soft blocks. The following symbols shall be used:

— TPC-EE Soft segment with both ester and ether linkages

— TPC-ES Polyester soft segment

— TPC-ET Polyether soft segment

3.3 Data block 2

In this data block, information about 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 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 — Codes used in data block 2

Code-letter	Position 1	Position 2 to 8
A	Adhesive	Processing stabilized
B	Blow moulding	Antiblocking
C	Calendering	Coloured
D	Disc manufacture	Powder
E	Extrusion	Expandable
F	Extrusion of films	Special burning characteristics
G	General use	Granules
H	Coating	Heat-ageing stabilized
K	Cable and wire coating	
L	Monofilament extrusion	Light and/or weather stabilized
M	Moulding	Nucleated
N	Multiple processing modes	Natural (no colour added)
P		Impact modified
R	Rotational moulding	Mould release agent
S	Sintering	Lubricated
T		Transparent
W		Stabilized against hydrolysis
X	No indication	
Z		Antistatic

3.4 Data block 3

3.4.1 General

In this data block, the hardness is represented by a two-figure code-number (see 3.4.2), the melting temperature by a two-figure code-number (see 3.4.3) and the tensile/flexural modulus of elasticity by a three-figure code-number (see 3.4.4). The 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 limit because of manufacturing tolerances, the designation is not affected.

3.4.2 Hardness

The hardness shall be determined in accordance with ISO 14910-2.

The possible values of the hardness are divided into 11 ranges, each represented by a two-figure code-number as specified in Table 2.

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

Code-number	Range of hardness (Shore D)
30	≤ 32
35	> 32 but ≤ 37
40	> 37 but ≤ 42
45	> 42 but ≤ 47
50	> 47 but ≤ 52
55	> 52 but ≤ 57
60	> 57 but ≤ 62
65	> 62 but ≤ 67
70	> 67 but ≤ 72
75	> 72 but ≤ 77
80	> 77

NOTE The hardness of thermoplastic elastomers is measured in Shore A and Shore D units. Shore hardness is a measure of the resistance of a material to penetration by an indenter under a defined spring force. It is determined as a number from 0 to 100 on the Shore A or Shore D scale. The higher the number, the higher the hardness of the material. The Shore A scale is used for very flexible types of elastomer and the Shore D scale for less flexible and rigid types. The Shore A and Shore D scales overlap. For the designation of thermoplastic polyester/ether and polyether/ester elastomers, the Shore D scale is used as this scale covers the whole range of hardnesses encountered and is able to discriminate between very flexible, medium flexible and rigid materials.

3.4.3 Melting temperature

The melting temperature shall be determined in accordance with ISO 14910-2.

The possible values of the melting temperature are divided into 10 ranges, each represented by a two-figure code number as specified in Table 3.

Table 3 — Code-numbers used for melting temperature in data block 3

Code-number	Range of melting temperature °C
14	≤ 145
15	> 145 but ≤ 155
16	> 155 but ≤ 165
17	> 165 but ≤ 175
18	> 175 but ≤ 185
19	> 185 but ≤ 195
20	> 195 but ≤ 205
21	> 205 but ≤ 215
22	> 215 but ≤ 225
23	> 225

3.4.4 Tensile/flexural modulus of elasticity

The tensile/flexural modulus of elasticity shall be determined in accordance with ISO 14910-2.

The possible values of the tensile/flexural modulus of elasticity are divided into 10 ranges, each represented by a three-figure code-number as specified in Table 4.

Table 4 — Code-numbers used for tensile/flexural modulus of elasticity in data block 3

Code-number	Range of modulus MPa
002	≤ 30
004	> 30 but ≤ 50
006	> 50 but ≤ 70
008	> 70 but ≤ 90
010	> 90 but ≤ 110
015	> 110 but ≤ 200
025	> 200 but ≤ 300
040	> 300 but ≤ 500
075	> 500 but ≤ 1 000
100	> 1 000

3.5 Data block 4

In this data block, the type of filler and/or reinforcing material is represented by 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 two-figure code-number in positions 3 and 4.

