INTERNATIONAL STANDARD

ISO 14910-1

First edition
1997-12-15

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

Part 1:
Designation system and basis for specifications

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
ISO 14910-1:1997(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 14910-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

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 specifications*

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

Annex A forms an integral part of this part of ISO 14910.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

Printed in Switzerland

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

Part 1:
Designation system and basis for specifications

1 Scope

1.1 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.

1.2 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, colourants, fillers and reinforcing materials.

1.3 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.

1.4 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 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 polyester/ester or polyether/ester 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 14910. 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 14910 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 1043-1:1997, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics.*

ISO 1043-2:1988, *Plastics — Symbols — Part 2: Fillers and reinforcing materials.*

ISO 14910-2:1997, *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion — Part 2: Preparation of test specimens and determination of properties.*

3 Designation system

The designation 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 designation, the individual-item block is subdivided into 5 data blocks comprising the following information:

— Data block 1: Identification of the plastic by its symbol 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: Information required for specification purposes is listed here. The use of data block 5 converts the designation to a specification. Only information listed in data block 5 becomes part of the specification requirements.

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, thermoplastic polyester/ester and polyether/ester elastomers are identified using the symbols and designations given in table 1 or developed from annex A.

Table 1 — Symbols indicating the chemical structure of copolyester/ester and copolyether/ester materials in data block 1 (examples)

Symbol	Chemical identification
TP 4T/PTMEGT	Copolyether/ester based on butanediol, poly(tetramethylene ether) glycol and terephthalic acid.
TP CL/4T	Copolyester/ester based on caprolactone, butanediol and terephthalic acid.
TP 4T/PPEGT	Copolyether/ester based on butanediol, poly(propylene ether) glycol and terephthalic acid.
TP 4T/BDT/PTMEGT	Copolyether/ester based on butanediol, butenediol, poly(tetramethylene ether) glycol and terephthalic acid.

3.2 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 used are specified in table 2.

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 2

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

3.3 Data block 3

In this data block, the hardness is represented by a 2-figure code-number (see 3.3.1), the melting temperature by a 2-figure code-number (see 3.3.2) and the tensile/flexural modulus of elasticity by a 3-figure code-number (see 3.3.3). 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.

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

3.3.1 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 2-figure code-number as specified in table 3.

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

Code-number	Range of hardness
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

3.3.2 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 2-figure code-number as specified in table 4.

Table 4 — 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

3.3.3 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 3-figure code-number as specified in table 5.

Table 5 — 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

3.4 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 6. Subsequently (without a space), the mass content may be given by a 2-figure 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 % glass fibres (GF) and 10 % mineral powder (MD) would be indicated by (GF25+MD10).

Table 6 — Code-letters for fillers and reinforcing materials in data block 4

Code-letter	Material	Code-letter	Form
B	Boron	**B**	Beads, spheres, balls
C	Carbon [1)]	**D**	Powder
G	Glass	**F**	Fibre
K	Calcium carbonate	**G**	Ground
M	Mineral, metal [2)]	**H**	Whiskers
S	Synthetic, organic [1)]	**X**	Not specified
T	Talc	**Z**	Others
X	Not specified		
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, or by additional codes to be agreed upon.

