
**Plastics — Fluoropolymer dispersions
and moulding and extrusion
materials —**

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

*Plastiques — Polymères fluorés: dispersions et matériaux pour
moulage et extrusion —*

Partie 1: Système de désignation 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 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 20568-1 cancels and replaces ISO 12086-1:2006, which has been technically revised to introduce a new designation system.

A list of all the parts in the ISO 20568 series can be found on the ISO website.

Plastics — Fluoropolymer dispersions and moulding and extrusion materials —

Part 1: Designation system and basis for specifications

1 Scope

This document establishes a system of designation for fluoropolymer materials, which may be used as the basis for specifications.

The various types of fluoropolymer are differentiated from each other by a classification system based on appropriate levels of the designatory properties and on information about the intended application and/or method of processing, important properties, additives, colorants, fillers and reinforcing materials.

For polytetrafluoroethylene (PTFE)

For PTFE granular moulding and ram extrusion materials, and for PTFE resin produced from coagulation of dispersion:

- standard specific gravity (SSG)
- bulk density
- particle size

For aqueous dispersion of PTFE

- PTFE percentage in dispersion
- surfactant percentage in dispersion
- surfactant tolerance level

For melt processable resins

For CPT, ECTFE, EFEP, ETFE, FEP, PFA, PVDF, PVF, VDF/CTFE, VDF/HFP, VDF/TFE, VDF/TFE/HFP

- melting-peak temperature
- melt mass-flow rate

For PCTFE

- zero-strength time (ZST)

For TFE/PDD

- glass transition temperature (T_g)

For aqueous dispersion of melt processable resins (ETFE, FEP, PFA, PVDF, PVF, VDF/CTFE, VDF/HFP, VDF/TFE, VDF/TFE/HFP)

- polymer percentage in dispersion
- surfactant percentage in dispersion

— surfactant tolerance level

The designation system is applicable to all fluoropolymers 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.

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 20568-2, if suitable.

In order to specify a thermoplastic material for a particular specification, the requirements are to be 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 472, *Plastics — Vocabulary*

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

ISO 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method*

ISO 11357-2, *Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature and glass transition step height*

ISO 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*

ISO 20568-2, *Plastics — Fluoropolymer dispersions and moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*

ASTM D1430, *Standard Classification System for Polychlorotrifluoroethylene (PCTFE) Plastics*

ASTM D2116, *Standard Specification for FEP-Fluorocarbon Molding and Extrusion Materials*

ASTM D4441, *Standard Specification for Aqueous Dispersions of Polytetrafluoroethylene*

ASTM D4591, *Standard Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry*

ASTM D4894, *Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials*

ASTM D4895, *Standard Specification for Polytetrafluoroethylene (PTFE) Resins Produced From Dispersion*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

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>

3.1**melt-processable**

capable of being processed by, for example, injection molding, screw extrusion and other operations typically used with thermoplastics

3.2**presintered resin**

resin that has been treated thermally at or above the melting point of the resin at atmospheric pressure without having been previously preformed

3.3**reprocessed plastic**

material from the manufacture of semifinished forms of fluoropolymers that has been converted to a form suitable for further use

3.4**sintering**

<PTFE> thermal treatment during which the material is melted and recrystallized by cooling, with coalescence occurring during the treatment

3.5**standard specific gravity****SSG**

specific gravity of a specimen of PTFE material preformed, sintered and cooled through the crystallization point at a rate of 1 °C per minute in accordance with the appropriate sintering schedule as described in ISO 20568-2

Note 1 to entry: The SSG of unmodified PTFE is inversely related to its molecular mass.

3.6**zero-strength time****ZST**

measure of the relative molecular mass of PCTFE

Note 1 to entry: The ZST of PCTFE is proportionally related to its molecular mass.

