
International Standard



488

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Milk — Determination of fat content — Gerber butyrometers

Lait — Détermination de la teneur en matière grasse — Butyromètres Gerber

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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 488 was developed by Technical Committee ISO/TC 34, *Agricultural food products*, and was circulated to the member bodies in November 1982.

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

Belgium	Iraq	South Africa, Rep. of
Brazil	Israel	Spain
Bulgaria	Kenya	Sri Lanka
Czechoslovakia	Korea, Dem. P. Rep. of	Switzerland
Egypt, Arab Rep. of	Netherlands	Tanzania
Ethiopia	New Zealand	Thailand
France	Peru	Turkey
Germany, F.R.	Philippines	United Kingdom
Hungary	Poland	USSR
India	Portugal	Venezuela
Iran	Romania	

No member body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 488-1966, of which it constitutes a technical revision.

NOTE — This International Standard has been developed jointly with the IDF (International Dairy Federation) and the AOAC (Association of Official Analytical Chemists, USA).

Milk — Determination of fat content — Gerber butyrometers

1 Scope and field of application

This International Standard specifies the characteristics of seven types of butyrometer for use in the determination of the fat content of whole milk, partly skimmed milk and skimmed milk by the Gerber method specified in ISO 2446.

NOTE — The method of using the 0 to 0,5 % butyrometer for skimmed milk, with which double the normal volumes of milk and reagents are required, is not specified in ISO 2446, but will be included when ISO 2446 is revised.

Recommended stoppers for the butyrometers are described in annex A and a recommended method of determining the scale errors of the butyrometers is described in annex B. These annexes do not form part of this International Standard.

2 Reference

ISO 2446, *Milk — Determination of fat content (Routine method)*.

3 Types of butyrometer

Seven types of butyrometer are specified as follows:

- a) a butyrometer with a scale range of 0 to 0,5 % fat, the smallest scale division of which is 0,02 %; this is a "double-quantity" butyrometer suitable for skimmed milk;
- b) a butyrometer with a scale range of 0 to 4 % fat, the smallest scale division of which is 0,05 %; this is a "precision" butyrometer suitable for whole milk of standardized fat content and partly skimmed milk;
- c) butyrometers with scale ranges of 0 to 5 %, 0 to 6 %, 0 to 7 % and 0 to 8 % fat respectively, the smallest scale divisions of which are 0,1 %; these are "general purpose" butyrometers suitable for whole milk;
- d) a butyrometer with a scale range of 0 to 10 % fat, the smallest scale division of which is 0,2 %; this is suitable for whole milk of high fat content, for example sheep's milk.

NOTES

- 1 The 0 to 0,5 % and 0 to 4 % butyrometers are also suitable for whey and buttermilk, but this usage is not described in ISO 2446.
- 2 For the meaning of "% fat" in relation to scale range, see ISO 2446.

4 Construction

4.1 Material

The butyrometers shall be made of clear glass which is as free as possible from visible defects. The stress in the glass shall be reduced by annealing to minimize the possibility of fracture by thermal or mechanical shock. The glass shall be resistant to the reagents used in the Gerber method (see ISO 2446).

4.2 Shape and dimensions

The shape and dimensions of the butyrometers shall be as shown in figures 1, 2, 3 and 4; the 0 to 5 %, 0 to 7 % and 0 to 8 % butyrometers shall have the same shape and dimensions as the 0 to 6 % butyrometer shown in figure 3.

The internal surface of the butyrometers shall be smooth and free from any defects so that, in use, none of the fat is prevented from entering the graduated tube.

The outer surface of the butyrometers shall be symmetrical about the axis and changes in cross-section shall be smooth, particularly the transition from the large bulb to the graduated tube.

The minimum wall thickness at any point shall be 0,9 mm in order to ensure that the butyrometers are sufficiently robust for the usage to which they are normally subjected.

4.3 Neck

Two types of neck are permitted:

- a) plain neck, strengthened at the outer end by an outside rim not exceeding 2,5 mm in thickness (see figures 1 and 3);
- b) corrugated neck, with the corrugations at right angles to the axis of the butyrometer and not in the form of a spiral producing a screw thread (see figures 2 and 4). The number of corrugations is not specified. The internal diameter of a corrugated neck shall be measured at the crests of the corrugations.

4.4 Large bulb (see clause 6)

The capacity of the large bulb, measured between the end of the neck and the 0 % graduation line (i.e. between levels A and

B in figures 1, 2, 3 and 4), shall be in accordance with table 1 for the different types of butyrometer.

