International Standard 1652

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Rubber latex — Determination of viscosity

Latex de caoutchouc — Détermination de la viscosité

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Descriptors : rubber, natural rubber, synthetic rubber, latex, tests, determination, viscosity, test equipment, viscometers.

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1652 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

ISO 1652 was first published in 1974. This second edition cancels and replaces the first edition, of which it constitutes a minor revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Rubber latex — Determination of viscosity

1 Scope and field of application

This International Standard specifies a method for the determination of the viscosity of both natural and synthetic rubber latices.

Two instruments are specified:

1) The L instrument is applicable for viscosities of up to 2 000 mPa·s (2 000 cP).

2) The R instrument is applicable for viscosities of above 200 mPa·s (200 cP).

2 References

ISO 123, *Rubber latex — Sampling.*

ISO 124, *Rubber latices — Determination of total solids content.*

3 Principle

The viscosity of a latex sample is determined by means of a viscometer which measures the torque produced on a specified spindle rotating at constant rotational frequency and at a low rate of shear while immersed to a specific depth in the latex.

Measurements may be made on the undiluted latex or on the latex after dilution to a required total solids content.

4 Apparatus

4.1 Viscometer[1], consisting of an electric synchronous motor which drives, at a constant rotational frequency, a shaft to which spindles of different shapes and dimensions may be attached. The spindle is immersed in the latex to a specified depth and the drag on the spindle rotating in the latex causes a torque to be developed on the spindle shaft. The equilibrium torque developed is indicated by means of a pointer and scale which is calibrated in units from 0 to 100.

The L instrument uses a spring torque of 67,37 ± 0,07 μN·m (637,7 ± 0,7 dyn·cm) at full-scale deflection.

The R instrument uses a spring torque of 718,7 ± 0,7 μN·m (7 187 ± 7 dyn·cm) at full-scale deflection.

The spindles shall be accurately made in accordance with the figure, and to the dimensions given in table 1.

A spirit level or bubble level shall be incorporated in the motor housing to indicate, with the spindle attached to the motor shaft, when the spindle is vertical.

A guard shall be used to protect the spindle in operation. This shall consist of a rectangular bar of section approximately 9,5 mm × 3 mm, with the corners rounded, bent into a U.

The upper ends of the vertical legs of the guard shall be securely attached to the motor housing but in such a way that the guard is removable for cleaning. The horizontal portion of the guard shall join the vertical legs of the guard through internal radii of approximately 6 mm.

The perpendicular distance between the inner faces of the two vertical legs of the guard when the guard is securely attached to the motor housing shall be 31,8 ± 0,8 mm with the L instrument and 76,2 ± 0,8 mm with the R instrument. The perpendicular distance between the upper face of the horizontal portion of the guard and the bottom of the spindle shaft, when the guard is securely attached to the motor housing and when the spindle is attached to the motor shaft, shall be not less than 10 mm with the L instrument and not less than 4,5 mm with the R instrument.

Table 1 — Spindle dimensions

Values in millimetres

Spindle number	*A* ± 1,3	*B* ± 0,03	*C* ± 0,03	*D* ± 0,06	*E* ± 1,3	*F* ± 0,15
L1	115,1	3,18	18,84	65,10	—	81,0
L2	115,1	3,18	18,72	6,86	25,4	50,0
L3	115,1	3,18	12,70	1,65	25,4	50,0
R1	133,3	3,18	56,26*	22,48**	27,0	61,1
R2	133,3	3,18	46,93	1,57	27,0	49,2
R3	133,3	3,18	34,69	1,65	27,0	49,2

* Wall thickness approximately 0,6 mm.

** Wall thickness approximately 1,0 mm.

1) Suitable instruments are obtainable from Brookfield Engineering Laboratories, Inc., Stoughton, Mass. 02072. Models LVF and LVT meet the requirements for the L instrument, and models RVF and RVT meet the requirements for the R instrument.

4.2 Beaker, glass, of internal diameter at least 85 mm and capacity at least 600 cm^3.

4.3 Water-bath, capable of being maintained at a nominal 25 °C, or 27 °C in tropical climates.

5 Sampling

Carry out the sampling in accordance with one of the methods specified in ISO 123.