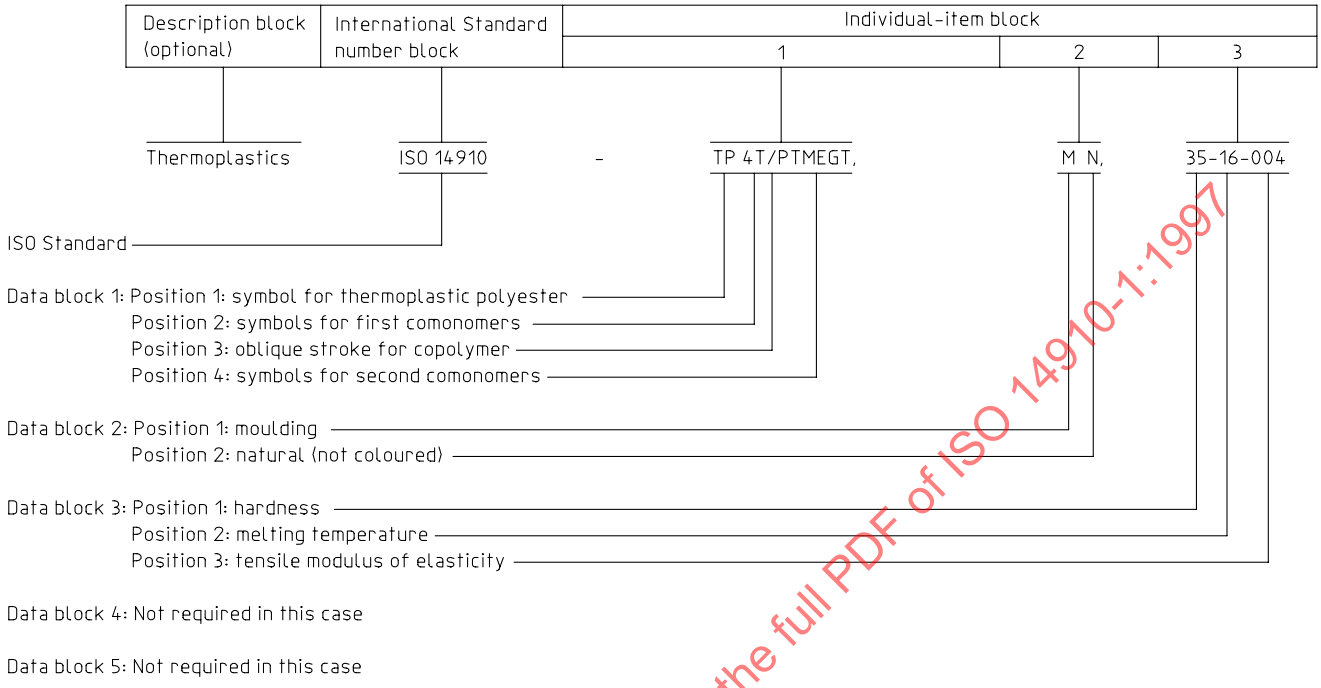
2) Metal fillers shall be identified by their chemical symbol after the mass content.

