International Standard 1413

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Horology — Shock-resistant watches

Horlogerie — Montres résistant aux chocs

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (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 authorized 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.

International Standard ISO 1413 was developed by Technical Committee ISO/TC 114, *Horology*, and was circulated to the member bodies in March 1983.

It has been approved by the member bodies of the following countries :

Czechoslovakia	Mexico
France	Romania
Germany, F. R.	Switzerland
India	USSR
Japan	

No member body expressed disapproval of the document.

This second edition cancels and replaces the first edition (i.e. ISO 1413-1973).

Printed in Switzerland

Horology — Shock-resistant watches

1 Scope and field of application

This International Standard specifies the minimum requirements for shock-resistant watches and describes the corresponding method of test.

It is intended to allow homologation testing of watches rather than the individual control of all watches of a production batch. Indeed, assuming that each watch could comply with the minimum requirements without apparent damage, readjustment could still be made necessary because the test can lead to an alteration of the initial rate of a watch.

This International Standard is based on the simulation of the shock received by a watch on falling accidentally from a height of 1 m on to a horizontal hardwood surface.

2 Reference

ISO 3158, *Timekeeping instruments — Symbolization of control positions.*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1 shock-resistant watch : A watch complying with the minimum requirements of this International Standard.

3.2 residual effect : The difference of rates observed under the conditions of test specified in this International Standard.

4 Minimum requirements

When tested as specified in clause 5, a shock-resistant watch shall comply with the following minimum requirements :

a) it shall not stop after either of the two shocks;

b) the residual effect shall not exceed 2 s per day for quartz watches, or 60 s per day for all other types of watches;

c) examination of the watch shall not reveal any deterioration affecting its performance or its appearance (for example bent or displaced hands, altered display, impaired automatic device or calendar, cracked glass, bent horns, bent or broken crown or damaged push-button, etc.).

5 Method of test

A wristwatch shall be tested without the bracelet, unless the latter forms an integral part of the watch.

5.1 Test temperature

Throughout the test period, the ambient temperature shall be between 18 and 25 °C and shall not vary by more than 2 °C.

5.2 Apparatus

The apparatus used to produce the shock shall be a pendulum impact tester (see clause 7) or any other apparatus the construction of which complies with the characteristics specified in clause 6.

5.3 Procedure

5.3.1 Determination of rate before shocks

5.3.1.1 Mechanical watches

Sixty minutes after winding to maximum, the rate of the watch to be tested shall be checked continuously for at least 1 min in each of the positions FH, 6H and 9H (see ISO 3158) using an apparatus for measuring the instantaneous rate.

5.3.1.2 Quartz watches

Quartz watches shall be allowed to function for at least 2 h before starting the test; after this period, the rate shall be checked in position CH or FH using an apparatus for measuring the instantaneous rate.

5.3.2 First shock

The shock shall be directed against the caseband, parallel to the plane of the watch, on the "9 o'clock" side.

NOTE — Similarly, in the case of watches with a digital display, the shock should be given at the same location.

5.3.3 Second shock

The shock shall be directed against the glass, perpendicular to the plane of the watch.

5.3.4 Determination of rate after shocks

5.3.4.1 Mechanical watches

Five minutes after the second shock, the rate shall be checked continuously for at least 1 min in each of the positions FH, 6H and 9H using an apparatus for measuring the instantaneous rate.

5.3.4.2 Quartz watches

Five minutes after the second shock, the rate shall be checked in position CH or FH using an apparatus for measuring the instantaneous rate.

5.4 Residual effect

The residual effect shall be calculated from the greatest difference of rates determined in the same position under the conditions specified in 5.3.1 and 5.3.4.

6 Characteristics common to all types of apparatus

The following characteristics apply for all types of apparatus.

6.1 Characteristics of hammer

6.1.1 The part of the hammer striking the watch (the sabot) shall be made of polytetrafluoroethylene.

6.1.2 The dimensions of the sabot shall be as shown in figure 1.

$a \geqslant 30$ mm

$e \geqslant 10$ mm

6.1.3 The total mass of the hammer, including the sabot, shall be at least 3 kg.

6.2 Impact speed

The impact speed v, corresponding to an unimpeded fall from a height of 1 m, is 4,43 m/s.

6.3 Arresting device applied to the watch after shock

After the shock, the watch shall travel freely along its trajectory and shall be gradually arrested by a device which does not inflict any further shock.

7 Characteristics specific to pendulum impact testers

If a pendulum impact tester is used, it shall be made and used according to the following requirements.

7.1 Starting position of hammer

The angle α, giving the starting position of the hammer (see figure 2), shall be calculated by means of the formula

$$\cos\frac{\alpha}{2} = \frac{v\,T}{4\,\pi\,r}$$

where

$v = 4{,}43$ m/s;

T is the period, in seconds;

r is the radius, in metres.

These last two values are determined by the manufacturer of the pendulum impact tester.

The period T represents the duration, in seconds, of one oscillation of low amplitude (see figure 3).

