
**Plastics — Sulfone polymer moulding
and extrusion materials —**

**Part 1:
Designation system and basis for
specifications**

*Plastiques — Matériaux à base de polymères sulfone pour moulage et
extrusion —*

Partie 1: Système de désignation et base de spécifications

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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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 24025-1 cancels and replaces ISO 25137-1:2009, which has been technically revised.

The main changes compared to the previous edition are as follows:

- in [Clause 2](#), reference to ISO 25137-2 has been changed to ISO 24025-2;
- [Clause 3](#) has been added;
- in [Clause 4](#), the positions of data block have been changed;
- in [Clause 5](#), the positions of data block have been changed.

A list of all parts in the ISO 24025 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Sulfone polymer moulding and extrusion materials —

Part 1: Designation system and basis for specifications

1 Scope

This document establishes a system of designation for sulfone polymer moulding and extrusion materials, including polysulfone (PSU), polyethersulfone (PESU) and polyphenylsulfone (PPSU), which can be used as the basis for specifications.

The types of sulfone polymer materials are differentiated from each other by a classification system based on appropriate levels of the designatory properties

- a) temperature of deflection under load,
- b) melt mass-flow rate,
- c) Charpy notched impact strength,
- d) tensile modulus, and
- e) yield stress,

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

This document is applicable to all sulfone polymers that contain ether oxygen, which is a necessary component of the polymers as in the diphenyl sulfone moiety. It applies to sulfone polymer materials ready for normal use in the form of powder, granules or pellets, unmodified or modified by colorants, additives, fillers, etc.

This document not intended to imply that materials having the same designation necessarily give the same performance. It does not provide engineering data, performance data or data on processing conditions which can be required to specify a material for a particular application and/or method of processing.

If such additional properties are required, they are determined in accordance with the test methods specified in ISO 24025-1, if suitable.

In order to specify a thermoplastic material for a particular application or to ensure reproducible processing, 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 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 24025-2, *Plastics — Sulfone polymer moulding and extrusion materials — 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:

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

4 Designation system

4.1 General

The designation 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 PSU, PESU or PPSU in accordance with ISO 1043-1 and information about the composition of the polymer (see 4.2).

Data block 2: Fillers or reinforcing materials and their nominal content (see 4.3).

Data block 3: Position 1: Intended application 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 alternative specifications, a fifth data block may be added containing additional information (see 4.6).

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 (,,).

4.2 Data block 1

In this data block, after the hyphen, the polymer is identified by its abbreviated term PSU, PESU or PPSU, in accordance with ISO 1043-1, giving information on the composition as indicated in Table 1.

Table 1 — Abbreviated terms used for information on the major component (≥75 % by mass) in the composition of the polymer in data block 1

Abbreviated term	Chemical structure of the repeating unit
PSU (polysulfone)	oxy-1,4-phenylenesulfonyl-1,4-phenylene-oxy-1,4-phenylene(dimethylmethy-ene)-1,4-phenylene
PESU (polyethersulfone)	oxy-1,4-phenylenesulfonyl-1,4-phenylene
PPSU (polyphenylsulfone)	oxybiphenyl-4,4'-diyoxy-1,4-phenylenesulfon-yl-1,4-phenylene

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 mass content may be given by a two-figure number in position 3.

Table 2 — 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	Granules, ground
		H	Whiskers
K	Chalk		
L	Cellulose		
M	Mineral ^{a, b} , metal ^a		
S	Synthetic, organic ^a	S	Scales, flakes
T	Talc		
X	Not specified	X	Not specified
Z	Others ^b	Z	Others

^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.

^b Mineral fillers shall be designated more precisely if a symbol is available.

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 8 % mineral powder (MD) would be indicated by (GF25+MD08).

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	Code-letter	Positions 2 to 8
		A	Processing stabilized
B	Blow moulding	B	Antiblocking
C	Calendering	C	Coloured
		D	Power
E	Extrusion	E	Expandable
F	Extrusion of films	F	Special burning characteristics
G	General use	G	Granules
		H	Heat stabilized
K	Cable and wire coating	K	Metal deactivated
L	Monofilament extrusion	L	Light 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	Transparent
X	No indication		
		Y	Increased electrical conductivity
		Z	Antistatic

4.5 Data block 4

4.5.1 General

In this data block, the set of conditions used to anneal specimens before determination of the temperature of deflection under load is represented by a code-letter and the range of the temperature of deflection under load by a three-figure code-number (see 4.5.2), the melt volume-flow rate by a two-figure code-number (see 4.5.3) and the impact strength by a two-figure code-number (see 4.5.4). 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 designates 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 can be possible for currently available polymers.

4.5.2 Temperature of deflection under load

The temperature of deflection under load should be determined in accordance with ISO 24025-2 at a stress level of 1,8 MPa, using test specimens moulded from dry material, annealed under one of the sets of conditions given in Table 4 and then conditioned, before the determination, at $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 10) \%$ relative humidity for minimum of 24 h.

Table 4 — Specimen-annealing conditions

Code-letter	Temperature °C	Time h
A	140	4
B	170	1
C	200	1

The possible values of the temperature of deflection under load are divided into 12 ranges, each represented by a three-figure code-number as specified in [Table 5](#).

