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Paints and varnishes — Pendulum damping test

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, International Standard ISO 1522 replaces ISO Recommendation R 1522-1971 drawn up by Technical Committee ISO/TC 35, *Paints and varnishes*.

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The Member Bodies of the following countries approved the Recommendation :

Austria	Israel	Spain
Chile	Italy	Sweden
Denmark	Netherlands	Switzerland
Egypt, Arab Rep. of	New Zealand	Turkey
France	Poland	United Kingdom
Germany	Portugal	U.S.S.R.
Greece	South Africa, Rep. of	Yugoslavia

No Member Body expressed disapproval of the Recommendation.

Paints and varnishes – Pendulum damping test

0 INTRODUCTION

This International Standard is one of a series dealing with the sampling and testing of paints, varnishes and related products. It should be read in conjunction with ISO 1512, ISO 1513 and ISO 1514.

Types of instrument

Two test procedures have been considered in some detail, namely those of König and Persoz, which are defined respectively by DIN 53 157 and NF T 30–016. The instruments embody the same principle – that the amplitude of oscillation of a pendulum touching a surface decreases more rapidly the softer the surface – but differ in respect of dimensions, period and amplitude of oscillation. The interaction between the pendulum and the paint film is complex, depending as it does on both elastic and viscoelastic properties, and it is not possible to establish a general relationship between results obtained by the two tests. One type of pendulum only must therefore be used in a given series of measurements of damping time.

The following considerations may serve as a guide in considering which pendulum may offer an advantage for a particular purpose.

- a) In general, the damping time of the König pendulum is approximately half that of the Persoz pendulum.
- b) On surfaces of low coefficient of friction, the Persoz pendulum may skid which would invalidate the results; however, this occurs only rarely in the field of paints and varnishes.
- c) It should be noted that both instruments reflect the sensitivity of the physical properties of a paint to its environment, and the test should therefore be conducted under controlled conditions of temperature and humidity and in the absence of draughts. The thickness of the paint film and the nature of the substrate may also affect the damping times.

Supplementary information

The method of test specified requires to be completed, for any particular application, by the following supplementary information. This information should be derived from the national standard or other document for the product under

test or, where appropriate, should be the subject of agreement between the interested parties.

- a) Nature and surface preparation of substrate.
- b) Method of application of test coating to substrate.
- c) Thickness, in micrometres, of the dry coating, including method of measurement, and whether it is a single coating or a multicoat system.
- d) Duration and conditions of drying of the coated panel before testing (or conditions of stoving and ageing if applicable).
- e) Whether the König or the Persoz pendulum is to be used.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies standard conditions for carrying out a pendulum damping test on a single coating or a multicoat system of paint, varnish or related product.

2 REFERENCES

- ISO 1512, *Paints and varnishes – Sampling*.
- ISO 1513, *Paints and varnishes – Examination and preparation of samples for testing*.
- ISO 1514, *Paints and varnishes – Standard panels for testing*.
- ISO 2808, *Paints and varnishes – Determination of film thickness*.

3 APPARATUS

3.1 Pendulum

Both the pendulums described below comprise an open framework connected by a cross-bar, to the under face of which two balls are inset to serve as the fulcrum, the lower end of the framework being formed into a pointer. The two pendulums differ in shape, mass and other details, as shown in the descriptions in 3.1.1 and 3.1.2.

3.1.1 The König pendulum (see Figure 1) rests on two ball bearings of $5 \pm 0,005$ mm diameter, of hardness HRC $63 \pm 3,30 \pm 0,2$ mm apart, and is counterpoised (to adjust the natural frequency of oscillation) by means of a weight sliding on a vertical rod attached to the cross-bar. On a polished plate glass panel, the period of oscillation shall be $1,4 \pm 0,02$ s and the time for damping from a 6° displacement to a 3° displacement shall be 250 ± 10 s. The total mass of the pendulum shall be $200 \pm 0,2$ g.

3.1.2 The Persoz pendulum (see Figure 2) rests on two stainless steel balls of $8 \pm 0,005$ mm diameter, of hardness HRC $59 \pm 1,50 \pm 1$ mm apart. A counterpoise is not provided. On a polished plate glass panel, the period of oscillation shall be $1 \pm 0,001$ s and the time for damping from a 12° displacement to a 4° displacement on the same substrate shall be at least 420 s. The total mass of the pendulum shall be $500 \pm 0,1$ g, and its centre of gravity at rest shall be $60 \pm 0,1$ mm below the plane of the fulcrum, the pointer tip being $400 \pm 0,2$ mm below the plane of the fulcrum.

3.2 Instrument stand for supporting test panel and pendulum. It is common to both procedures and comprises a heavy supported vertical rod to which is attached a horizontal table with a flat working surface, the dimensions of which may be conveniently 95 mm X 110 mm and not less than 10 mm thick. The stand also carries a stirrup to support the pendulum away from the table and a mechanism for shock-free lowering of the pendulum on to the test panel.

