
**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 spécifications



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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Designation system	2
4.1 General	2
4.2 Data block 1	2
4.3 Data block 2	3
4.4 Data block 3	4
4.5 Data block 4	4
4.5.1 General	4
4.5.2 Hardness	5
4.5.3 Melting temperature	5
4.5.4 Tensile/flexural modulus of elasticity	6
4.6 Data block 5	6
5 Examples of designations	6
Annex A (informative) Definition of thermoplastic polyester/ester and polyether/ estercopolymer elastomers	9
Bibliography	11

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.

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 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This first edition of ISO 20029-1 cancels and replaces ISO 14910-1:2013, which has been technically revised to introduce a new designation system.

The revised designation system is published under a new ISO number, as many existing documents refer to ISO 14910-1. If the existing ISO 14910-1 would be replaced by the new designation system, these documents would refer to the incorrect designation system.

In order to give users time to switch from ISO 14910-1 to ISO 20029-1, any designation system according to ISO 14910-1 is to be phased out in 5 to 10 years.

A list of all parts in the ISO 20029 series can be found on the ISO website.

Introduction

ISO 14910-1:2013 is complex and does not fit with daily practice anymore. In practice, ISO 18064 and ISO 11469 are, in combination, “improperly” being used as a designation system for, e.g. marking. The aim of this document is to simplify the data block system and to connect more to ISO 18064 and ISO 11469, where the first two blocks are used for generic identification and marking of products.

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

Part 1: Designation system and basis for specification

1 Scope

This document 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 document 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 document does not provide engineering data, performance data or data on processing conditions which may be required to specify a material. If such additional properties are required, they are intended to be determined in accordance with the test methods specified in ISO 20029-2, if suitable.

In order to designate a thermoplastic polyester/ester or polyether/ester elastomer to meet particular specifications, the requirements are given in data block 5 (see [4.1](#)).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1043-4, *Plastics — Symbols and abbreviated terms — Part 4: Flame retardants*

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

ISO 20029-2, *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion — Part 2: Preparation of test specimens and determination of properties*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Designation system

4.1 General

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

Designation						
Description block (optional)	International Standard number block	Identity 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 about the composition of the polymer (see 4.2).
- Data block 2:
 - fillers or reinforcing materials and their nominal content;
 - flame retardant;
 - optionally recycle and its content (see 4.3).
- Data block 3: Position 1: Intended application and/or method of processing (see 4.4). Positions 2 to 8: Important properties, additives and supplementary information (see 4.4).
- Data block 4: Designatory properties (see 4.5).
- Data block 5: For the purpose of specifications, a fifth data block contains appropriate information (see 4.6).

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.

NOTE Data blocks 1 and 2 together form the part marking symbol.

4.2 Data block 1

In this data block, after the hyphen, the thermoplastic elastomer is identified by its abbreviated term in accordance with ISO 18064 and, after a space, a symbol indicating the composition as specified in Table 1.

Table 1 — Symbols indicating the chemical structure of thermoplastic polyester/ester and polyether/ester elastomers in data block 1

Symbol	Chemical identification
TPC-ES	Polyester soft segment
TPC-ET	Polyether soft segment
TPC-EA	Alkane soft segment
TPC-XY	Not defined

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 (see [Annex A](#)).

4.3 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 2](#). Subsequently (without a space), the actual 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 followed by the total filler content. 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) or (GF+MD)35.

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

Code-letter	Material (Position 1)	Form (Position 2)
B	Boron	Balls; beads; spheres
C	Carbon ^a	
D		Powder; dry blend
E		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”.		

Separated from the filler and/or reinforcement code by a space, the addition of a flame retardant or flame retardant behaviour is represented by the abbreviated term “FR” followed, without a space, by a two digit code number between parentheses of the flame retardant type in accordance with ISO 1043-4.

Separated by a space from the flame retardant or the reinforcement code if no flame retardant code is used, the declaration of recyclate is represented by the code R between parentheses (R). Following the code R, the mass content may be given between the parentheses without a space.