Table 1 — Capacity of large bulb according to type of butyrometer

Scale range, % fat	Capacity of large bulb, ml
0 to 0,5	43,5 ± 0,5
0 to 4	21,7 ± 0,3
0 to 5-6-7 or 8	21,5 ± 0,4
0 to 10	21,0 ± 0,4

4.5 Graduated tube

The graduated tube shall be of the flat-bore type shown in cross-section in figures 1, 2, 3 and 4.

4.6 Small bulb (see clause 6)

The capacity of the small bulb, measured between the top graduation line and the internal end of the bulb (i.e. between levels C and D in figures 1, 2, 3 and 4), shall be at least 1,5 ml for all the butyrometers.

The small bulb shall be slightly tapered as shown in figures 1, 2, 3 and 4, and the inside of the bulb shall be so shaped that liquid can flow freely between the bulb and the graduated tube.

A small patch of matt surface, on which a temporary identification mark can be written, shall be provided on the small bulb.

5 Scale and graduation

5.1 Length of scale

The length of the scale between the extreme graduation lines (i.e. between levels B and C in figures 1, 2, 3 and 4) shall be as follows:

- a) 0 to 0,5 % butyrometer: not less than 17,5 mm;
- b) all other butyrometers: not less than 65 mm.

NOTE — It is recommended that scale lengths are as large as possible, consistent with the other constructional requirements, for ease of reading the scales.

5.2 Position of scale

The position of the scale on the flat-bore tube shall be such that the scale is approximately central with respect to the length of the tube and that the tube is internally uniform in cross-section for at least 3 mm beyond each end of the scale.

5.3 Basis of scale (see clause 6)

The basis of the scale shall be as follows:

- a) for the 0 to 0,5 % butyrometer, the capacity of the flat-bore tube between the 0 % and 0,5 % graduation lines shall be 0,125 ml;
- b) for all other butyrometers, the capacity of the flat-bore tube between any two graduation lines covering a range of 1 % shall be 0,125 ml.

5.4 Graduation lines

The graduation lines shall be fine, clean and permanent, and of a uniform thickness which is not less than 0,1 mm and not more than 0,2 mm. The lines shall lie in planes perpendicular to the longitudinal axis of the flat-bore tube, with no evident irregularity in their spacing; the mid-point of the lines shall be coincident with the longitudinal axis.

Short graduation lines shall be at least 2 mm in length for the 0 to 0,5 % and 0 to 4 % butyrometers, and at least 3 mm in length for all other butyrometers. Graduation lines of intermediate length shall project equally beyond the left and right of short graduation lines for a distance of at least 1 mm. Full length graduation lines shall extend completely across the flat portion of the front of the flat-bore tube.

5.5 Graduation scheme

The graduation scheme shall be as follows:

- a) for the 0 to 0,5 % butyrometer: the graduation lines shall indicate 0,02 % intervals, those indicating 0,1 % intervals being full length and numbered and the remainder being short (see figure 1).
- b) for the 0 to 4 % butyrometer: the graduation lines shall indicate 0,05 % intervals, those indicating 1 % intervals being full length and numbered, those indicating 0,5 % intervals being full length, those indicating 0,1 % intervals being of intermediate length and the remainder being short (see figure 2).
- c) for the 0 to 5, 0 to 6, 0 to 7 and 0 to 8 % butyrometers: the graduation lines shall indicate 0,1 % intervals, those indicating 1 % intervals being full length and numbered, those indicating 0,5 % intervals being of intermediate length and the remainder being short (see figure 3).
- d) for the 0 to 10 % butyrometer: the graduation lines shall indicate 0,2 % intervals, those indicating 1 % intervals being full length and numbered and the remainder being short (see figure 4).

5.6 Graduation numbers and percentage symbol

The graduation numbers shall be permanent and clearly legible, and each shall be located immediately above the graduation line to which it refers, to the right of the longitudinal axis of the scale and upright when the butyrometer is placed vertically with the small bulb uppermost (see figures 1, 2, 3 and 4).

The percentage symbol (%) shall be permanent, clearly legible and located to the left of the uppermost graduation number (see figures 1, 2, 3 and 4).

5.7 Scale error tolerances (see clause 6)

The scale error tolerances shall be as follows:

- a) for the 0 to 0,5 % butyrometer: the error in a single portion of the scale covering at least four-fifths of the total scale shall not exceed a value equivalent to plus or minus half a smallest scale division;
- b) for all other butyrometers: the error in each of at least three approximately equal and consecutive portions of the scale which in total cover most of the scale, and the algebraic sum of these errors, shall not exceed a value equivalent to plus or minus half a smallest scale division.

NOTE — For certain special purposes described in ISO 2446, butyrometers having scale errors, as defined above, of less than $\pm 0,01$ % are required.

6 Reference temperature

The reference temperature in relation to the requirements for capacity specified in 4.4, 4.6 and 5.3, and in relation to the requirements specified in 5.7, is 20 °C.

