
**Plastics — Homopolymer and
copolymer resins of vinyl chloride —
Part 1:
Designation system and basis for
specifications**

*Plastiques — Résines d'homopolymères et de copolymères de chlorure
de vinyle —*

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 24024-1 cancels and replaces ISO 1060-1:1998, which has been technically revised.

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

- the positions of Data block 2 and Data block 4 in the old designation system have been changed;
- the last designation example has been deleted.

A list of all parts in the ISO 24024 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 — Homopolymer and copolymer resins of vinyl chloride —

Part 1: Designation system and basis for specifications

1 Scope

1.1 This document establishes a system of designation for vinyl chloride thermoplastic resins which can be used as the basis for specifications.

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

- a) reduced viscosity;
- b) apparent density;
- c) retention on a 63 µm mesh sieve;
- d) plasticizer absorption at room temperature (for general-purpose resins);
- e) the viscosity and the type of rheological behaviour of a standard paste (for paste resins only);

and on information about basic polymer parameters, polymerization processes and intended applications.

1.3 This document is applicable to resins in powder form which consist of homopolymers of the monomer vinyl chloride and copolymers, terpolymers, etc., of vinyl chloride with one or more other monomers, but where vinyl chloride is the main constituent. The resins can contain small amounts of non-polymerized substances (e.g. emulsifying or suspending agents, catalyst residues, etc.) and other substances added during the course of polymerization.

1.4 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 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 24024-2, if suitable.

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

ISO 24024-2, *Plastics — Homopolymer and copolymer resins of vinyl chloride — Part 2: Preparation of test samples 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 and specification system

4.1 General

The designation and specification system for thermoplastics is based on the following standardized 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 providing the following information:

Data block 1: Identification of the plastic by its symbol (PVC, etc.) in accordance with ISO 1043-1 and information about the polymerization process and the composition of the polymer (see 4.2).

Data block 2: Fillers or reinforcing materials and their nominal content (not included in this document, see 4.3).

Data block 3: Intended application (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, poly(vinyl chloride) resins are identified by the symbol PVC for homopolymer or VC/.../... for copolymers / terpolymers respectively, in accordance with ISO 1043-1, followed, for copolymers / terpolymers, by a space and by a two-figure number indicating the

percentage content of combined vinyl chloride. This is calculated from the chlorine content determined in accordance with ISO 24024-2, using [Formula \(1\)](#):

$$[\text{VC}] = 1,7629 \times [\text{Cl}] \quad (1)$$

where

[VC] is the combined vinyl chloride content;

[Cl] is the chloride content.

After a hyphen, the polymerization process is indicated by a single code-letter as specified in [Table 1](#).

Table 1 — Code-letters used for additional information in data block 1

Code-letter	Definition
S	Suspension polymerization
E	Emulsion polymerization
M	Bulk polymerization
X	Process other than the above, or an intermediate process, including micro-suspension

4.3 Data block 2

Not included in this document.

4.4 Data block 3

In this data block, information about intended application is given. The code-letters used are specified in [Table 2](#).

Table 2 — Code-letters used in data block 3

Code-letter	Intended application
P	Paste resins
F	Filler resins
G	General-purpose resins (excluding categories P and F)

4.5 Data block 4

4.5.1 General

In this data block, the reduced viscosity is represented by a three-figure code-number (see [4.5.2](#)), the apparent bulk density by a two-figure code-number (see [4.5.3](#)) and retention on a 63 µm mesh sieve by a two-figure code-number (see [4.5.4](#)). For general-purpose resins and filler resins, the plasticizer absorption at room temperature is represented by a two-figure code-number (see [4.5.5](#)). For paste resins, the viscosity of a standard paste is represented by a letter indicating the paste formulation used, two two-figure code-numbers for the viscosity at 16 s⁻¹ and 100 s⁻¹ and a code-letter indicating the type of rheological behaviour of the paste (see [4.5.6](#)). The codes representing the four 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.

NOTE Not all combinations of the values of designatory properties are provided in currently available polymers.

4.5.2 Reduced viscosity

The reduced viscosity shall be determined in accordance with ISO 24024-2.

The possible values of the reduced viscosity are divided into 26 ranges, each represented by a three-figure code-number as specified in [Table 3](#).

