BRITISH STANDARD

BS 4960:1986

Specification for

Weighing instruments for domestic cookery

UDC 681.26:641

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Furniture and Household Equipment Standards Committee (FHM/-) to Technical Committee FHM/30, upon which the following bodies were represented:

British Hardware and Housewares Manufacturers Association

British Retailers Association

Consumer Standards Advisory Committee of BSI

Department of Health and Social Security

Department of Trade and Industry (National Weights and Measures Laboratory)

Federation of British Hand Tool Manufacturers

Good Housekeeping Institute

Institute of Trading Standards Administration

National Association of Teachers of Home Economics Ltd.

National Federation of Scale and Weighing Machine Manufacturers

Scottish Health Services

United Kingdom Home Economics Federation

This British Standard, having been prepared under the direction of the Furniture and Household Equipment Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 December 1986

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Amendments issued since publication

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Contents

Foreword

This revision of BS 4960 has been prepared under the direction of the Furniture and Household Equipment Standards Committee. It supersedes the 1973 edition of BS 4960 which is withdrawn.

The revision has been undertaken to reflect technical advances in domestic weighing instruments and to take account of comments received since the publication of the previous edition.

The standard does not specify limits to the capacity of the instruments but for normal domestic cookery purposes it is generally considered that weighing instruments having a maximum capacity of 1 kg are suitable. However, the upper limit may be restricted to below the apparent full scale deflection by the bulk of the material being weighed, relative to pan size, and the lower limit to above the lowest marked graduations by the inertia of spring systems, etc. Users are advised that small quantities of ingredients need to be weighed on an instrument designed for accuracy with small loads or measured out by volume, for example by using measuring spoons.

The requirement for a 25 g weight to be provided within a set of loose weights has been reviewed and it has been concluded that, because of the risk of confusion with the 20 g weight and the simplicity of achieving 25 g by means of a combination of the 20 g and 5 g weights, such a weight no longer need be included.

Attention is drawn to Statutory Instrument SI 1978 No. 1927 “Materials and Articles in Contact with Food Regulations” and subsequent amendments.

Users of this standard should note that EEC Directive 73/360/EEC applies to weighing instruments covered by this standard and that in certain European countries, notably France, such instruments must conform to that Directive. In the United Kingdom the Directive, or the equivalent national requirement, is applied only to weighing instruments intended for trade purposes and, as these are excluded from the scope of BS 4960, weighing instruments which comply with this standard are not controlled in manufacture or sale in the UK; conversely no requirement of BS 4960 should be taken to imply any restriction of the supply or use of domestic instruments complying fully with the EEC Directive.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for the accuracy, general performance and reliability of weighing instruments for domestic cookery.

Consideration is given to most types of such weighing instruments including dial, digital and sliding weight types and those using loose weights. This standard is applicable to instruments designed to stand on a horizontal surface or to be mounted on a wall.

The standard does not apply to weighing instruments intended for trade purposes.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

NOTE to clause **2** Where appropriate, definitions have been taken from Recommendation No. 3 of the International Organization for Legal Metrology (OIML). Where a term used by OIML differs from that in common usage, the OIML term is given in parenthesis.

2.1
maximum capacity

the highest weight value the instrument is designed to indicate

2.2
minimum capacity

the value of the load below which the weighing result may be subject to an excessive relative error

2.3
weighing range

the range between the maximum and minimum capacities

2.4
indicating device (element)

the part of the load measuring device that displays the weighing result; it may indicate both the equilibrium and the weighing result

2.5
analogue (continuous) indication

continuous visual indication, permitting the evaluation of the equilibrium position to a fraction of the scale interval

2.6
digital (discontinuous) indication

discontinuous indication in which the scale marks, generally composed of a sequence of aligned figures, do not permit interpolation to fractions of the scale interval

2.7
parallax error

the apparent displacement of an indicating scale with respect to a pointer, or indicator, caused by a change in the point of observation

2.8
repeatability

the ability of a weighing instrument to provide weighing results which agree one with the other for the same load deposited several times in a practically identical manner under reasonably constant conditions

2.9
scale

the means by which the weighing result is conveyed to the observer, e.g. a printed or engraved dial, a chart, or illuminated integers

