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

Plastiques — Polyamides — Détermination de l'indice de viscosité



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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	3
5 Reagents and materials	3
5.1 Solvents and reagents	3
5.2 Cleaning liquids	4
6 Apparatus	4
7 Preparation of test samples	5
7.1 General	5
7.2 Samples containing less than 98 % (by mass) polyamide	6
8 Calculation of test portion	6
9 Selection of solvent	6
10 Procedure	7
10.1 Cleaning of the viscometer	7
10.2 Preparation of test solution	7
10.2.1 General	7
10.2.2 Volumetric method	8
10.2.3 Volumetric method, in exact relation to the polymer content	8
10.2.4 Gravimetric method, in exact relation to the polymer content	8
10.3 Measurement of flow times	9
11 Expression of results	10
12 Repeatability and reproducibility	11
13 Relationship between the viscosity number determined in 96 % (by mass) sulfuric acid solution and the viscosity determined in various solvents	11
14 Test report	11
Annex A (informative) Determination of the concentration of commercial sulfuric acid (95 % to 98 %) and adjustment to 96 % by titration	13
Annex B (informative) Determination of the concentration of sulfuric acid (95 % to 98 %) and adjustment to 96 % by flow time measurement in a small capillary viscometer	16
Annex C (informative) Determination of the concentration of commercial formic acid and adjustment to 90 % by titration	18
Annex D (informative) Determination of the concentration of commercial formic acid and adjustment to 90 % by density measurement	20
Annex E (informative) Relationship between the viscosity number determined in 96 % (by mass) sulfuric acid solution and the viscosity determined in various solvents	23
Bibliography	35

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 sixth edition cancels and replaces the fifth edition (ISO 307:2007), which has been technically revised to update [Clause 9](#). It also incorporates the Amendment ISO 307:2007/Amd.1:2013.

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.

Introduction

This document specifies a method for the determination of the viscosity number of dilute solutions of polyamides in certain specified solvents. The determination of the viscosity number of a polyamide provides a value that depends on the molecular mass of the polymer, but does not strictly correlate with the molecular mass.

Additives such as flame-retardants and modifiers often interfere with the viscosity measurement and may have an increasing effect on the viscosity number in one solvent and a decreasing effect in another solvent. The extent of the effect depends among others on the additive, the quantity of the additive, the presence of other additives and reactions.

The viscosity number of a polyamide sample containing additives that interfere with the viscosity measurement, measured in a specific solvent, represents a specific viscosity number for the polyamide under investigation and the actual measurement conditions. The measured viscosity number cannot, in principle, be converted from one solvent to another and is only suitable for intra-product comparison.

The viscosity number of pure polyamides or polyamides containing additives that do not interfere with the viscosity measurement can be converted from one solvent to another by a general relationship for that type of polyamide.

Polyamide test samples for the determination of the viscosity number are intended to be completely soluble in the solvents mentioned. Additives contained in them, like glass and carbon fibres, are to be separated from the solution.

As it is not possible to distinguish between extractables such as caprolactam, its oligomers and other extractable additives, these are considered as an essential part of the sample and therefore included in the sample mass.

The test method is applicable for production control and intra-product comparison even if the polyamide contains additives that do interfere with the viscosity measurement. However, it should be realised that deviations of the viscosity number can be caused by either the polyamide itself, effects caused by the additives present, or a combination of these.

The interference of additives with the viscosity determination can be checked by comparing the viscosity results of dry blend mixtures and regular production samples at several concentrations of the additive under investigation and in the solvents concerned. It should be noted that the other additives present also could influence the viscosity result.

The repeatability and reproducibility of the test method are strongly influenced by the correctness of the solvent concentration, the use of the Hagenbach correction if applicable and the temperature of the solvent on diluting the sample solution.

In this document, two specific viscometers are recommended. Furthermore, other types of viscometers listed in ISO 3105 may also be used, provided that the results are demonstrated to be equivalent to those measured with the recommended viscometers. It is to be expected that in the next revision the use of the other types of viscometers will be excluded.

Plastics — Polyamides — Determination of viscosity number

1 Scope

This document specifies a method for the determination of the viscosity number of dilute solutions of polyamides in certain specified solvents.

The method is applicable to the polyamides designated PA 46, PA 6, PA 66, PA 69, PA 610, PA 612, PA 11, PA 12, PA 6T/66, PA 6I/6T, PA 6T/6I/66, PA 6T/6I, PA 6I/6T/66 and PA MXD6 as defined in ISO 16396-1, as well as to copolyamides, compounds of polyamides and other polyamides that are soluble in one of the specified solvents under the specified conditions.

The method is not applicable to polyamides produced by anionic polymerization of lactams or produced with cross-linking agents; such polyamides are normally insoluble in the specified solvents.

The viscosity number is determined by the general procedure specified in ISO 1628-1, observing the particular conditions specified in this document.

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 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 1628-1, *Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 1: General principles*

ISO 3105, *Glass capillary kinematic viscometers — Specifications and operating instructions*

ISO 3451-4, *Plastics — Determination of ash — Part 4: Polyamides*

ISO 15512, *Plastics — Determination of water content*

ISO 16396-1, *Plastics — Polyamide (PA) moulding and extrusion materials — Part 1: Designation system, marking of products and basis for specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1628-1 and the following apply.

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/>

3.1

viscosity number

<polymer> value calculated by the following formula for flow times long enough so that no kinetic energy correction need be applied:

$$VN = \left(\frac{\eta}{\eta_0} - 1 \right) \times \frac{1}{c}$$