4 Designation and specification system**4.1 General**

The designation system for thermoplastics is based on the following standard 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 five data blocks comprising the following information:

- Data block 1: Identification of the plastic by its abbreviated term for the fluoropolymer as listed in [Table 1](#) and information about the composition of the polymer (see [Table 1](#) and [Table 2](#)).
- Data block 2: Fillers or reinforcing materials and their nominal 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, the fifth data block contains appropriate 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 a comma.

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

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

4.2 Data block 1

In this data block, fluoropolymers are identified by the abbreviated term in accordance with ISO 1043-1 (supplemented by the abbreviated term listed in Table 1) and, after a hyphen, a symbol indicating the additional information as specified in Table 2.

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

	Meaning of code letter
CPT	chlorotrifluoroethylene-perfluoroalkoxy-tetrafluoroethylene copolymer
ECTFE	ethylene-chlorotrifluoroethylene copolymer
EFEP	ethylene-tetrafluoroethylene-hexafluoropropene copolymer
ETFE	ethylene-tetrafluoroethylene copolymer
FEP	perfluoro(ethylene-propene) copolymer
PCTFE	polychlorotrifluoroethylene
PFA	perfluoro(alkoxy alkane)
PTFE	polytetrafluoroethylene
PVDF	poly(vinylidene fluoride)
PVF	poly(vinyl fluoride)
TFE/PDD	tetrafluoroethylene-perfluorodioxole copolymer
VDF/CTFE	vinylidene fluoride-chlorotrifluoroethylene copolymer
VDF/HFP	vinylidene fluoride-hexafluoropropene copolymer
VDF/TFE	vinylidene fluoride-tetrafluoroethylene copolymer
VDF/TFE/HFP	vinylidene fluoride-tetrafluoroethylene-hexafluoropropene copolymer

Table 2 — Meaning of code letter, when used, for additional information in data block 1

Code-letter	Meaning of code-letter
A	Modified
D	Dispersion
E	Emulsion polymer
F	Filler resin (additive resin)
H	Homopolymer
K	Copolymer
S	Suspension polymer
SS	Presintered suspension polymer

Table 2 (continued)

Code-letter	Meaning of code-letter
Z1	In-house-recovered material; out of specification/waste
Z2	Reprocessed; byproduct from processing
Z3	Postconsumer material

Blends can be made from materials mentioned in both [Tables 1](#) and [2](#) (see ISO 1043-1). 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 FEP and PFA is designated: FEP+PFA.

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 3](#). Subsequently (without a space), the actual content by mass percentage shall be given by a two-figure number in position 3.

Table 3 — Symbols for fillers and reinforcing materials and form or structure in data block 2

Code-letter	Material ^a	Code-letter	Form or structure
B	Boron	B	Bead, spheres, balls
C	Carbon	C	Chips, cuttings
C1	Coke	D	Powder
C2	Partially graphitized carbon	F	Fibre
C-G	Graphite	G	Ground
E	Clay	H	Whiskers
G	Glass	K	Knitted fabric
K	Calcium carbonate	L	Layer
M	Mineral, metal	M	Mat (thick)
M1	Aluminium oxide	N	Non-woven and thin
M2	Bronze	P	Paper
M3	Calcium fluoride	S	Rovings
M4	Molybdenum disulfide	T	Scales, flakes
M5	Stainless steel	V	Cord
P	Mica	W	Veneer
Q	Silica	X	Not specified
R	Aramid	Y	Yarn
S	Synthetic, organic	Z	Others
S-X	X is the abbreviated term for a polymer used as the filler		
T	Talcum		
X	Not specified		
Z1	In-house-recovered material		
Z2	Reprocessed material		
Z3	Postconsumer material		

^a The materials may be further defined, for example, by their chemical symbols or by additional symbols defined in the relevant International Standard.

Mixtures of materials or forms may be indicated by combining the relevant codes using the “+” sign and placing the whole between parentheses. For examples, a mixture of 25 % glass fibres (GF) and 8 % mineral powder (MD) would be indicated by (GF25+MD8).

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 are specified in Table 4. If information is presented in positions 2 to 8 and no specific information is given in position 1, the letter X (no indication) shall be inserted in position 1.