2.10
principal indicating scale

the superior indication of the weighing result and its units, e.g. the outermost scale of a dial, the uppermost portion of a chart or that section of a scale marked in bolder type

2.11
scale division

the value, expressed in units of mass, of the difference between the values corresponding to two consecutive scale marks in analogue indication. The difference between two consecutive indicated values in digital indication

2.12
tolerance (maximum permissible error)

the maximum difference, positive or negative, allowed between the weighing result and the equivalent in standard masses of the load weighed

2.13
zeroing (zero setting) device

a device for setting to zero the indicating scale of the weighing instrument when there is no load on the load receptor

2.14
tare facility

a means for balancing the weight of a container without intruding upon the weighing range of the instrument

3 Materials and construction

3.1 All weighing instruments

3.1.1 *General*. All exterior surfaces which can be touched by test finger II of BS 3042:1971 shall be finished smooth and free from sharp projections enabling simple domestic cleaning procedures to be employed for hygiene purposes.

There shall be no deterioration in the appearance of any exterior surface of the instrument or of any loose weights, other than superficial discolouration of non-ferrous materials, after a period of 48 h in an atmosphere of 90 ± 5 % r.h. and 30 ± 2 °C, followed by thorough drying and polishing with a soft cloth.

NOTE An appropriate surface finish may be applied to render exterior surfaces or loose weights resistant to humidity.

3.1.2 *Case*. The case and any window shall protect the mechanism in normal use.

The case shall be undamaged, when viewed by the unaided eye, by a blow of force 0.5 ± 0.05 N m applied anywhere upon its surface, except any electronic control or indicating panel, by means of the impact test device described in Appendix A with no blow applied within 20 mm of any previous blow.

The base shall be stable and shall not rock when the instrument is used on a flat surface.

3.1.3 *Scoop*. Any scoop supplied with the weighing instrument shall be able to withstand three drops from a height of 1 m on to the surface described in Appendix B without sustaining other than superficial damage such as minor scratches or dents.

NOTE It is a requirement of the Materials and Articles in Contact with Food Regulations (SI 1978 No. 1927) that a scoop is made of materials of a type and purity that under normal conditions of use present no toxic hazards nor in any way affect the organoleptic qualities of foodstuffs weighed in it.

A scoop supplied for use with the weighing instrument shall fit securely on the appropriate scoop carrier of the weighing instrument and shall be in stable equilibrium on a flat surface when evenly filled.

A scoop supplied with the weighing instrument shall have a cubic capacity sufficient to contain a mass of granulated sugar equivalent to 50 % of the maximum capacity of the instrument without overflowing.

NOTE A scoop should permit easy and satisfactory pouring of common household ingredients such as sugar, currants, etc.

3.1.4 *Zeroing*. The mechanism of a self-indicating weighing instrument shall incorporate a means to zero the instrument for a nil load condition.

The zeroing device shall be controlled from the exterior of the instrument without the use of special tools and, unless it is an auto-zeroing device of a digital display instrument, shall be capable of adjustment over a range of at least 4 % of maximum capacity or 100 g whichever is the lesser.

The auto-zeroing of digital display instruments is acceptable.

3.1.5 *Dual marking*. Where instruments are dual marked in both metric and imperial units the metric scale shall be the principal indicating scale and equivalent indications (or weights) shall be in the ratio lb: kg of 2.2 : 1. For digital displays allowing equal choice of metric or imperial indications to be made, the metric display shall be regarded as the principal indicating scale.

3.1.6 *Reading distance*. The indicated weighing result shall be readable at a distance of 0.5 m.

3.1.7 *Electronic instruments*. Electronic instruments shall not use mains voltage for their operation and any transformed voltage shall be achieved with the mains input transformer being a safety isolating transformer complying with BS 3535.

NOTE Electronic instruments should not present any electrical or thermal hazards to the user in the course of normal usage nor as the result of a malfunction.

3.2 Dial display instruments

NOTE A typical dial display instrument is shown in Figure 1, and typical dial layouts are shown in Figure 2 and Figure 3. Attention is drawn to the recommendations given in BS 3693.