Table 3 — Code-numbers used for reduced viscosity in data block 4

Code-number	Range of reduced viscosity ml/g
045	≤47
050	>47 but ≤52
055	>52 but ≤57
060	>57 but ≤62
065	>62 but ≤67
070	>67 but ≤72
075	>72 but ≤77
080	>77 but ≤82
085	>82 but ≤87
090	>87 but ≤92
095	>92 but ≤97
100	>97 but ≤105
110	>105 but ≤115
120	>115 but ≤125
130	>125 but ≤135
145	>135 but ≤152
160	>152 but ≤167
175	>167 but ≤182
190	>182 but ≤197
205	>197 but ≤212
220	>212 but ≤227
235	>227 but ≤242
250	>242 but ≤257
265	>257 but ≤272
280	>272 but ≤287
295	>287
XXX	not possible to measure because of insoluble

4.5.3 Apparent density

The apparent density shall be determined in accordance with ISO 24024-2.

The possible values of the apparent density are divided into 12 ranges, each represented by a two-figure code number as specified in [Table 4](#).

Table 4 — Code-numbers used for apparent density in data block 4

Code-number	Range of apparent density g/ml
30	≤0,32
35	>0,32 but ≤0,37
40	>0,37 but ≤0,42
45	>0,42 but ≤0,47
50	>0,47 but ≤0,52
55	>0,52 but ≤0,57
60	>0,57 but ≤0,62
65	>0,62 but ≤0,67
70	>0,67 but ≤0,72
75	>0,72 but ≤0,77
80	>0,77 but ≤0,82
85	>0,82

4.5.4 Retention on a 63 µm sieve

The retention on a 63 µm sieve shall be determined in accordance with ISO 24024-2.

The possible values of the retention on the 63 µm sieve are divided into eight ranges, each represented by a two figure code-number as specified in [Table 5](#).

Table 5 — Code-numbers used for retention on a 63 µm sieve in data block 4

Code-number	Range of retention on 63 µm sieve mass fraction in %
00	≤1
03	>1 but ≤5
12	>5 but ≤20
30	>20 but ≤40
50	>40 but ≤60
70	>60 but ≤80
88	>80 but ≤95
98	>95

4.5.5 Plasticizer absorption at room temperature (for general purpose resins and filler resins only)

The plasticizer absorption at room temperature shall be determined in accordance with ISO 24024-2. The possible values of the plasticizer absorption are divided into five ranges, each represented by a two-figure code-number as specified in [Table 6](#).

Table 6 — Code-numbers used for plasticizer absorption in data block 4

Code-number	Range of plasticizer absorption phr (parts per 100 parts of resin by mass)
05	≤10
15	>10 but ≤20
25	>20 but ≤30
35	>30 but ≤40

Table 6 (continued)

Code-number	Range of plasticizer absorption phr (parts per 100 parts of resin by mass)
45	>40
XX	not practical to measure reproducibly

4.5.6 Viscosity and type of rheological behaviour of a standard paste (for paste resins only)

4.5.6.1 Viscosity of paste

The viscosity of a standard paste shall be determined in accordance with ISO 24024-2, $(24 \pm 0,5)$ h after preparation of the paste and at shear rates of $(16 \pm 1) \text{ s}^{-1}$ and $(100 \pm 1) \text{ s}^{-1}$. The conditioning and test temperature shall be $(23 \pm 0,2) \text{ }^\circ\text{C}$.

The possible values of the two viscosities determined at the shear rates of 16 s^{-1} and 100 s^{-1} respectively are divided into nine ranges, each represented by a two-figure code-number as specified in [Table 7](#). The code-numbers for the two viscosities are separated by an oblique stroke. The standard paste formulation used, A or B, is recorded immediately in front of these code-numbers.

Table 7 — Code-numbers used for viscosity of a standard paste in data block 4

Code-number	Range of viscosity Pa s
02	≤ 3
04	>3 but ≤ 5
06	>5 but ≤ 7
08	>7 but ≤ 9
10	>9 but ≤ 11
15	>11 but ≤ 18
20	>18 but ≤ 25
30	>25 but ≤ 40
50	>40
XX	not practical to measure reproducibly

4.5.6.2 Rheological behaviour of paste

The rheological behaviour between the shear rates 16 s^{-1} and 100 s^{-1} of the standard paste chosen to determine the viscosities in accordance with [4.5.6.1](#) shall be expressed by one of the following code-letters: D = dilatant, N = Newtonian, P = pseudoplastic and X = unspecified (see [Table 8](#)). The code-letter which describes the rheological behaviour shall be recorded in the designation immediately after the viscosities determined in accordance with [4.5.6.1](#).