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 % (by mass) of glass fibre (GF) and 10 % (by mass) of mineral powder (MD) would be indicated by (GF25+MD10).

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

Code-letter	Material (Position 1)	Form (Position 2)
B	Boron	Balls; beads; spheres
C	Carbon[a]	
D		Powder; dry blend
F		Fibre
G	Glass	Granules; ground
H		Whiskers
K	Calcium carbonate ($CaCO_3$)	
M	Mineral[a]; metal[b]	
S	Organic[a]; synthetic	
T	Talc	
X	Not specified	Not specified
Z	Others[a]	Others

[a] These materials may be further defined after position 4 of the data block, e.g. by chemical symbol or by additional codes to be agreed upon.

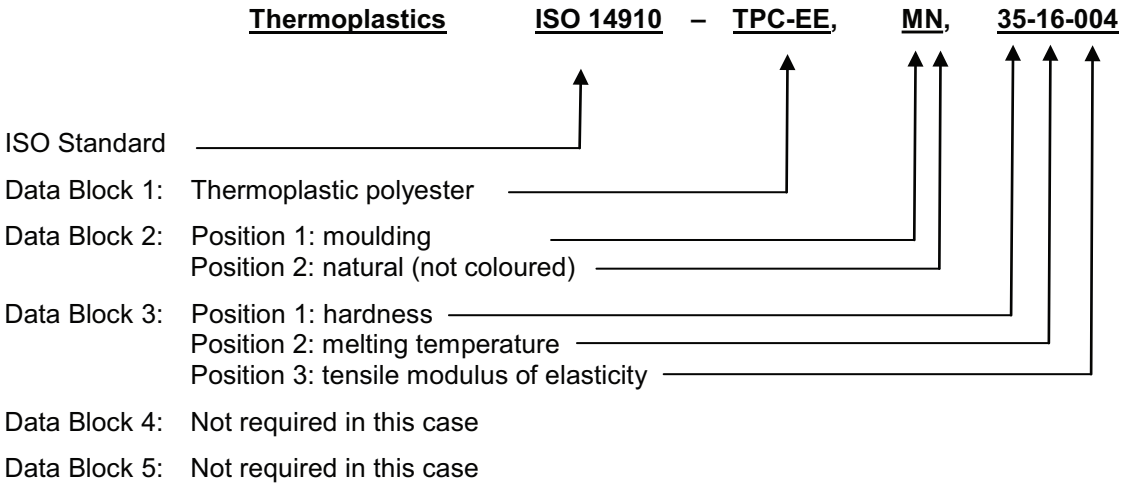
[b] Metal fillers shall be identified by their chemical symbol (in capital letters) after the mass content. For example, 5 % steel whiskers may be designated “MH05FE”.

3.6 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 may be done for example by reference to a suitable national standard or to a standard-like, generally established specification.