$\beta_{max} = 10°$

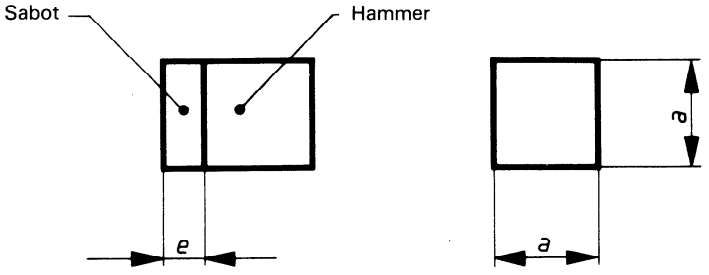

Figure 1

7.2 Working check

Before performing tests, the proper function of the hammer shall be checked.

The check shall be carried out with the hammer freely oscillating.

The manufacturer of the pendulum impact tester shall state the minimum height h (see figure 4) corresponding to the ascent of the hammer to position B after starting in position A (horizontal). If this height h is not reached, the pendulum impact tester shall be checked.

7.3 Position of watch

7.3.1 The watch shall be laid freely on its horizontal support to be subjected to the two shocks indicated in 5.3.2 and 5.3.3.

7.3.2 The position occupied by the watch on this support shall be such that the shock is produced at the exact instant when the pendulum passes through its point of stable equilibrium.

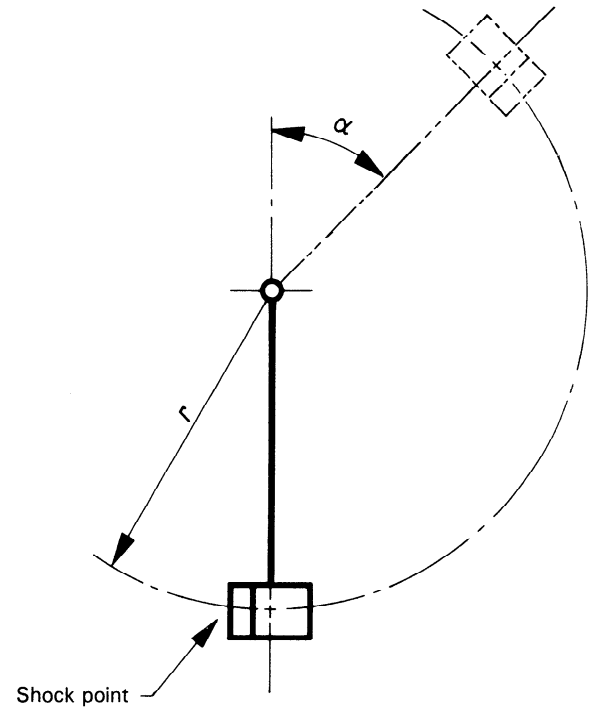

Figure 2

7.4 Conditions of shock

7.4.1 At the moment of impact, the face of the sabot entering into contact with the watch shall be vertical and parallel to the vertical plane containing the axis of oscillation of the pendulum.

7.4.2 The polytetrafluoroethylene plate striking the watch shall be periodically shifted or ground flat.

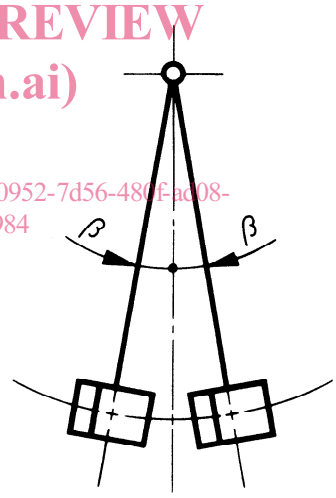

Figure 3

8 Marking

Watches which satisfy the minimum requirements specified in clause 4 may be marked with the mention

- "shock-resistant", in English;
- "résistant aux chocs", in French;
- "антиударные", in Russian;
- "stoßsicher", in German;
- " 耐衝撃 ", in Japanese;
- " 防震 ", in Chinese.

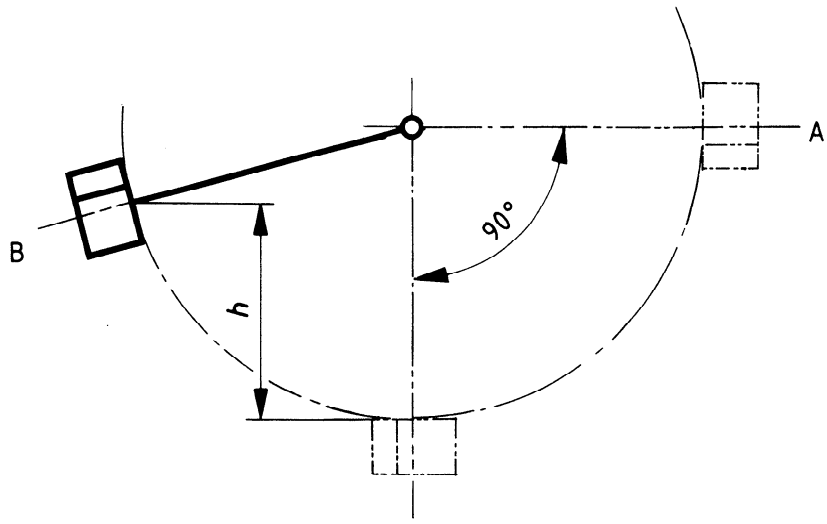

Figure 4

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