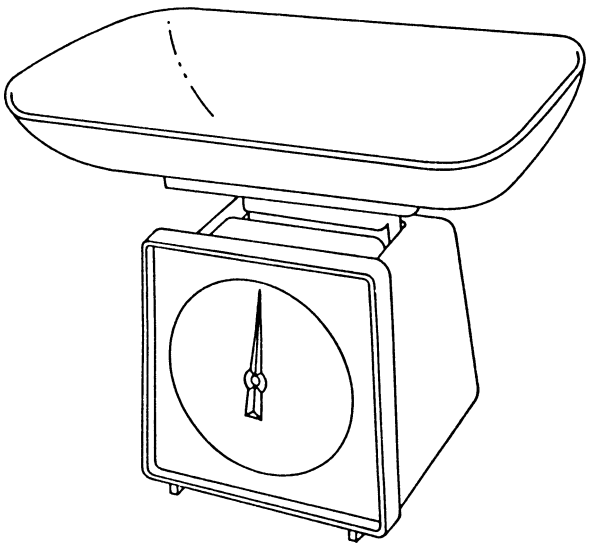

Figure 1 — Dial display instrument

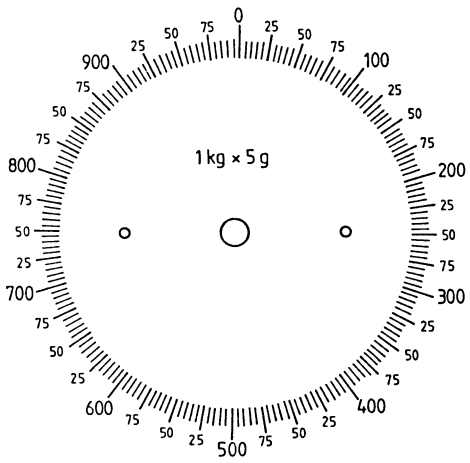

Figure 2 — Dial marked in 5 g divisions

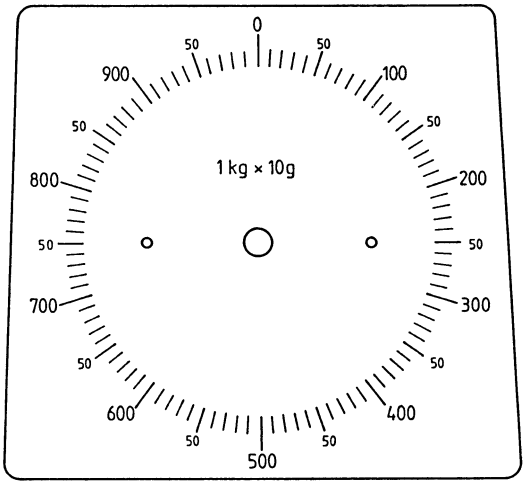

Figure 3 — Dial marked in 10 g divisions

3.2.1 *Scale division*. The divisions on the dial face shall be intervals of 1 g, 2 g, 5 g, 10 g, 20 g, 25 g or 50 g.

3.2.2 *Scale markings*. The pitch of adjacent graduations on an analogue indicating scale shall be at least 1.25 mm or shall appear to be so after magnification. Scale marks shall be of equal thickness throughout their length and of equal thickness to each other. At least every fifth scale mark shall be lengthened to aid reading. At least every tenth scale mark shall be figured.

Both the maximum capacity and the scale division(s) shall be marked on the dial face, e.g. 1 kg × 5 g, 2 kg × 5 g/10 g.

3.2.3 *Pointer*. The pointer shall be in a contrasting colour to the dial face and shall penetrate into the metric scale up to approximately one-third of the minor scale mark. The thickness of the tip of the pointer shall not exceed the width of the scale mark.

The pointer shall be sufficiently close to the dial face to limit parallax error such that a 50 mm shift of the eye to either side of the mid-point of the pointer at a distance of 0.5 m gives a difference in reading of no more than one scale division. For dual marked scales, pointers shall permit both scales to be read to an equal accuracy.

3.2.4 *Protection of markings*. Scale markings shall remain clearly legible following rubbing by hand for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked with petroleum spirit or the dial face shall be protected by a transparent window. The window shall have no cracks greater than 30 mm in length or with sharp edges or loose pieces following the application of the impact test specified in **3.1.2**.

3.3 Digital display instruments

NOTE Typical digital display instruments are shown in Figure 4 and Figure 5.