6 Preparation of sample

Determine the total solids content of the latex in accordance with ISO 124, and then, if necessary, accurately adjust to the required value by the addition of distilled water or water of equivalent purity. Add the water slowly to the latex and stir the mixture gently for 5 min, taking care to avoid inclusion of air.

If the latex contains occluded air and has a viscosity of less than about 200 mPa·s (200 cP), remove the air by allowing the latex to stand for 24 h.

If the latex contains occluded air and no other volatile component, and has a viscosity greater than about 200 mPa·s (200 cP), remove the air by allowing the latex to stand under vacuum until foaming ceases.

Should the presence of coagulum be noted, carefully strain the latex through a screen having square apertures with sides of approximately 500 µm.

7 Procedure

Pour the sample (clause 6) into the beaker (4.2). Place the beaker in the water-bath (4.3), maintained at 25 or 27 °C, and stir the sample gently until its temperature is 25 ± 2 °C or 27 ± 2 °C. Record the precise temperature. Immediately attach the spindle securely to the motor shaft and attach the guard securely to the motor housing of the viscometer (4.1). Carefully insert the spindle and guard into the sample, in such a way as to avoid air being trapped, until the surface of the sample is at the mid-point of the groove on the spindle shaft. The spindle shall be placed vertically in the sample and in the centre of the beaker.

Select the rotational frequency of the instrument as follows:

L instrument: 60 ± 0,2 min^{-1} (1 ± 0,003 s^{-1})

R instrument: 20 ± 0,2 min^{-1} (0,333 ± 0,003 s^{-1})

Switch on the viscometer motor and take the equilibrium reading to the nearest unit scale division, in accordance with the manufacturer's operating instructions. 20 to 30 s may elapse before the equilibrium reading is attained.

Use the lowest numbered spindle able to record the viscosity.

8 Expression of results

Calculate the viscosity of the latex, expressed in millipascal seconds (centipoises), using the appropriate factor obtained from table 2.

Table 2 — Factors necessary to convert reading on scale 0 to 100 to millipascal seconds (centipoises)

Spindle number	Factor
L1	× 1
L2 or R1	× 5
L3 or R2	× 20
R3	× 50

9 Test report

The test report shall include the following particulars:

a) reference to this International Standard;

b) identification of the test sample;

c) the results and the method of expression used;

d) the instrument used (L or R);

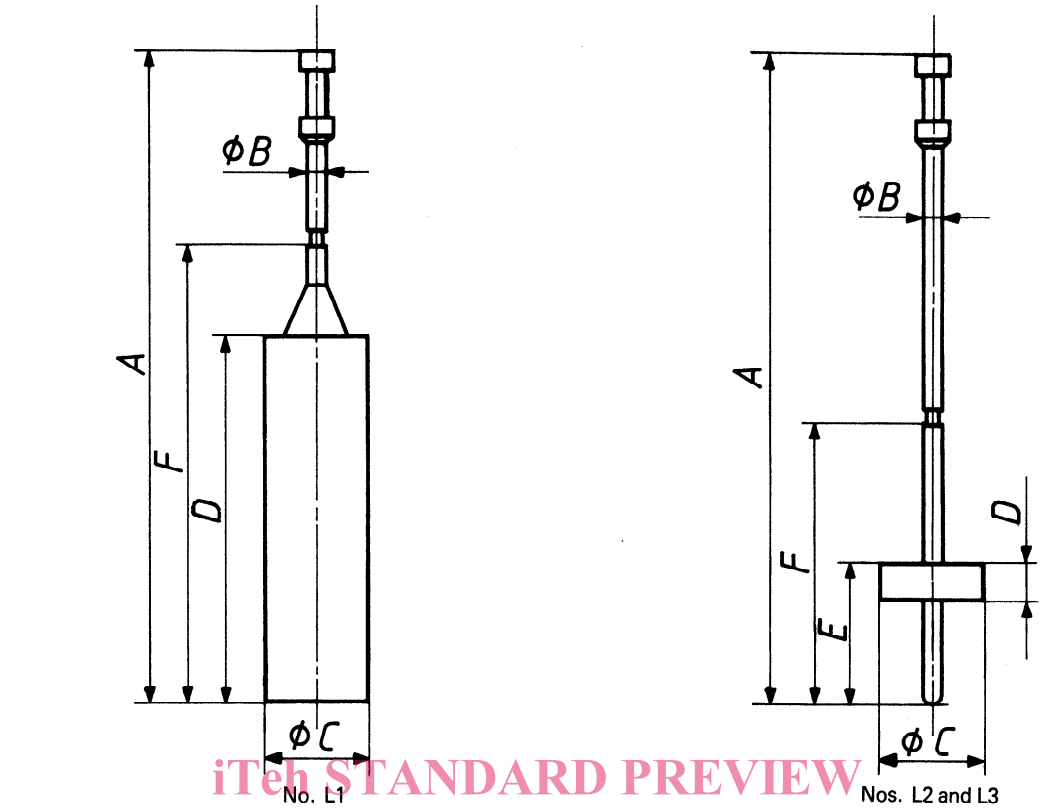
e) the spindle number;