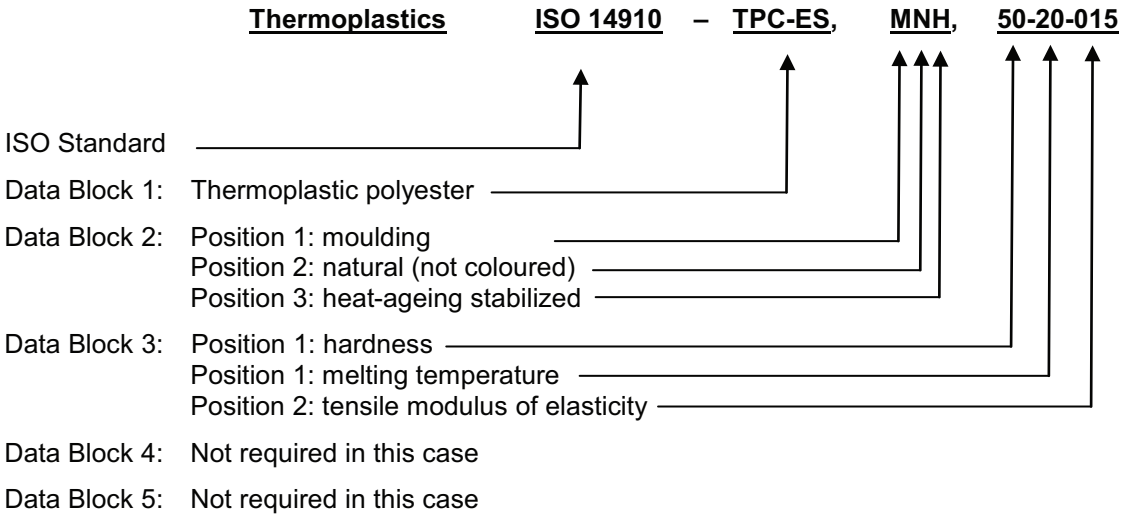
4 Examples of designations

A thermoplastic copolyether/ester based on butanediol/terephthalic acid and poly(tetramethylene ether) glycol/terephthalic acid (TPC-EE), intended for moulding (M), natural (not coloured) (N) and having a hardness of 35 (35), a melting temperature of 156 °C (16) and a tensile modulus of elasticity of 32 MPa (004), would be designated:



Designation: ISO 14910-TPC-EE,MN,35-16-004

A thermoplastic copolyester/ester based on butanediol/terephthalic acid and caprolactone (TPC-ES), intended for moulding (M), natural (not coloured) (N), stabilized for heat-ageing (H) and having a hardness of 48 (50), a melting temperature of 200 °C (20) and a tensile modulus of elasticity of 127 MPa (015), would be designated:



Designation: **ISO 14910**-TPC-ES,MNH,50-20-015

Annex A
(informative)

Definition of thermoplastic polyester/ester and polyether/ estercopolymer elastomers

Thermoplastic polyester materials contain ester groups, -CO-O-, at regular intervals in the linear polymer chain.

One segment of a polyester/ester copolymer is built up from a starting material with hydroxyl (-OH) groups, also called diols, plus a starting material with carboxylic acid (-COOH) groups, also called dicarboxylic acids, or esters of such acids, and the second segment is built up from a hydroxycarboxylic acid or its lactone, in each case by a polycondensation process.

One segment of a polyether/ester copolymer is built up from diols and dicarboxylic acids, or esters of such acids, and the second segment is built up from polyalkylene ether glycols and dicarboxylic acids, in each case by a polycondensation process (see Tables A.1 to A.3).

Table A.1 — Hydroxyl units

Monomer unit derived from	CAS No.
Ethylene glycol	107-21-1
1,3-Propanediol	504-63-2
1,4-Butanediol	110-63-4
1,6-Hexanediol	629-11-8
1,14-Tetradecanediol	19812-64-7
2-Butene-1,4-diol	110-64-5
Cyclohexanedimethanol	105-08-8
Neopentyl glycol	126-30-7
Poly(ethylene ether) glycol	25322-68-3
Poly(propylene ether) glycol	25322-69-4
Ethylene oxide polypropylene glycol	91858-59-2
Poly(tetramethylene ether) glycol	25190-06-1

Table A.2 — Carboxylic units

Monomer unit derived from	CAS No.
Adipic acid	124-04-9
Azelaic acid	123-99-9
Sebacic acid	111-20-6
Dodecanedioic acid	143-07-7
Hydrogenated dimeric fatty acid	68783-41-5
Terephthalic acid	100-21-0
Isophthalic acid	121-91-5
Trimellitic acid	528-44-9
2,6-Naphthalenedicarboxylic acid	1141-38-4
Phthalic acid	88-99-3

Table A.3 — Hydroxycarboxylic units

Monomer unit derived from	CAS No.
Caprolactone	502-44-3
p-Hydroxybenzoic acid	99-96-7
4-Hydroxyvaleric acid lactone	108-29-2

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