3.3.1 *Scale division*. The digital readout shall display at divisions of 1 g, 2 g, 5 g, 10 g, 20 g, 25 g or 50 g.

NOTE The provision of a 5 g interval, at least to 250 g, is considered essential when the accepted imperial to metric recipe conversions are used.

3.3.2 *Markings*. The display shall contrast sharply with its background (see **3.1.6**).

Both the maximum capacity and the divisions shall be marked adjacent to the display, e.g. 1 kg × 5 g, 2 kg × 5 g/10 g.

3.3.3 *Protection of display*. The digital display shall be protected by a transparent window. The window shall have no cracks greater than 30 mm in length or with sharp edges or loose pieces following the application of the impact test specified in **3.1.2**.

3.4 Sliding weight instruments

NOTE A typical sliding weight instrument is shown in Figure 6. Attention is drawn to the recommendations given in BS 3693.

3.4.1 *Scale division*. The scale on the minor poise bar shall be divided into scale intervals of 1 g, 2 g, 5 g, 10 g, 20 g, 25 g or 50 g.

3.4.2 *Scale markings*. The scale marks on the minor poise bar shall be at least 2 mm apart centre to centre. Scale marks shall be of equal thickness throughout their length and of equal thickness to each other. At least every fifth scale mark shall be lengthened to aid reading. At least every tenth scale mark shall be figured.

Scale markings shall remain clearly legible following rubbing by hand for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked with petroleum spirit.

3.4.3 *Poise weights and bars*. The sliding poise weight on the minor poise bar shall be continuously adjustable along the bar. It shall be provided with an indicating device to read against the scale marks of the minor index scale.

The sliding poise weight on the major poise bar shall be positively located at each setting position and shall be provided with an indicating device to read against the scale marks of the major index scale.

NOTE These requirements generally result in the minor poise bar being smooth and the major poise bar being notched.

An indicating device shall be fitted at the end of the beam together with a fiducial mark on the case, to indicate when the weighing mechanism is in balance.

3.5 Instruments using loose weights

NOTE A typical weighing instrument using loose weights is shown in Figure 7.

3.5.1 *Mechanism*. Pivots shall be self-engaging and shall not be able to disengage from their bearings in normal use.

3.5.2 *Balance*. Where provision for adjustment of the balance of the instrument takes the form of a weight sliding on a bar, this sliding weight shall be provided with a locking device which shall not require the use of any special tools.

3.5.3 *Weights*. Where a set of metric weights is provided they shall be as follows:

Capacity	Quantity provided
g	
5	1
10	1
20	2
50	1
100	1
200	2
500	1

NOTE Additional weights of 25 g, 1 kg, 2 kg or 5 kg may be provided.

The capacity of each weight shall be clearly marked upon it using the abbreviation kg or g, as appropriate, and shall be accurate to ± 0.5 g or ± 1 % whichever is the greater.

The weights in the set shall be stackable or presented in a protective case or box or as a combination of these.

Weights shall be made from a material which has a density of not less than 7 000 kg/m^3. The shape of a weight shall be such that it has no unnecessary cavities which might retain dirt and no sharp edges or protrusions which can be chipped or broken off when the weight is dropped three times from a height of 1 m on to the surface described in Appendix B. The finish shall be devoid of porosity holes and there shall be no unrecessed surface areas of lead.

3.5.4 *Weight receptor*. The weight receptor shall have a retaining rim and shall be large enough to carry the largest weight provided, for stackable weights, or all the weights provided, if not stackable, within the recess. If weights are not provided, the area of the weight receptor within the rim shall be capable of accepting a circular weight of diameter 90 mm.

4 Performance

4.1 General

Only certified masses stamped by the Weights and Measures Inspectorate shall be used to check the accuracy of weighing instruments.

4.2 Weighing accuracy

The indicated weighing result for dial, digital and sliding weight instruments shall be accurate to within ± 1 scale division up to and including half of the maximum capacity and to within ± 1.5 scale divisions beyond this and up to the maximum capacity or to not more than ± 1 % of the applied load at any point in the weighing range, whichever is the greater.

The balance point of an instrument with loose weights shall be achieved for a load of 1 kg by a balancing load of 1 kg ± 5 g with all bearings disposed to the limit of their lateral constraints.