Table 4 — Code-letters used in data block 3

Intended application or method of processing		Essential properties, additives or other information	
Code-letter	Position 1	Code-letter	Positions 2 to 8
A	Adhesives	C	Coloured
B	Blow moulding	D	Powder
B1	Extrusion blow moulding	D1	Dry blend
B2	Injection blow moulding	D2	Free-flowing
C	Calendering	D3	Not free-flowing
E	Extrusion	E	Expandable
F	Filled compounds	F	Special burning characteristics
G	General use	F1	Oxygen index >95 %
H	Coating	F2	Flame retarded
H1	Powder coating	F4	Reduced smoke emission
H2	Dip coating	G	Granules
H3	Wet coating	G1	Pellets
H4	Impregnation	G2	Lentils
H5	Spray coating	G3	Beads
K	Cable and wire coating	H1	Stabilized against radiation
L	Monofilament extrusion	L	Light and weather stabilized
M	Moulding	M	Nucleated
M1	Injection moulding	M1	Modified by comonomer
M2	Transfer moulding	N	Natural (no colour added)
P	Paste extrusion	N1	Suitable for food contact
Q	Compression moulding	N2	High purity
Q1	Automatic moulding	P	Impact modified
Q2	Isostatic moulding	R	Mould release agent
R	Rotational moulding	S	Lubricated
S	Sintering	S1	External lubrication
T	Tape manufacture	T	Transparent
T1	Skived tape or film	T1	Translucent
T2	Unsintered tape or film	T2	Opaque
T3	Expanded tape or film	T3	Improved transmission in UV
V	Thermoforming	T4	Reduced transmission in UV
X	No indication	V	Heat shrinkable
Y	Textile yarns, spinning	W1	Improved chemical resistance

Table 4 (continued)

Intended application or method of processing		Essential properties, additives or other information	
Code-letter	Position 1	Code-letter	Positions 2 to 8
Z	Tubing	X	Crosslinkable
		Y	Increased electrical conductivity
		Z	Antistatic

4.5 Data block 4

Each member of the fluoropolymer family has its own set of designatory properties selected from the properties listed below. There is one position in data block 4 for each of the designatory properties for a particular fluoropolymer. Therefore, data block 4 may have more positions for one fluoropolymer than for another. The code for melt mass-flow rate may require more than one letter or number. The code-symbols of designatory properties 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 range limit because of manufacturing tolerances, the designation is not affected.

Not all combinations of the values of the designatory properties may be possible for currently available materials.

4.5.1 PTFE

4.5.1.1 For polytetrafluoroethylene (PTFE-S) granular moulding and ram extrusion materials, and for polytetrafluoroethylene (PTFE-E) resin produced from coagulation of dispersion

In this data block, standard specific gravity is represented by one-figure code-number, bulk density is represented by one-figure code-number and particle size is represented by one-figure code number. The three code-numbers are separated from each other by hyphens.

4.5.1.1.1 Standard specific gravity (SSG)

Standard specific gravity (SSG) is the property usually used to measure the relative molecular mass of the polymers used in the PTFE industry. SSG shall be determined in accordance with the procedure described in ISO 20568-2. Codes and ranges are listed in [Table 5](#).

Table 5 — Codes for standard specific gravity (SSG) in data block 4

Code	SSG
0	2,000 to <2,140
1	2,140 to <2,160
2	2,160 to <2,180
3	2,180 to <2,200
4	2,200 to <2,220
5	2,220 to <2,240
6	2,240 to <2,260
7	2,260 to <2,400

4.5.1.1.2 Bulk density

Bulk density shall be determined as described in ISO 20568-2. The codes are listed in [Table 6](#).

Table 6 — Codes and ranges for bulk density in data block 4

Code	Bulk density g/l
0	1 to <200
1	200 to <500
2	500 to <800
3	800 to <1 100
4	1 100 to <2 000

4.5.1.1.3 Particle size

Particle size shall be determined by the method described in ISO 20568-2. The methods include wet- or dry-sieve analysis, electric sensing-zone testing and light scattering. Codes and ranges are given in [Table 7](#).