f) the total solids content of the latex (diluted if required);

g) the test temperature of the latex;

h) any unusual features noted during the determination;

j) any operation not included in this International Standard or in the International Standards to which reference is made, or regarded as optional.



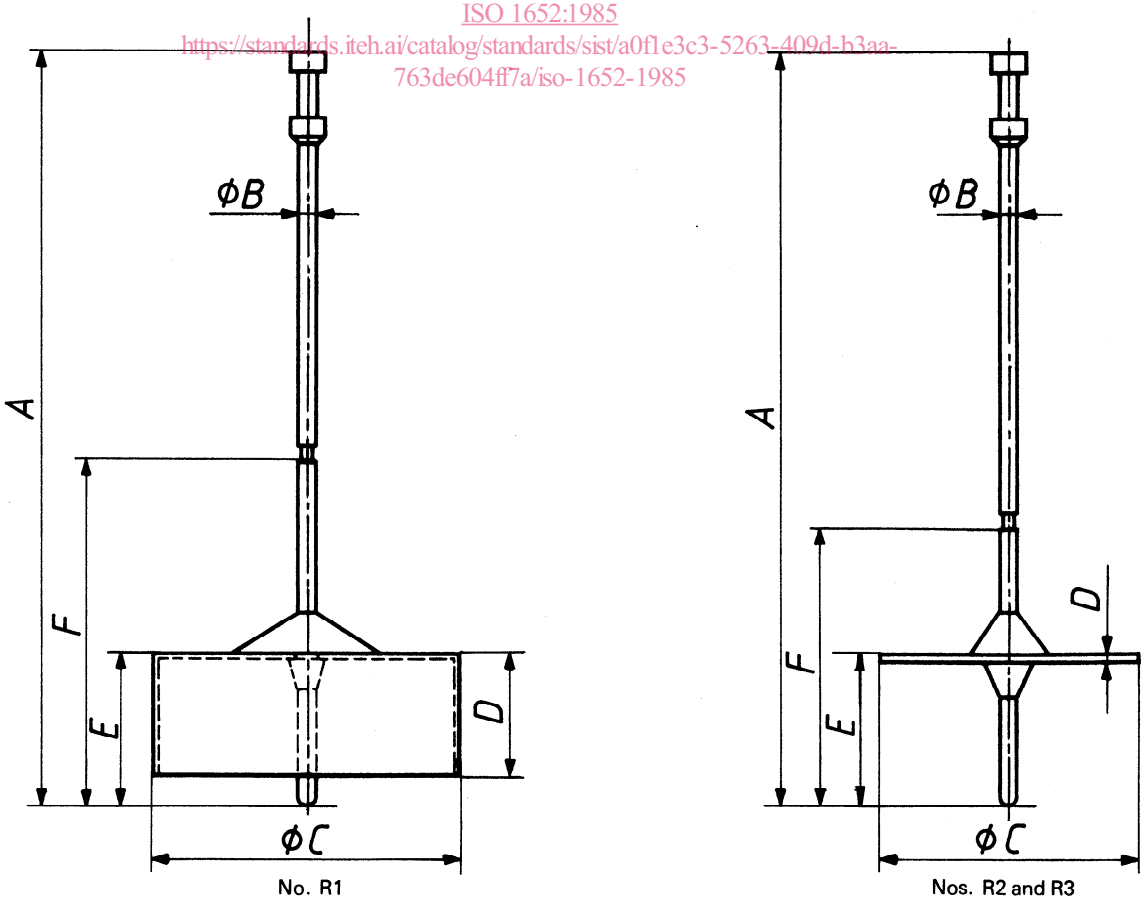


Figure — Spindles

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