NOTE Instruments are zeroed or balanced before the addition of the certified masses and between additions if intermediate removal of one or all of the masses takes place.

4.3 Sensitivity

The application at any point in the capacity range of an instrument with loose weights or with analogue indication, of a mass equal to the permitted tolerance at that point (see **4.2**) shall cause a permanent and visible alteration to the state of balance or indicated weighing result.

The application at any point in the capacity range of an instrument with digital indication of a mass equal to 1.5 times the permitted tolerance at that point (see **4.2**) shall cause a permanent and visible alteration to the indicated weighing result.

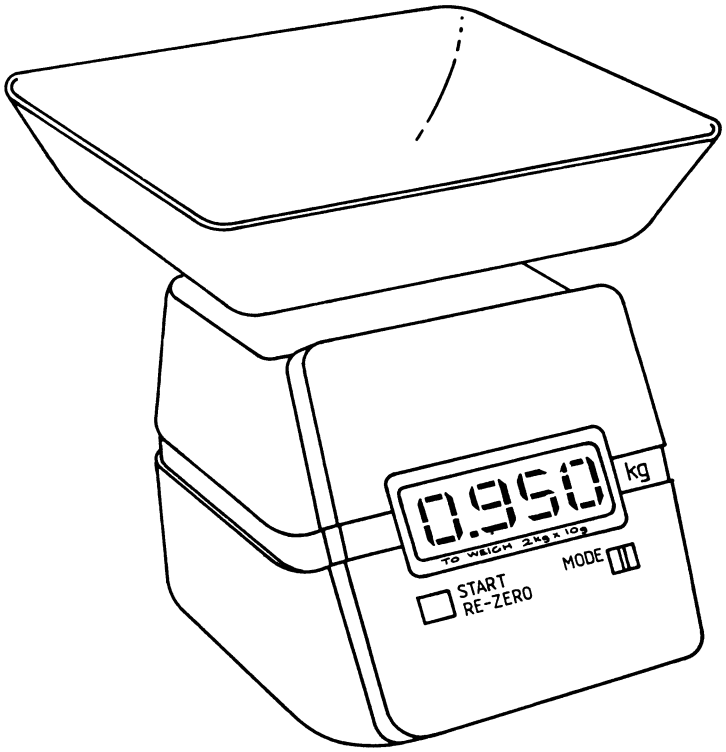

Figure 4 — Digital display instrument

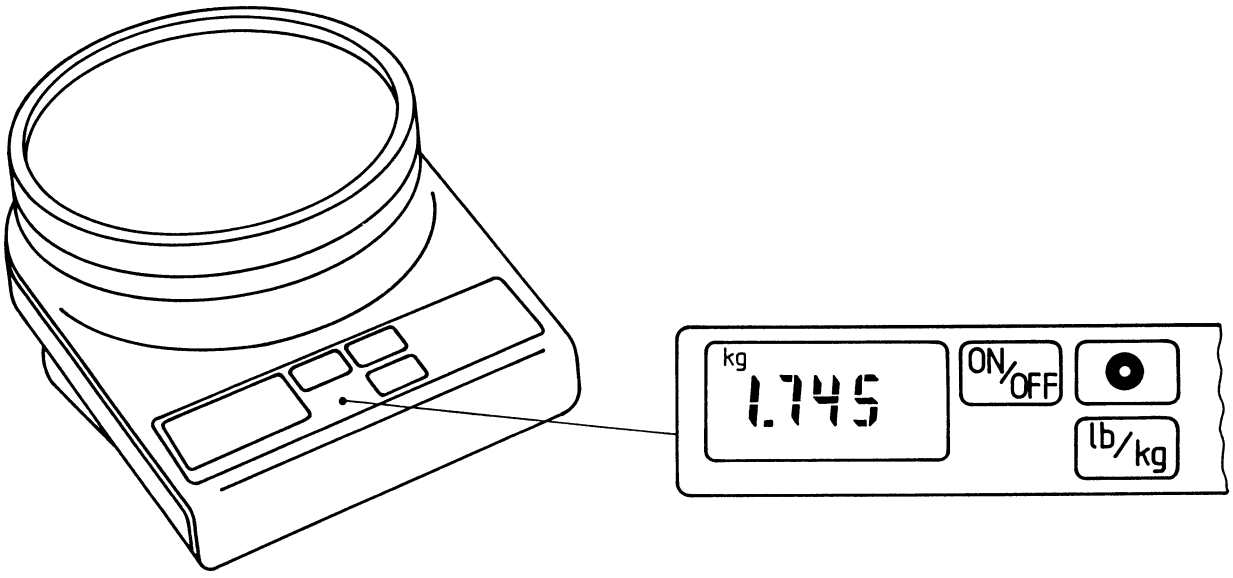

Figure 5 — Digital display instrument with tare facility

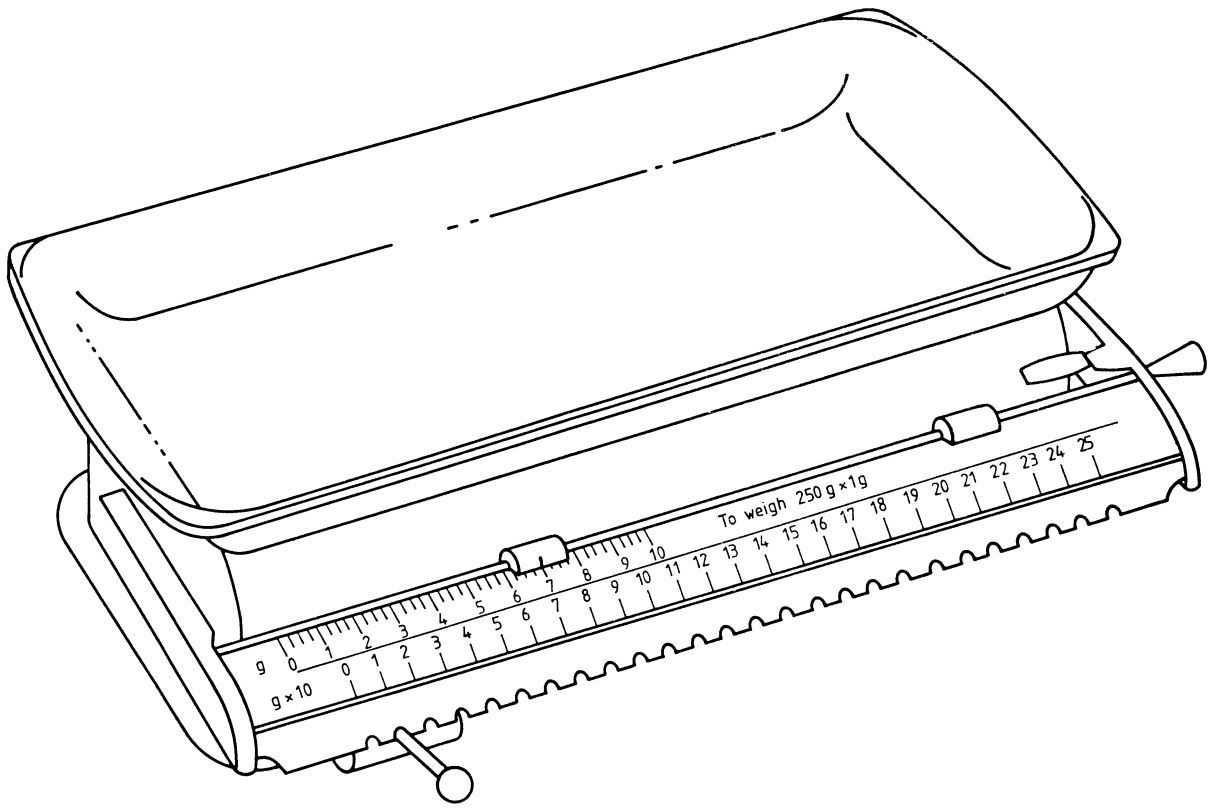

Figure 6 — Sliding weight instrument

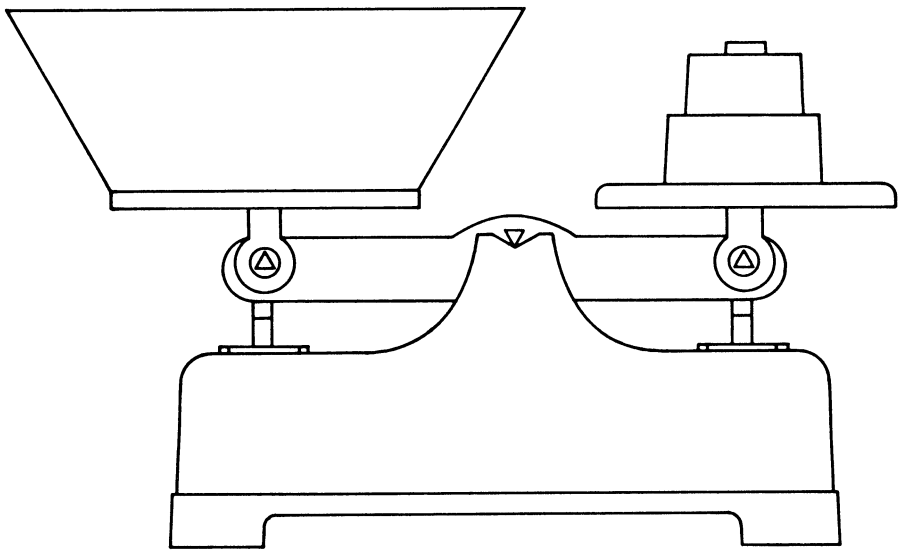

Figure 7 — Instrument with loose weights

4.4 Repeatability

There shall be no difference greater than 0.5 times the permitted tolerance (see **4.2**) between any of 5 separate weighings of an identical mass at any point in the capacity range of the instrument.

4.5 Uneven loading

The instrument shall remain accurate within the requirements of **4.2** when a mass equal to one quarter of the maximum capacity of the instrument is displaced 25 mm in any direction from the centre of the scoop or load receptor of a dial or digital instrument or moved to any point on the scoop or load receptor of a sliding weight instrument.