3.3 Scale on the front of the stand. It is marked to permit reading of the angular displacement of the pendulum either through 6° and 3° (König pendulum) or 12° and 4° (Persoz pendulum) from a centre point indicating the rest position of the pendulum. The scale may be moved horizontally, and locked in position, to bring the zero marking and the rest position of the pendulum tip into coincidence.

This scale may be marked on a mirror, or a mirror may be placed behind the scale, to assist in eliminating parallax errors during observation.

4 SAMPLING

A representative sample of the product to be tested (or of each product in the case of a multicoat system) shall be taken as specified in ISO 1512. The sample shall then be examined and prepared for testing as specified in ISO 1513.

5 TEST PANELS

5.1 Material and dimensions

Unless otherwise specified, the test panel shall be of polished plate glass of dimensions 100 mm X 100 mm X 5 mm and shall comply with ISO 1514.

5.2 Preparation and coating of panels

The test panel shall be prepared in accordance with ISO 1514, unless otherwise specified, and shall then be coated by the specified method with the product or system under test.

5.3 Thickness of coating

The thickness, in micrometres, of the dry coating shall be determined by the method specified, using one of the procedures specified in ISO 2808.

6 PROCEDURE

6.1 General

6.1.1 Drying the test panel

The coated test panels shall be dried (or stoved and aged) for the specified time and under the specified conditions and, unless otherwise specified, shall be conditioned at a temperature of $23 \pm 2^\circ$ C and relative humidity of $50 \pm 5\%$ for a minimum of 16 h. The appropriate test procedure shall then be carried out as soon as possible.

6.1.2 Ambient conditions

The test shall be carried out at a temperature of $23 \pm 2^\circ$ C and relative humidity of $50 \pm 5\%$, unless otherwise specified. The apparatus shall be used away from draughts and vibrations, and the use of a protective enclosure is recommended.

6.2 Determination of pendulum damping time

6.2.1 Place the test panel on the table with the paint film uppermost and level it by means of the adjusting screws at the base of the instrument and using a spirit level.

6.2.2 Clean the fulcrum balls by wiping with soft tissue wetted with diethyl ether, leave the pendulum in ambient conditions (see 6.1.2) for 10 min, and then lower it gently on to the test panel.

6.2.3 Check the coincidence of scale zero and tip rest position and adjust if necessary.

6.2.4 Deflect the pendulum, without lateral displacement of the fulcrum, through the appropriate angle (6° for the König pendulum, 12° for the Persoz pendulum) and allow to rest against the stop provided.

6.2.5 Release the pendulum and simultaneously start a stop-watch.

6.2.6 Record the time, in seconds, for the amplitude to fall

- either from 6° to 3° (König pendulum),
- or from 12° to 4° (Persoz pendulum).

6.2.7 Carry out a determination on three different parts of the same test panel. Record each result and the mean of three determinations.

7 TEST REPORT

The test report shall include the following information :

- a) a reference to this International Standard or to a corresponding national standard;

b) the type and identification of the product under test;

c) the items of supplementary information referred to in the Introduction to this International Standard;

d) the national standard or other document supplying the information referred to in c) above;

e) any deviation, by agreement or otherwise, from the test procedure specified;

f) the results of the test (together with any further details required by the document referred to in d) above;

g) the date of the test.

Dimensions in millimetres

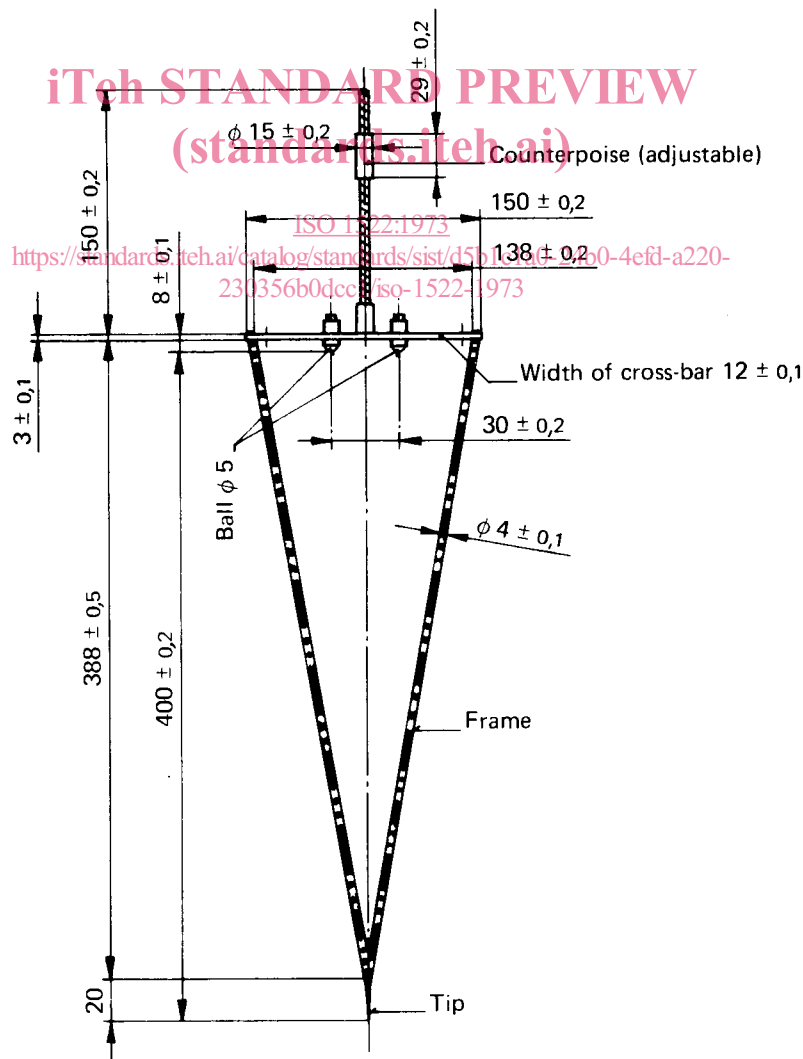


FIGURE 1 – König pendulum

Dimensions in millimetres

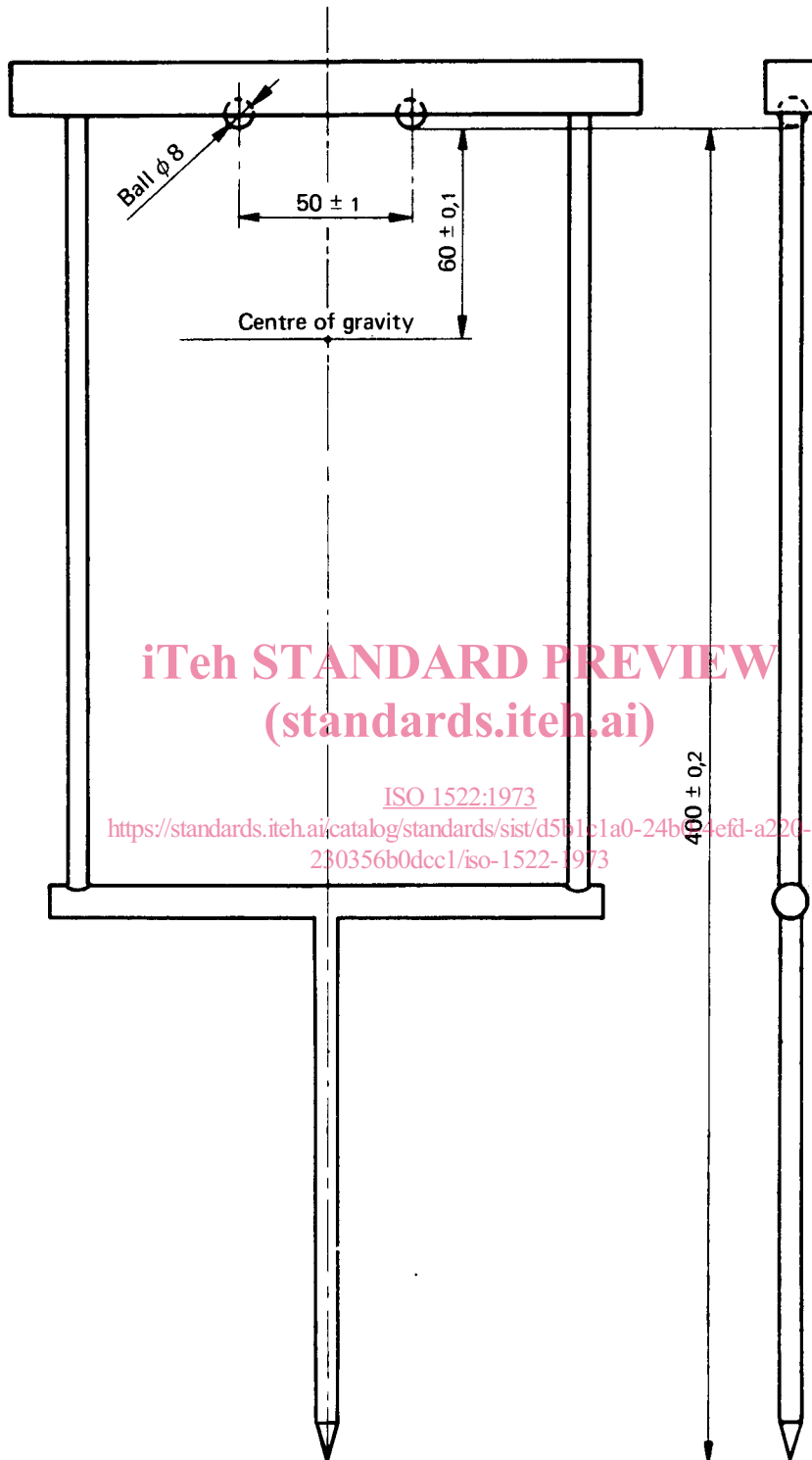


FIGURE 2 – Persoz Pendulum

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