

# INTERNATIONAL STANDARD

**ISO**  
**3219**

Second edition  
1993-10-01

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## **Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate**

*Plastiques — Polymères/résines à l'état liquide, en émulsion ou en  
dispersion — Détermination de la viscosité au moyen d'un viscosimètre  
rotatif à gradient de vitesse de cisaillement défini*



Reference number  
ISO 3219:1993(E)

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3219 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 3219:1977), of which it constitutes a technical revision.

It was prepared in liaison with ISO/TC 45, *Rubber and rubber products*, and ISO/TC 35, *Paints and varnishes*.

Annexes A and B form an integral part of this International Standard.

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# Plastics — Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate

## 1 Scope

This International Standard specifies the general principles of a method for determining the viscosity of polymers and resins in the liquid, emulsified or dispersed state, including polymer dispersions, at a defined shear rate by means of rotational viscometers with standard geometry.

Viscosity determinations made in accordance with this standard consist of establishing the relationship between the shear stress and the shear rate. The results obtained with different instruments in accordance with this standard are comparable and apply to controlled shear as well as controlled stress instruments.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

## 3 Principle

The viscosity of a fluid sample is measured using a rotational viscometer with defined characteristics, which permits the simultaneous measurement of the shear rate used and the shear stress applied.

The viscosity  $\eta$  is determined using the following equation:

$$\eta = \frac{\tau}{\dot{\gamma}}$$

where

$\tau$  is the shear stress;

$\dot{\gamma}$  is the shear rate.

According to the International System of Units (SI), the unit of dynamic viscosity is the pascal second (Pa·s):

$$1 \text{ Pa}\cdot\text{s} = 1 \text{ N}\cdot\text{s}/\text{m}^2$$

### NOTES

1 Symbols are in accordance with ISO 31-3:1992, *Quantities and units — Part 3: Mechanics*.

2 If the viscosity depends on the shear rate at which the measurement is made, i.e.  $\eta = f(\dot{\gamma})$ , the fluid is said to exhibit non-Newtonian behaviour. Fluids with a viscosity independent of the shear rate are stated to exhibit Newtonian behaviour.

## 4 Apparatus

### 4.1 Rotational viscometer

#### 4.1.1 Measuring system

The measuring system shall consist of two rigid, symmetrical, coaxial surfaces between which the fluid whose viscosity is to be measured is placed. One of these surfaces shall rotate at a constant angular velocity while the other remains at rest. The measuring