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

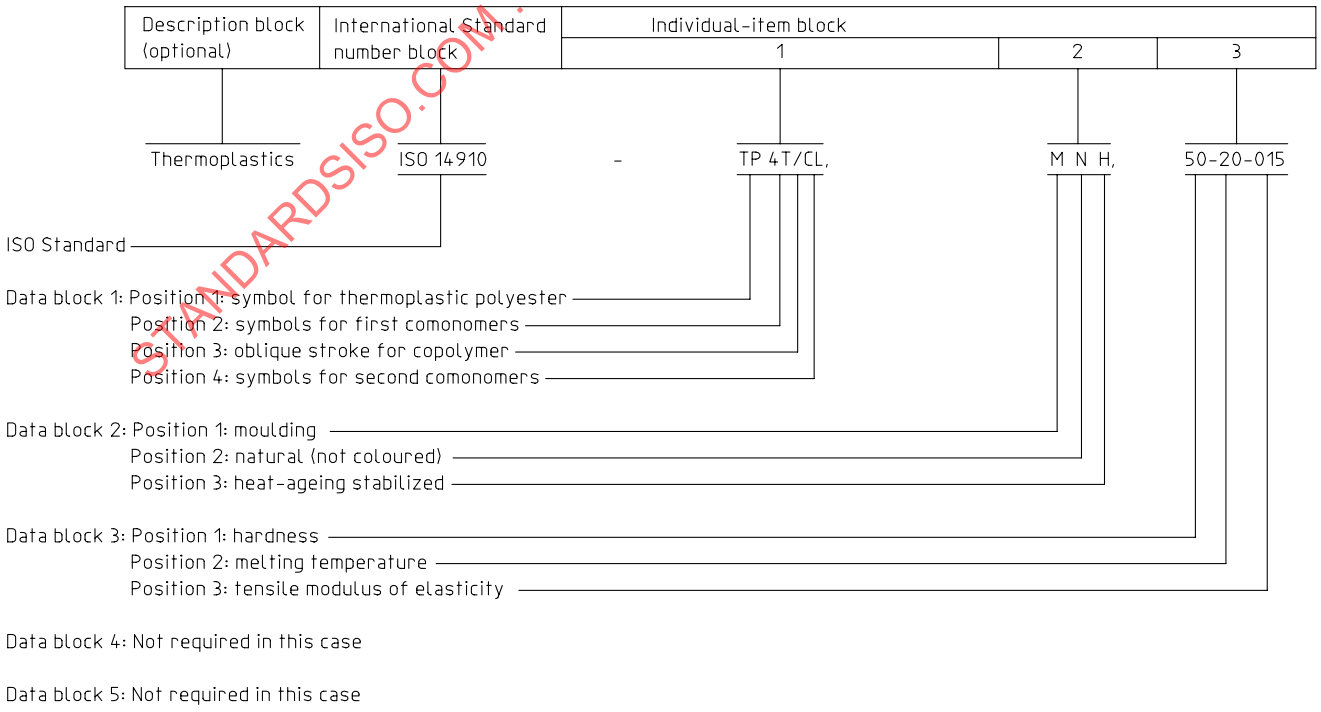
4 Examples of designations

A thermoplastic copolyether/ester (TP) based on butanediol (4)/terephthalic acid (T) and poly(tetramethylene ether) glycol (PTMEG)/terephthalic acid (T), 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: Thermoplastics ISO 14910-TP 4T/PTMEGT,MN,35-16-004

A thermoplastic copolyester/ester (TP) based on butanediol (4)/terephthalic acid (T) and caprolactone (CL), 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: Thermoplastics ISO 14910-TP 4T/CL,MNH,50-20-015

Annex A
(normative)

Designation of thermoplastic polyester/ester and polyether/ester copolymer 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.

Aliphatic polyester segments based on linear diols and linear dicarboxylic acids or esters of such acids are designated by two or more code-numbers. The first code-number (which may have one or two digits) corresponds to the number of C-atoms in the linear diol (see table A.1) and the second code-number (which may also have one or two digits) corresponds to the number of C-atoms in the linear dicarboxylic acid (see table A.2).

Non-linear aliphatic, cycloaliphatic and aromatic compounds used as monomer units in the polyester chain are designated by code-letters (see tables A.1, A.2 and A.3).

Copolyesters are designated by an oblique stroke (/) between the code-numbers representing the components of the copolyester (cf annex A, clause A.6, in ISO 1043-1:1997). Copolyesters with the same code-numbers or code-letters can have quite different properties, depending on the ratio of the starting materials. Therefore, the ratio, in mass percent, may optionally be indicated in parentheses at the end of the designation.

Examples of these designations are shown in table 1.

Table A.1 — Symbols for hydroxy units [first digit(s)]

Symbol	Monomer unit derived from	CAS No.
2	Ethylene glycol	107-21-1
3	1,3-Propanediol	504-63-2
4	1,4-Butanediol	110-63-4
6	1,6-Hexanediol	629-11-8
14	1,14-Tetradecanediol	19812-64-7
BD	2-Butene-1,4-diol	110-64-5
CH	Cyclohexanedimethanol	105-08-8
NG	Neopentyl glycol	126-30-7
PEEG	poly(ethylene ether) glycol	25322-68-3
PPEG	poly(propylene ether) glycol	25322-69-4
EOPPG	ethylene oxide polypropylene glycol	91858-59-2
PTMEG	poly(tetramethylene ether) glycol	25190-06-1
XX	Not specified	