Table 8 — Code-letters used for rheological behaviour in data block 4

Code-letter representing rheological behaviour	Ratio Viscosity at shear rate of 16 s^{-1} / Viscosity at shear rate of 100 s^{-1}
D	<0,75
N	0,75 to 1,33
P	>1,33
X	unspecified

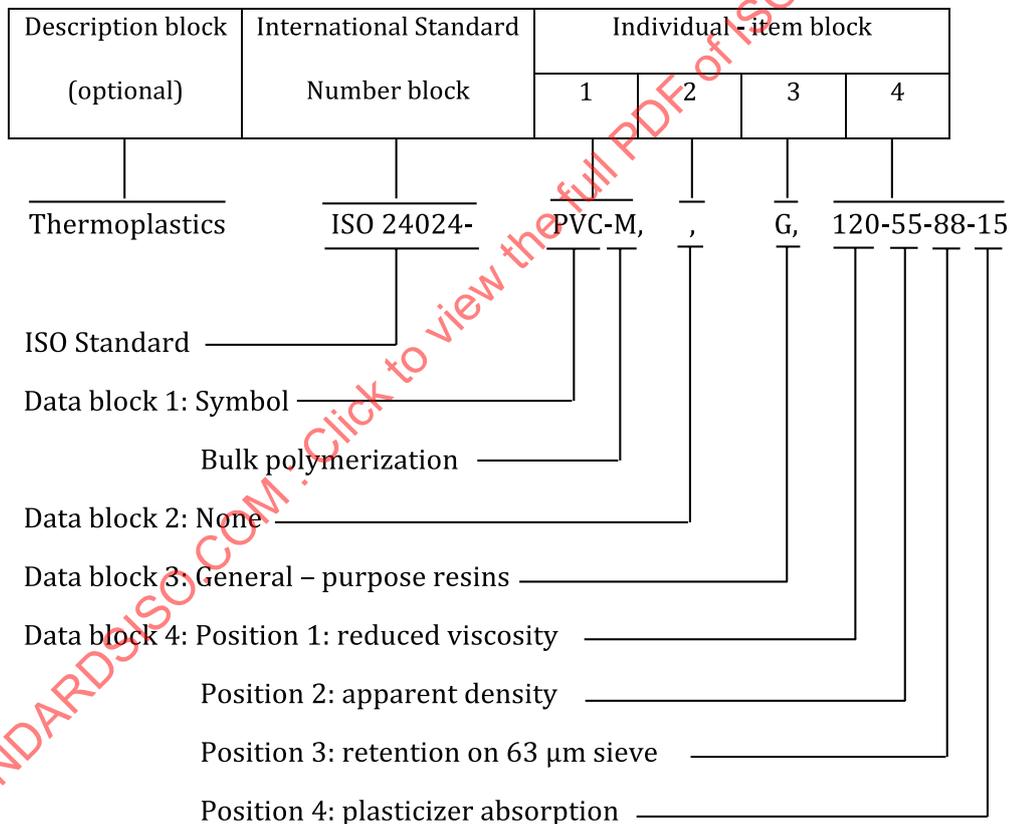
If the viscosity at the shear rate of 100 s^{-1} is not measurable, even with the formulation B paste, the rheological behaviour may be determined by measuring the viscosity over smaller range of shear rates (e.g. 16 s^{-1} to 40 s^{-1}) and determining the viscosity at 100 s^{-1} by extrapolating from 40 s^{-1} to 100 s^{-1} .

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 some other document recognized as suitable by the interested parties.

5 Examples of designations

5.1 A vinyl chloride homopolymer (PVC) produced by bulk polymerization (M) and intended for general – purpose applications (G), having a reduced viscosity of 120ml/g (120), an apparent density of 0,55 g/ml (55), a retention on a 63 μm sieve of 92 % (88) and a plasticizer absorption of 16 phr (15), would be designated:



Designation: (Thermoplastics) ISO 24024-PVC-M, , G, 120-55-88-15