An instrument with loose weights, when balanced with a 500 g load, shall not require an added mass exceeding 5 g to restore balance when the masses are displaced off centre as follows:

a) the weight on the scoop or load receptor is disposed to either side or back or front by a distance of 25 mm or by the maximum distance permitted by its shape if this is less than 25 mm; and

b) at the same time, the weight on the weight receptor is disposed to the extremities of the flat area of the receptor limited by its rim.

Measurements shall be taken at each possible position.

During this procedure the scoop or load receptor shall not be caused to tip for any position of the load.

4.6 Shock loading

The instrument parts shall be undamaged when viewed by the unaided eye and it shall remain accurate to within the requirements of **4.2** following the dropping on to the scoop or load receptor, from a height of 50 mm, of a load equal to the maximum capacity of the instrument.

For instruments with loose weights, the load applied shall be equal to the sum of all the weights provided, or 1 kg if no weights are provided, which shall be present upon the weight receptor.

NOTE A sandbag is a suitable load for this test.

4.7 Durability

The instrument shall remain accurate to within 1.5 times the permitted tolerance of **4.2** following 6 000 weighings at one-half of the maximum capacity for a dial, digital or sliding weight instrument or 6 000 weighings of a 1 kg load for an instrument with loose weights.

5 Marking and labelling

5.1 Marking

The weighing instrument shall be legibly and permanently marked with the following:

a) the name and/or mark of the UK manufacturer, distributor or vendor;

b) the number and date of this British Standard, i.e. BS 4960:1986[1)].

NOTE If required, the words "Not legal for trade" may also be included.

5.2 Labelling

A label shall be attached to, or a leaflet provided with, the instrument giving details of:

a) the maximum capacity of the instrument and the scale division(s);

b) instructions for use, including operation of the zeroing feature of the instrument;

c) maintenance and hygiene requirements, including cleaning recommendations, and the maximum temperature of liquid in which the scoop may be immersed without damage or distortion;

d) any appropriate warnings concerning compatibility with ingredients such as lemon juice, vinegar, etc., the immersion of the instrument's casing in liquids or the potential flammability of the instrument in close proximity to, or on contact with, a naked flame.

NOTE Labels, leaflets, packaging and display or promotional material may carry the phrase "Complies with the accuracy requirements of BS 4960". This will only be permissible when the weighing instrument complies with *all* the other requirements of this standard as well, since clauses of a British Standard cannot be applied selectively.

[1)] Marking BS 4960:1986 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification should be addressed to the appropriate certification body.

Appendix A Spring-operated impact test device

The device is shown in Figure 8 and consists of three main parts: the body, the striking element and the spring-loaded release cone.

The body comprises the housing, the striking element guide, the release mechanism and all the parts to which this is rigidly fixed. The mass of this assembly is 1 250 g.

The striking element comprises the hammer head, the hammer shaft and the cocking knob. The mass of this assembly is 250 g.

The hammer head has a hemispherical face of polyamide having a Rockwell hardness of R 100, with a radius of 10 mm. It is fixed to the hammer shaft in such a way that the distance from its tip to the plane of the cone front when the striking element is on the point of release is 20 mm.

The cone has a mass of 60 g and the cone spring is such that it exerts a force of 20 N when the release jaws are on the point of releasing the striking element.

The hammer spring is adjusted so that the product of the compression, in millimetres, and the force exerted, in newtons, equals 1 000, the compression being approximately 20 mm. With this adjustment, the impact energy is 0.5 ± 0.05 N·m.

The release mechanism springs are adjusted so that they exert just sufficient pressure to keep the release jaws in the engaged position.

The apparatus is cocked by pulling the cocking knob until the release jaws engage with the groove in the hammer shaft.

The blows are applied by pushing the release cone against the sample in a direction perpendicular to the surface at the point to be tested.

The pressure is slowly increased so that the cone moves back until it is in contact with the release bars which then move to operate the release mechanism and allow the hammer to strike.

Appendix B Impact surface

The impact surface consists of a steel plate, 4 mm thick, with its upper side coated with a 2 mm thickness of rubber or flexible plastics material of hardness 75 ± 5 Shore A, laid on a non-flexible horizontal surface.

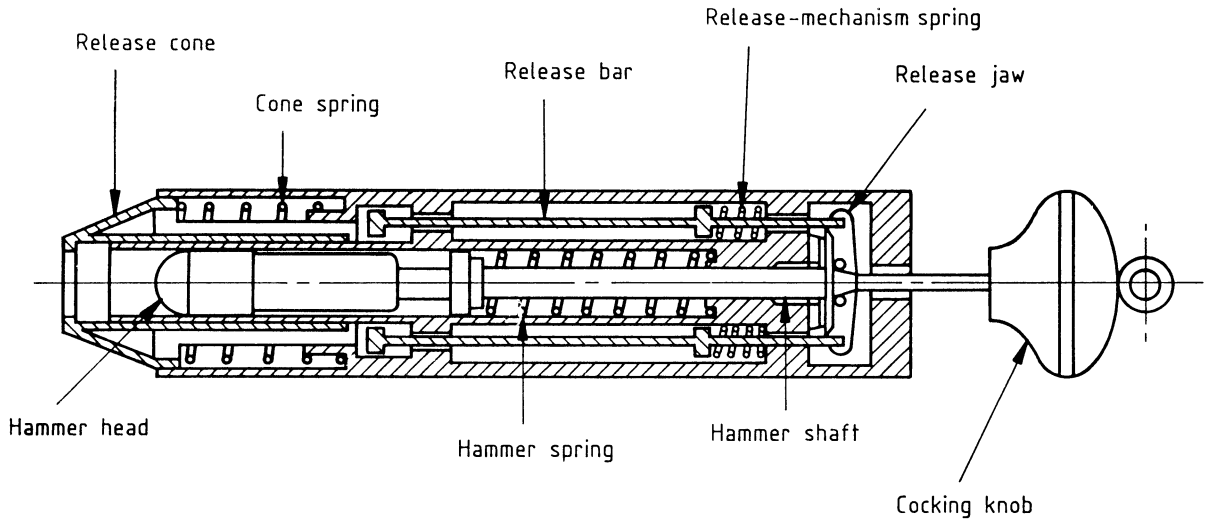

Figure 8 — Spring-operated impact test device

Publications referred to

BS 3042, *Standard test fingers and probes for checking protection against electrical, mechanical and thermal hazard.*

BS 3535, *Safety isolating transformers for industrial and domestic purposes.*

BS 3693, *Recommendations for the design of scales and indexes.*

International Organization for Legal Metrology (OIML) Recommendation 3

BSI — British Standards Institution

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