4.4 Data block 3

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 3](#).

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 3 — Code-letters used in data block 3

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

4.5 Data block 4

4.5.1 General

In this data block, the range of designatory property 1, hardness, is represented by a 2-figure code-number (see [4.5.2](#)), the range of designatory property 2, melting temperature, by a 2-figure code-number (see [4.5.3](#)) and the range of designatory property 3, modulus of elasticity, by a 3-figure code-number (see [4.5.3](#)). 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.

4.5.2 Hardness

The hardness shall be determined in accordance with ISO 20029-2.

The possible values of the hardness are divided into 11 ranges, each represented by a two-figure code-number as specified in [Table 4](#).

Table 4 — Code-numbers used for hardness in data block 4

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.

4.5.3 Melting temperature

The melting temperature shall be determined in accordance with ISO 20029-2.

The possible values of the melting temperature are divided into 10 ranges, each represented by a two-figure code number as specified in [Table 5](#).

Table 5 — Code-numbers used for melting temperature in data block 4

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

4.5.4 Tensile/flexural modulus of elasticity

The tensile/flexural modulus of elasticity shall be determined in accordance with ISO 20029-2.

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 6.

Table 6 — Code-numbers used for tensile/flexural modulus of elasticity in data block 4

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

4.6 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.

5 Examples of designations

A thermoplastic copolyether/ester based on butanediol/terephthalic acid and poly(tetramethylene ether) glycol/terephthalic acid (TPC-ET), 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									
Description block (optional)	Identity block								
	ISO Standard	Individual item block							
		Data block 1	Data block 2			Data block 3		Data block 4	Data block 5
		Polymer	Performance and origin related information			Application and processing		Properties	Additional information
		Type	Filler	Flame retard- ant	Recy- clate	Process- ing	Character- istics		
Thermo- plastics	20029	TPC-ET				M	N	35-16-004	
>Part marking<									
No	No	Yes	Yes			No		No	No

Designation: Thermoplastics ISO 20029-TPC-ET,,MN,35-16-004,, or
ISO 20029-TPC-ET,,MN,35-16-004,, or
ISO 20029-TPC-ET,,MN,35-16-004

Part marking: >TPC-ET<

A thermoplastic copolyether/ester based on butanediol/terephthalic acid and poly(tetramethylene ether) glycol/terephthalic acid (TPC-ET), containing 5 % glass fibre, flame retardant code number 40 and 10 % recyclate, 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								
Description block (optional)	Identity block							
	ISO Standard	Individual item block						
		Data block 1	Data block 2			Data block 3	Data block 4	Data block 5
		Polymer	Performance and origin related information			Application and processing	Properties	Additional information
		Type	Filler	Flame retardant	Recyclate	Processing	Characteristics	
Thermoplastics	20029	TPC-ET	GF5	FR(40)	(R10)	M	N	35-16-004
>Part marking<								
No	No	Yes	Yes			No	No	No

Designation: Thermoplastics ISO 20029-TPC-ET,GF5 FR(40) (R10),MN,35-16-004,, or
ISO 20029-TPC-ET,GF5 FR(40) (R10),MN,35-16-004,, or
ISO 20029-TPC-ET,GF5 FR(40) (R10),MN,35-16-004

Part marking: >TPC-ET-GF5 FR(40) (R10)<

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								
Description block (optional)	Identity block							
	ISO Standard	Individual item block						
		Data block 1	Data block 2			Data block 3	Data block 4	Data block 5
		Polymer	Performance and origin related information			Application and processing	Properties	Additional information
		Type	Filler	Flame retardant	Recyclate	Processing	Characteristics	
Thermoplastics	20029	TPC-ES				M	NH	50-20-015
>Part marking<								
No	No	Yes	Yes			No	No	No

Designation: Thermoplastics ISO 20029-TPC-ES,,MNH,50-20-015,, or
ISO 20029-TPC-ES,,MNH,50-20-015,, or
ISO 20029-TPC-ES,,MNH,50-20-01

Part marking: >TPC-ES<

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