Table 7 — Codes and ranges for particle size (50 % retention) in data block 4

Code	Particle size μm
0	0,1 to <10
1	10 to <125
2	125 to <250
3	250 to <355
4	355 to <500
5	500 to <710
6	710 to <1 000
7	1 000 to <1 400

4.5.1.2 Aqueous dispersion of polytetrafluoroethylene (PTFE-D)

In this data block, PTFE percentage in dispersion is represented by one-figure code-number, nominal content of surfactant based on dry PTFE is represented by one-figure code-number and surfactant tolerance level is represented by one-figure code-number. The three code-numbers are separated from each other by hyphens.

4.5.1.2.1 PTFE percentage in dispersion

Percentage PTFE in dispersion shall be determined in accordance with the procedures provided in ISO 20568-2. Codes and ranges are listed in [Table 8](#).

Table 8 — Codes and ranges for percentage PTFE in dispersions in data block 4

Code	Percentage PTFE
0	>0 to <10
1	10 to <40
2	40 to <70
3	70 to <100

4.5.1.2.2 Surfactant percentage in dispersion

Surfactant percentage in dispersion shall be determined as described in ISO 20568-2. The codes are listed in [Table 9](#).

Table 9 — Codes and ranges for added-surfactant content in data block 4 (calculated as a percentage of the mass of the polymer)

Code	Percentage surfactant, nominal
0	0
1	>0 to <5
2	5 to <10
3	10 to <15
4	15 to <20
5	20 to <25
6	25 to <30

4.5.1.2.3 Surfactant tolerance level

The codes of manufacturing surfactant tolerances are listed in [Table 10](#).

Table 10 — Codes and ranges for surfactant tolerance level in data block 4

Code	Percentage surfactant tolerance
0	±0,5
1	±1,0
2	±2,0

4.5.2 Melt processable resins

4.5.2.1 CPT, ECTFE, EFEP, ETFE, FEP, PFA, PVDF, PVF, VDF/CTFE, VDF/HFP, VDF/TFE, VDF/TFE/HFP

In this data block, melting-peak temperature is represented by one code-letter and melt mass-flow rate is represented by three code-symbols (one code-number, one code-letter and one code-number). Melting-peak temperature and melt mass-flow rate codes are separated from each other by hyphens.

4.5.2.1.1 Melting-peak temperature

The melting-peak temperature shall be determined in accordance with the principles of ISO 11357-3 and ASTM D4591, modified by details given in ISO 20568-2. Melting-peak temperature shall be used as a designatory property. Codes and ranges are given in [Table 11](#).

Table 11 — Codes and ranges for melting-peak temperature in data block 4

Code	Range of temperature °C
A	100 to <110
B	110 to <120
C	120 to <130
D	130 to <140
E	140 to <150
F	150 to <160
G	160 to <170
H	170 to <180
I	180 to <190
J	190 to <200
K	200 to <210

Table 11 (continued)

Code	Range of temperature °C
L	210 to <220
M	220 to <230
N	230 to <240
O	240 to <250
P	250 to <260
Q	260 to <270
R	270 to <280
S	280 to <290
T	290 to <300
U	300 to <310
V	310 to <320
W	320 to <330
X	330 to <340
Y	340 to <350

For glass transition, temperature of TFE/PDD shall also use [Table 10](#).

4.5.2.1.2 Melt mass-flow rate

Melt mass-flow rate shall be determined in accordance with ISO 1133-1, modified by details provided in ISO 20568-2 and using test conditions selected from [Tables 12](#) and [13](#). The melt mass-flow rate is indicated in data block 4 by the codes for temperature and load given in [Tables 12](#) and [13](#) followed by the codes and ranges given in [Table 14](#).

Table 12 — Codes for melt mass-flow rate (MFR) test temperature in data block 4

Code	Test temperature °C
1	372 ± 1
2	297 ± 1
3	271,5 ± 1
4	265 ± 1
5	230 ± 1

Table 13 — Codes for MFR test load in data block 4

Code	Test load kg
A	0,325
B	1,20
C	2,16
D	3,8
E	5,0
F	10,0

Table 13 (continued)

Code	Test load
	kg
G	12,5
H	21,6
I	31,6

Table 14 — Codes for MFR in data block 4

Code	MFR
	g/10 min
0	0,0 to <0,1
1	0,1 to <0,2
2	0,2 to <0,5
3	0,5 to <1,0
4	1,0 to <2,0
5	2,0 to <5,0
6	5,0 to <10,0
7	10,0 to <20,0
8	20,0 to <50,0
9	50,0 to <100,0

4.5.2.2 PCTFE

In this data block, ZST is represented by one-figure code-number.

Zero-strength time (ZST) shall be determined as described in ASTM D1430 and the results coded as indicated in [Table 15](#).

Table 15 — Codes for zero-strength time (ZST) in data block 4

Code	ZST
	s
0	1 to <100
1	100 to <200
2	200 to <300
3	300 to <450
4	450 to <600

4.5.2.3 TFE/PDD

Glass transition temperature shall be determined in accordance with ISO 11357-2 and ASTM D4591. Glass transition temperature shall be used as a designatory property. Codes and ranges are given in [Table 11](#).

4.5.2.4 Aqueous dispersion of melt processable resins (ETFE, FEP, PFA, PVDF, PVF, VDF/CTFE, VDF/HFP, VDF/TFE, VDF/TFE/HFP)

In this data block, the polymer percentage in dispersion is represented by one-figure code-number, nominal content of surfactant based on dry polymer is represented by one-figure code-number and surfactant tolerance level is represented by one-figure code-number. The three code-numbers are separated from each other by hyphens.

4.5.2.4.1 Polymer percentage in dispersion

Percentage polymer in dispersion shall be determined in accordance with the procedures provided in ISO 20568-2. Codes and ranges are listed in [Table 16](#).

Table 16 — Codes and ranges for percentage polymer in dispersions in data block 4

Code	Percentage polymer
0	>0 to <10
1	10 to <40
2	40 to <70
3	70 to <100

4.5.2.4.2 Surfactant percentage in dispersion

Surfactant percentage in dispersion shall be determined as described in ISO 20568-2. The codes are listed in [Table 17](#).

Table 17 — Codes and ranges for added-surfactant content in data block 4 (calculated as a percentage of the mass of the polymer)

Code	Percentage surfactant, nominal
0	0
1	>0 to <2
2	2 to <4
3	4 to <6
4	6 to <8
5	8 to <10
6	10 to <12
7	12 to <14
8	14 to <16

4.5.2.4.3 Surfactant tolerance level

The codes of manufacturing surfactant tolerances are listed in [Table 18](#).

