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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

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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.