Table 5 — Code-number for temperature of deflection under load in data block 4

Code-number	Range of temperature of deflection under load °C
145	≤ 150
155	> 150 but ≤ 160
165	> 160 but ≤ 170
175	> 170 but ≤ 180
185	> 180 but ≤ 190
195	> 190 but ≤ 200
205	> 200 but ≤ 210
215	> 210 but ≤ 220
225	> 220 but ≤ 230
235	> 230 but ≤ 240
245	> 240 but ≤ 250
255	> 250

4.5.3 Melt volume-flow rate

The melt mass-flow rate (MFR) shall be determined in accordance with ISO 24025-2 under conditions specified in [Table 6](#). The material for the determination of the MFR shall be dry.

Table 6 — Test condition used for the determination of melt mass-flow rate

Code-letter	Test temperature °C	Nominal load kg
A	343	2,16
B	360	10,00
C	365	5,00
D	380	2,16

The possible values of MFR are divided into 7 ranges, each represented by a two-figure code-number as specified in [Table 7](#).

Table 7 — Code-numbers for melt volume-flow rate in data block 4

Code-number	Range of melt mass-flow rate g/10 min
02	> 2 but ≤ 5
05	> 5 but ≤ 10
10	> 10 but ≤ 15
15	> 15 but ≤ 20
20	> 20 but ≤ 30
30	> 30 but ≤ 40
40	> 40

4.5.4 Charpy notched impact strength

The Charpy notched impact strength shall be determined in accordance with ISO 24025-2.

The possible values of Charpy notched impact strength are divided into 10 ranges, each represented by the letter N and a two-figure code-number as specified in [Table 8](#).

Table 8 — Code-numbers for Charpy notched impact strength in data block 4

Code-number	Range of Charpy notched impact strength kJ/m ²
N 03	≤ 4,0
N 05	> 4,0 but ≤ 6,0
N 07	> 6,0 but ≤ 8,0
N 09	> 8,0 but ≤ 10,0
N 15	> 10,0 but ≤ 20,0
N 25	> 20,0 but ≤ 30,0
N 35	> 30,0 but ≤ 40,0
N 45	> 40,0 but ≤ 50,0
N 55	> 50,0 but ≤ 60,0
N 65	> 60,0

4.5.5 Tensile modulus

The tensile modulus shall be determined in accordance with ISO 24025-2.

The possible values of tensile modulus are divided into 9 ranges, each represented by a three-figure code-number as specified in [Table 9](#).

Table 9 — Code-numbers for tensile modulus in data block 4

Code-number	Range of tensile modulus MPa
015	≤ 2 000
020	> 2 000 but ≤ 4 000
040	> 4 000 but ≤ 6 000
060	> 6 000 but ≤ 8 000
080	> 8 000 but ≤ 10 000

Table 9 (continued)

Code-number	Range of tensile modulus MPa
100	> 10 000 but ≤ 12 000
120	> 12 000 but ≤ 14 000
140	> 14 000 but ≤ 16 000
160	> 16 000

4.5.6 Yield stress

The yield stress shall be determined in accordance with ISO 24025-2.

The possible values of yield stress are divided into 7 ranges, each represented by a two-figure code-number as specified in Table 10.

Table 10 — Code-numbers for yield stress in data block 4

Code-number	Range of yield stress MPa
60	≤ 65
65	> 65 but ≤ 85
70	> 85 but ≤ 105
75	> 105 but ≤ 125
80	> 125 but ≤ 145
85	> 145 but ≤ 165
90	> 165

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

5.1 Designation only

A polysulfone (PSU) moulding and extrusion material intended for injection moulding (M), having a temperature of deflection under load, determined after annealing the specimens at 170 °C for 1 h, of 181 °C (B185) and containing 30 % of glass fibre (GF30), would be designated:

Description block (optional)	International Standard number block	Individual-item block				
		1	2	3	4	5
Thermoplastics	ISO 24025	-	PSU,	GF30,	M,	B185
ISO Standard						
Data block 1: Symbol						
Data block 2: Position 1: glass						
Position 2: fibre						
Position 3: 30%						
Data block 3: Injection moulding						
Data block 4: Temperature of deflection under load						
Data block 5: Not used						

Designation: ISO 24025-PSU,GF30,M,B185

A polyethersulfone (PESU) moulding and extrusion material containing 30 % glass fibre (GF30), intended for injection moulding (M), having a melt mass-flow rate of 35 g/10 min at 380 °C and a load of 2,16 kg (D30) and tensile modulus of 2 300 MPa (020), would be designated:

Description block (optional)	International Standard number block	Individual-item block				
		1	2	3	4	5
Thermoplast	ISO 24025	-	PESU,	GF30,	M,	D30-020,
ISO Standard						
Data block 1: Symbol						
Data block 2: Position 1: glass						
Position 2: fibre						
Position 3: 30%						
Data block 3: Injection moulding						
Data block 4: Position 1: melt mass-flow rate						
Position 2: tensile modulus						
Data block 5: Not used						

Designation: ISO 24025-PESU,GF30,M,D30-020

5.2 Designation transformed into a specification

A polyphenylsulfone (PPSU) moulding and extrusion material containing 30 % glass fibre (GF30), intended for injection moulding (M), having special burning characteristics (F), a melt mass-flow rate of 35 g/10 min at 365 °C and 5 kg (C30) and a yield stress of 70 MPa (65), and meeting the requirements of ASTM D 6394, would be specified: