

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION

### R 1522

PAINTS AND VARNISHES

PENDULUM DAMPING TEST

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1st EDITION

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## BRIEF HISTORY

The ISO Recommendation R 1522, *Paints and varnishes – Pendulum damping test*, was drawn up by Technical Committee ISO/TC 35, *Paints and varnishes*, the Secretariat of which is held by the Netherlands Normalisatie-instituut (NNI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1522, which was circulated to all the ISO Member Bodies for enquiry in November 1969. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

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

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

**PAINTS AND VARNISHES**  
**PENDULUM DAMPING TEST**

**INTRODUCTION**

This ISO Recommendation 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 Recommendation R 1512, *Paints and varnishes – Sampling*, R 1513 *Paints and varnishes – Examination and preparation of samples for testing*, and R 1514, *Paints and varnishes – Standard panels for testing*.

**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.

- (1) In general, the damping time of the König pendulum is approximately half that of the Persoz pendulum.
- (2) 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.
- (3) 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 described 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 parties to the test.

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

1. SCOPE

This ISO Recommendation describes standard conditions for carrying out a pendulum damping test on a single coating or a multicoat system of paint, varnish or related product.

2. APPARATUS

2.1 *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 clauses 2.1.1 and 2.1.2.

2.1.1 THE KÖNIG PENDULUM (see Figure 1) rests on two ball bearings,  $5 \pm 0.005$  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 should be  $1.4 \pm 0.02$  second and the time for damping from a  $6^\circ$  displacement to a  $3^\circ$  displacement should be  $250 \pm 10$  seconds. The total mass of the pendulum should be  $200 \pm 0.2$  g.

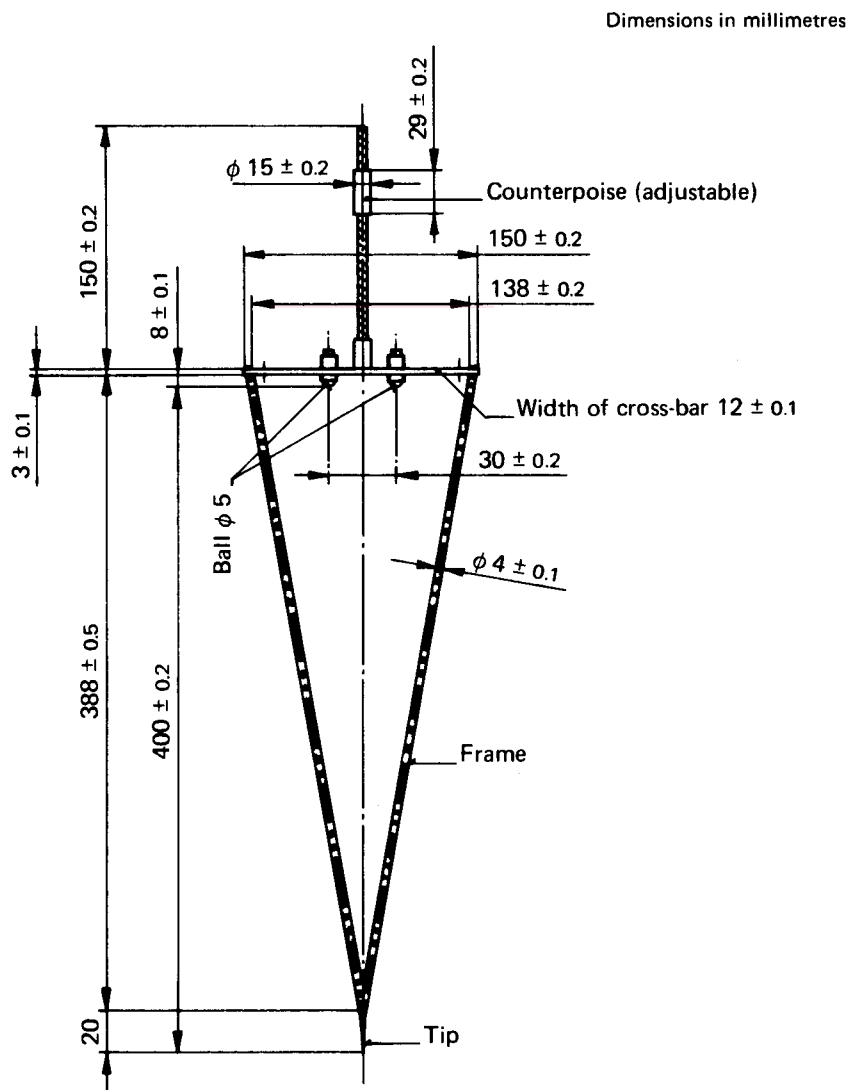


FIGURE 1 - König pendulum

2.1.2 THE PERSOZ PENDULUM (see Figure 2) rests on two stainless steel balls,  $8 \pm 0.005$  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 should be  $1 \pm 0.001$  second and the time for damping from a  $12^\circ$  displacement to a  $4^\circ$  displacement on the same substrate should be at least 420 seconds. The total mass of the pendulum should be  $500 \pm 0.1$  g, and its centre of gravity at rest should 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.

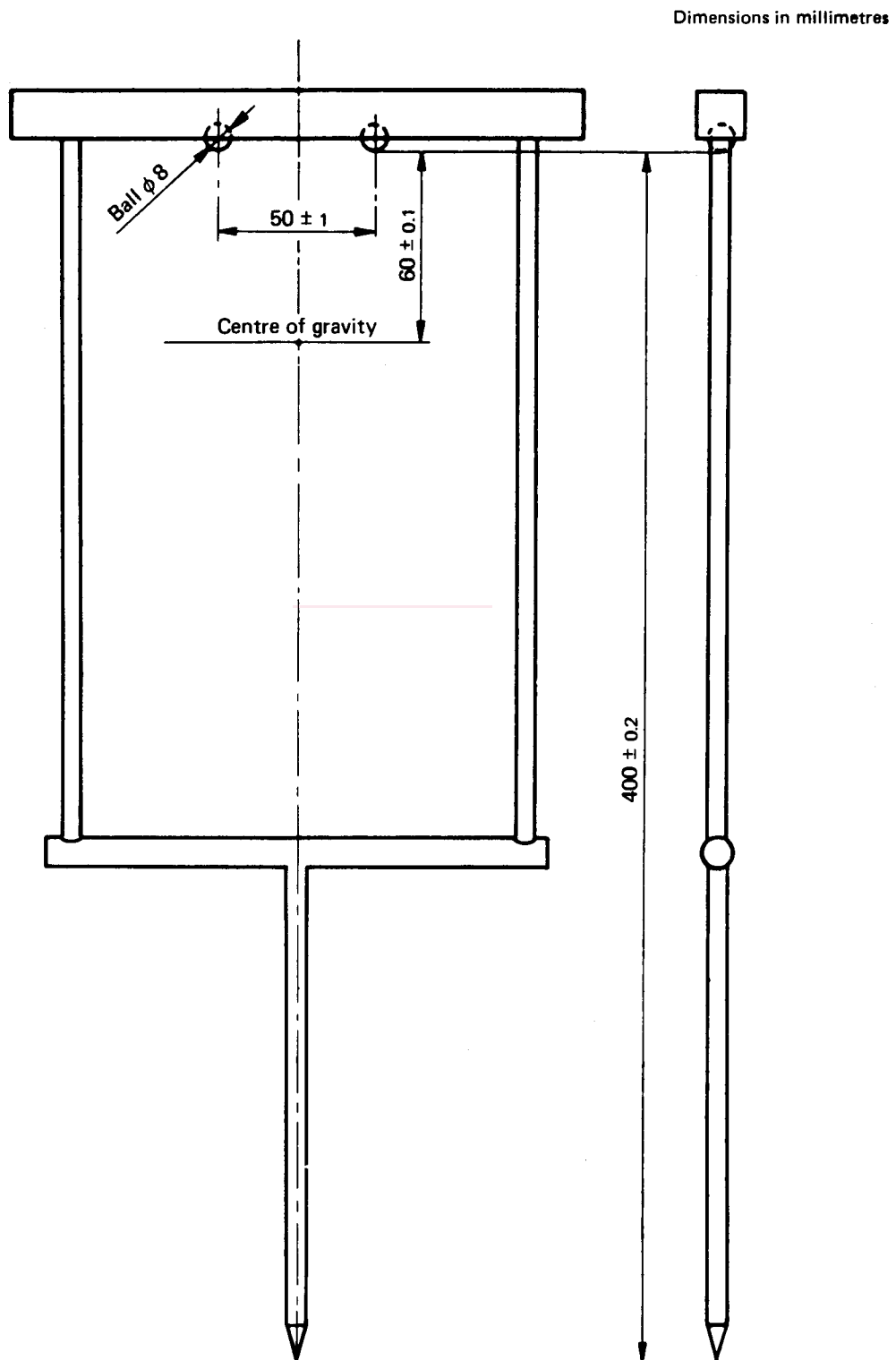


FIGURE 2 - Persoz pendulum

- 2.2 *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 × 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.
- 2.3 *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.

### 3. SAMPLING

A representative sample of the product to be tested (or of each product in the case of a multicoat system) should be taken as described in ISO Recommendation R 1512, *Paints and varnishes – Sampling*. The sample should then be examined and prepared for testing as described in ISO Recommendation R 1513, *Paints and varnishes – Examination and preparation of samples for testing*.

### 4. TEST PANELS

#### 4.1 Material and dimensions

Unless otherwise specified the test panel should be of polished plate glass of dimensions 100 mm × 100 mm × 5 mm complying with ISO Recommendation R 1514, *Paints and varnishes – Standard panels for testing*.

#### 4.2 Preparation and coating of panels

The test panel should be prepared in accordance with ISO Recommendation R 1514, *Paints and varnishes – Standard panels for testing*, unless otherwise specified and should then be coated by the specified method with the product or system under test.

#### 4.3 Thickness of coating

The thickness in micrometres of the dry coating should be determined by the method specified, using one of the procedures described in ISO Recommendation R ...\*.

### 5. PROCEDURE

#### 5.1 General

- 5.1.1 *Drying the test panel*. The coated test panels should be dried (or stoved and aged) for the specified time and under the specified conditions and, unless otherwise specified, should be conditioned at a temperature of  $23 \pm 2$  °C and relative humidity of  $50 \pm 5$  % for a minimum of 16 hours. The appropriate test procedure should then be carried out as soon as possible.
- 5.1.2 *Ambient conditions*. The test should be carried out at a temperature of  $23 \pm 2$  °C and relative humidity of  $50 \pm 5$  %, unless otherwise specified. The apparatus should be used away from draughts and vibrations, and the use of a protective enclosure is recommended.

\* In preparation.

## 5.2 Determination of pendulum damping time

- 5.2.1 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.
- 5.2.2 Clean the fulcrum balls by wiping with soft tissue wetted with diethyl ether, leave the pendulum in ambient conditions (see clause 5.1.2) for 10 minutes, and then lower it gently on to the test panel.
- 5.2.3 Check the coincidence of scale zero and tip rest position and adjust if necessary.
- 5.2.4 Deflect the pendulum, without lateral displacement of the fulcrum, through the appropriate angle ( $6^\circ$  for the König pendulum,  $12^\circ$  for the Persoz pendulum) and allow to rest against the stop provided.
- 5.2.5 Release the pendulum and simultaneously start a stop-watch.
- 5.2.6 Record the time in seconds for the amplitude to fall
  - either from  $6^\circ$  to  $3^\circ$  (König pendulum),
  - or from  $12^\circ$  to  $4^\circ$  (Persoz pendulum).
- 5.2.7 Carry out a determination on three different parts of the same test panel. Record each result and the mean of three determinations.

## 6. TEST REPORT

The test report should include the following information :

- (a) a reference to this ISO Recommendation or to a corresponding national standard;
  - (b) type and identification of the product under test;
  - (c) the items of supplementary information referred to in the introduction to this ISO Recommendation;
  - (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 described;
  - (f) the results of the test (together with any further details required by the document referred to in (d) above);
  - (g) date of the test.
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