Table 18 — Codes and ranges for surfactant tolerance level in data block 4

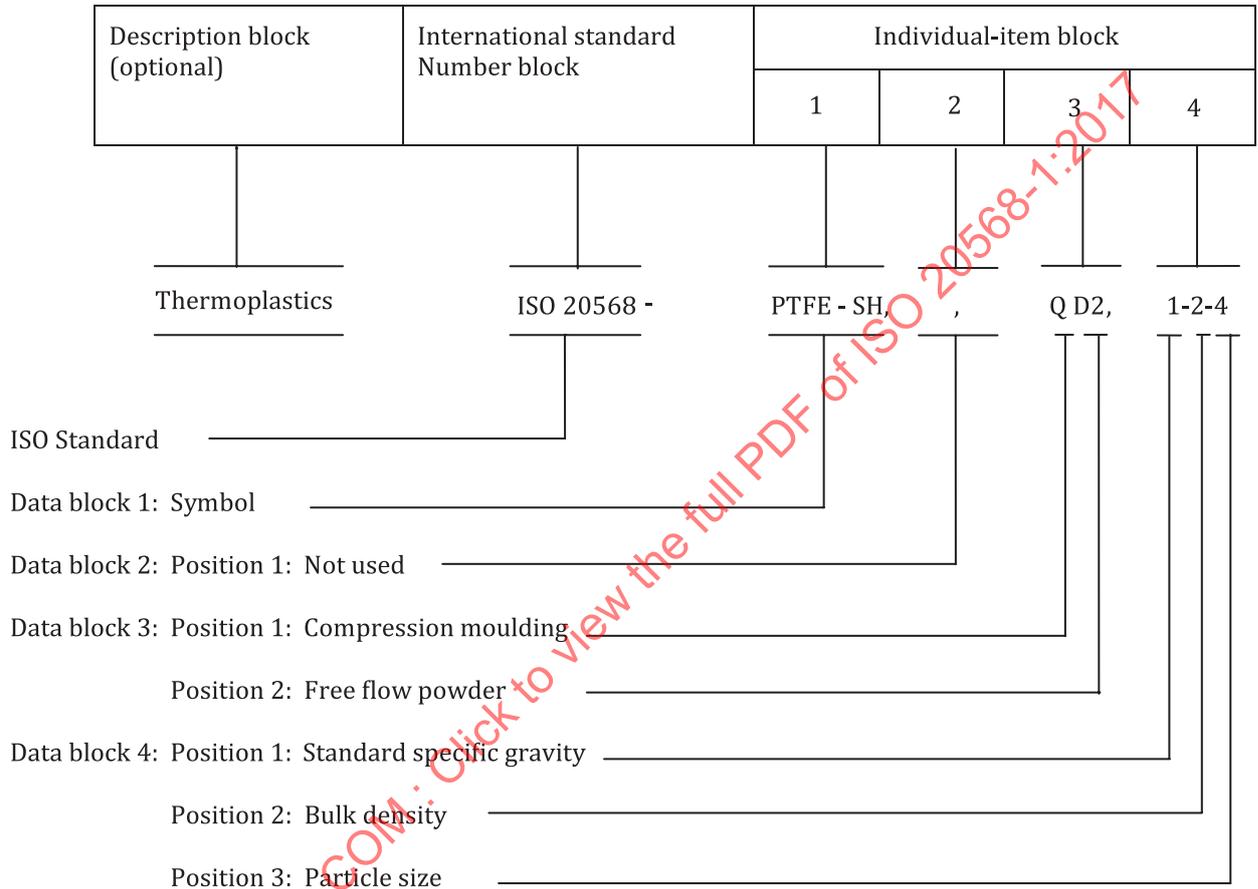
Code	Percentage surfactant tolerance
0	±0,5
1	±1,0
2	±2,0

4.6 Data block 5

Indication of additional requirements in this data block transforms the designation of a material into a specification for a particular material. This may be done, for example, by reference to a suitable national standard or a standard-like, generally established specification.

5 Examples of designations

5.1 A polytetrafluoroethylene, suspension polymer/homopolymer material (PTFE-SH), no filler (,,) intended for compression moulding (Q), free flow powder (D2), having standard specific gravity of 2,140 to <2,160 (1), bulk density of 500 g/l to 700 g/l (2) and particle size of 400 µm to <500 µm (4), would be designated as follows.



Designation: (Thermoplastics) ISO 20568-PTFE-SH,,QD2,1-2-4

A polytetrafluoroethylene, suspension polymer/homopolymer material (PTFE-SH), no filler (,,) intended for compression moulding (Q), free flow powder (D2), having standard specific gravity of 2,140 to <2,160 (1), bulk density of 500 g/l to 700 g/l (2), particle size of 400 µm to <500 µm (4) and meeting the requirements of ASTM D4894 Type IV Grade 1, would have the specification: (Thermoplastics) ISO 20568-PTFE-SH,,QD2,1-2-4,ASTM D4894, IV1.