
**Plastics — Polyamide (PA) moulding
and extrusion materials —**

**Part 1:
Designation system, marking of
products and basis for specifications**

iTeh STANDARD PREVIEW
*Plastiques — Matériaux polyamides (PA) pour moulage et extrusion —
Partie 1: Système de désignation, marquage des produits et base de
spécification*
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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 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 16396-1 cancels and replaces ISO 1874-1:2010, 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 1874-1. If the existing ISO 1874-1 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 1874-1 to ISO 16396-1, any designation system according to ISO 1874-1 is to be phased out in 5 to 10 years. During this period, ISO 1874-2 will effectively be Part 2 of this International Standard.

ISO 16396 consists of the following parts, under the general *Plastics — Polyimide (PA) moulding and extrusion materials*:

- Part 1: *Designation system, marking of products and basis for specification*

Introduction

ISO 1874-1:2010 is complex and does not fit with daily practice anymore. In practice, ISO 1043 and ISO 11469 are, in combination, 'improperly' being used as a designation system for, e.g. marking. The aim of this International Standard is to simplify the data block system and to connect more to ISO 1043 and ISO 11469, where the first two blocks are used for generic identification and marking of products.

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Plastics — Polyamide (PA) moulding and extrusion materials —

Part 1: Designation system, marking of products and basis for specifications

1 Scope

This part of ISO 16396 establishes a system of designation for polyamide (PA) moulding and extrusion materials, which can be used as the basis for specifications.

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

- a) viscosity number and
- b) tensile modulus of elasticity

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

The designation system is applicable to all polyamide homopolymers, copolymers, and blends.

It applies to unmodified materials ready for normal use and materials modified, for example, by colorants, additives, fillers, reinforcing materials, and polymer modifiers.

This part of ISO 16396 does not apply to the following materials:

- a) monomer casting-type polyamides of PA 6;
- b) monomer casting-type polyamides of PA 12.

It is not intended to imply that materials having the same designation give the same performance. This part of ISO 16396 does not provide engineering data, performance data, or data on processing conditions which can be required to specify a material. If such additional properties are required, they will be determined in accordance with the test methods specified in ISO 1874-2, if suitable.

In order to designate a thermoplastic material to meet particular specifications, the requirements are to be given in data block 5 (see [3.1](#)).

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 307, *Plastics — Polyamides — Determination of viscosity number*

ISO 1043-1:2011, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 1874-2, *Plastics — Polyamide (PA) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*

3 Designation system

3.1 General

The designation system for thermoplastics is based on the following standard pattern:

| Designation | | | | | | |
|---------------------------|------------------------------|-----------------------|--------------|--------------|--------------|--------------|
| Description block | Identity block | | | | | |
| | International Standard Block | Individual item block | | | | |
| Thermoplastics (optional) | | Data block 1 | Data block 2 | Data block 3 | Data block 4 | Data block 5 |

Figure 1 — Data block designation system

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: Position 1: Identification of the plastic by its abbreviated term (PA), in accordance with ISO 1043-1 and information about the composition of the polymer.
Position 2: Information on the use of plasticizer (P) or impact modifier (I) (see 3.2).
- Data block 2: Position 1: Fillers or reinforcements and their nominal content.
Position 2: Flame retardant information.
Position 3: Declaration of recycle (R) (see 3.3).
- Data block 3: Position 1: Intended application and/or method of processing.
Positions 2 to 8: Important properties, additives, and supplementary information (see 3.4).
- Data block 4: Designatory properties (see 3.5).
- Data block 5: For the purpose of specification, the fifth data block contains appropriate information (see 3.6).

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 (,,). Terminal commas can be omitted.

NOTE Data blocks 1 and 2 together form the part marking symbol, connected with a hyphen, and placed between the punctuation marks ‘>’ and ‘<’, where no spaces are used between the codes.

EXAMPLE

| Designation | | | | | | | | | | | | |
|-------------------|----------------------------|--------------|------------------------|---------------|------------|----------------------------|---|--------------|--------------|----|------------|------------------------|
| Description block | Identity block | | | | | | | | | | | |
| | Thermo-plastics (optional) | ISO Standard | Individual-item block | | | | | | | | Properties | Additional information |
| Data block 1 | | | Data block 2 | | | Data block 3 | | Data block 4 | Data block 5 | | | |
| Polymer | | | Performance and origin | | | Application and processing | | | | | | |
| Type | Additive | Filler | Flame retardant | Recyclate | Processing | Characteristics | | | | | | |
| | 16396 | PA 6 | P | (GF+MD) 25 | FR(30) | (R50) | M | A | S14-060 | | | |
| >Part marking< | | | | | | | | | | | | |
| No | No | Yes | Yes | | | No | | No | No | No | | |

Designation: ISO 16396-PA 6-P,(GF+MD)25 FR(30) (R50),MA,S14-060,,

Part marking: >PA 6-P-(GF+MD)25FR(30)(R50)<

3.2 Data block 1

In this data block, after the hyphen, the plastic is identified by its abbreviated term (PA) in accordance with ISO 1043-1 and a symbol indicating the composition as specified in [Table 1](#).

Polyamides containing a plasticizer can be designated by adding the letter P after the symbol, separated from it by a hyphen (example: PA 610-P). [ISO 16396-1:2015](#)

Polyamides containing an impact modifier can be designated by adding the letter I after the symbol, separated from it by a hyphen (example: PA 6-I).

Examples of symbols indicating the chemical structure of copolyamide materials are given in [Table 2](#).

Table 1 — Symbols indicating the chemical structure of polyamide materials in data block 1

| Symbol | Name and chemical structure |
|---|--|
| Aliphatic - One monomer | |
| PA x | Polyamide, where x represents the number carbon atoms in the monomer. Examples: PA 6: Polyamide 6, homopolymer based on ε-caprolactam. PA 11: Polyamide 11, homopolymer based on 11-aminoundecanoic acid (see Annex A). |
| Aliphatic - Two monomers - Diamine / dicarboxylic acid | |
| PA xy | Polyamide, where — x represents the number carbon atoms in the diamine and — y represents the number of carbon atoms in the dicarboxylic acid (see Annex A). Examples: PA 46; Polyamide 46, homopolymer based on tetramethylenediamine and adipic acid PA 612; Polyamide 612, homopolymer based on hexamethylenediamine and dodecanedioic acid |

Table 1 (continued)

| Symbol | Name and chemical structure |
|--------|--|
| | Semi aromatic – Two monomers – (aromatic) Diamine / (aromatic) dicarboxylic acid |
| PA xy | <p>Polyamide, where</p> <p>— x represents the number carbon atoms in the diamine or the abbreviation of the diamine and</p> <p>— y represents the number of carbon atoms in the dicarboxylic acid or the abbreviation of the dicarboxylic acid (see Annex A).</p> <p>Examples:</p> <p>PA 4T, Polyamide 4T; homopolymer based on tetramethylenediamine and terephthalic acid.</p> <p>PA MXD6, Polyamide MXD6; homopolymer based on m-xylylenediamine and adipic acid.</p> |

Table 2 — Examples of symbols indicating the chemical structure of copolyamide materials in data block1

| Symbol ^a | Chemical structure ^b |
|---|---|
| PA 66/610 | Polyamide copolymers based on hexamethylenediamine, adipic acid, and sebacic acid. |
| PA 6/12 | Polyamide copolymers based on ϵ -caprolactam and laurolactam. |
| PA 6/66/CM6 | Polyamide ternary copolymers based on ϵ -caprolactam, hexamethylenediamine, adipic acid, bis(ρ -aminocyclohexyl)methane, and adipic acid. |
| PA 46/6 | Polyamide copolymers based on tetramethylenediamine, adipic acid, and ϵ -caprolactam. |
| PA 4T/6T | Polyamide copolymers based on tetramethylenediamine, hexamethylenediamine, and terephthalic acid. |
| PA 6T/XT | Polyamide copolymers based on hexamethylene diamine, an unspecified diamine and terephthalic acid. |
| PA 6T/66 | Polyamide copolymers based on hexamethylene diamine, terephthalic acid, and adipic acid. |
| PA 6T/6I | Polyamide copolymers based on hexamethylene diamine, terephthalic acid, and isophthalic acid. |
| PA 6T/6I/66 | Polyamide copolymers based on hexamethylene diamine, terephthalic acid, isophthalic acid and adipic acid. |
| PA 66/6I | Polyamide copolymers based on hexamethylene diamine, adipic acid, and isophthalic acid. |
| PA NDT/INDT | Polyamide copolymers based on 1,6 diamino-2,2,4-trimethylenehexane, 1,6 diamino-2,4,4-trimethylenehexane, and terephthalic acid. |
| PA 12/IPDI | Polyamide copolymers based on laurolactam, isophoronediamine, and isophthalic acid. |
| The following three designations include an indication of the mass content ratio (Annex A). | |
| PA 66/6 (90/10) | Polyamide copolymers based on 90 % (<i>m/m</i>) hexamethylenediamine and adipic acid and 10 % (<i>m/m</i>) ϵ -caprolactam. |
| PA 6/66 (80/20) | Polyamide copolymers based on 80 % (<i>m/m</i>) ϵ -caprolactam and 20 % (<i>m/m</i>) hexamethylenediamine and adipic acid. |
| PA 66/6 (80/20) | Polyamide copolymers based on 80 % (<i>m/m</i>) hexamethylenediamine and adipic acid and 20 % (<i>m/m</i>) ϵ -caprolactam. |
| ^a | Semi-crystalline polyamides can also be called polyphthalamides (PPA) if the residues of terephthalic acid or isophthalic acid or a combination of the two comprise at least 55 molar percentage of the dicarboxylic acid portion of the repeating structural units in the polymer chain (ASTM D 5336). |
| ^b | Other monomer combinations are possible. |

Blends

Blends can be made from materials mentioned in both tables and/or other polymers (ISO 1043). For polymer blends or alloys, use the abbreviated terms for the basic polymers with the main component

in first place followed by the other components in descending order according to their mass fractions, separated by a plus sign and no space before or after the plus sign.

EXAMPLE A blend of polyamide12 and polypropylene is designated: PA 12+PP.

3.3 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 3. Subsequently (without a space), the actual content by mass percent can be given by a two-figure number in position 3.

Mixtures of filler materials or forms can be indicated by combining the relevant codes using the sign “+” and placing the whole between parenthesis or by combining the relevant codes using the sign “+” and placing the whole between parentheses followed by the by the total filler content. For example, a mixture of 25 % (*m/m*) glass fibre (GF) and 10 % (*m/m*) mineral powder (MD) would be indicated by (GF25+MD10) or (GF+MD)35.

NOTE For marking purposes, combining the relevant codes followed by the total filler content outside the parentheses is preferred.

Table 3 — Coding system 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 |
| F | | Fibre |
| G | Glass | Granules; ground |
| H | | Whiskers |
| K | Calcium Carbonate (CaCO ₃) | |
| M | Mineral ^a | |
| ME | Metal ^b | |
| S | Organic, synthetic ^a | |
| T | Talcum | |
| X | Not specified | Not specified |
| Z | Others ^a | Others |

^a These materials can be identified after the code letter, e.g. by chemical symbol or additional codes to be agreed upon.

^b Metal filler shall be identified by the chemical symbol (in capital letters) after the mass content. For example, iron whiskers can be designated “MEH05FE”.

Separated from the 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 according 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 recycle is represented by the code R between parentheses (R). Following the code R, the mass content can be given between the parentheses without a space. For example, a PA 66 containing 20% glass fibre based upon a resin composed nominally of 70% recycle and 30% virgin material would be indicated ISO 16396-PA 66,GF20 (R70).