7 Inscriptions

The following inscriptions shall be permanently and legibly inscribed on the large bulb of the butyrometer:

- a) for the 0 to 0,5 % butyrometer:
 - 1) "Skimmed milk";
 - 2) "Double-quantity";
 - 3) the reference to this International Standard, i.e. ISO 488;
 - 4) the maker's or vendor's name or mark.
- b) for all other butyrometers:
 - 1) "Milk";
 - 2) the reference to this International Standard, i.e. ISO 488;
 - 3) the maker's or vendor's name or mark.

In both cases, an identification number may be inscribed, if required.

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Dimensions in millimetres

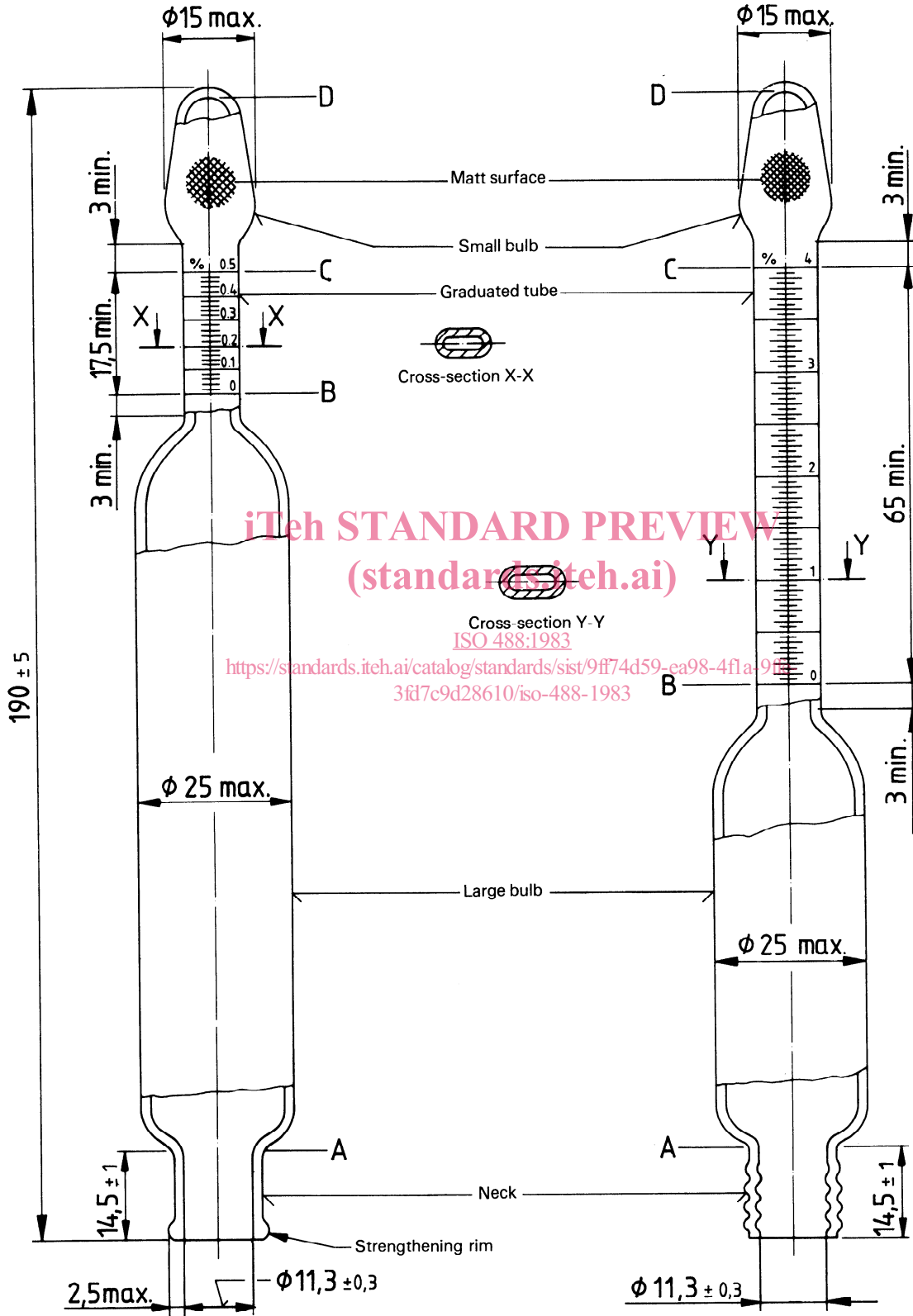


Figure 1 – 0 to 0,5 % butyrometer with plain neck

Figure 2 – 0 to 4 % butyrometer with corrugated neck

Dimensions in millimetres

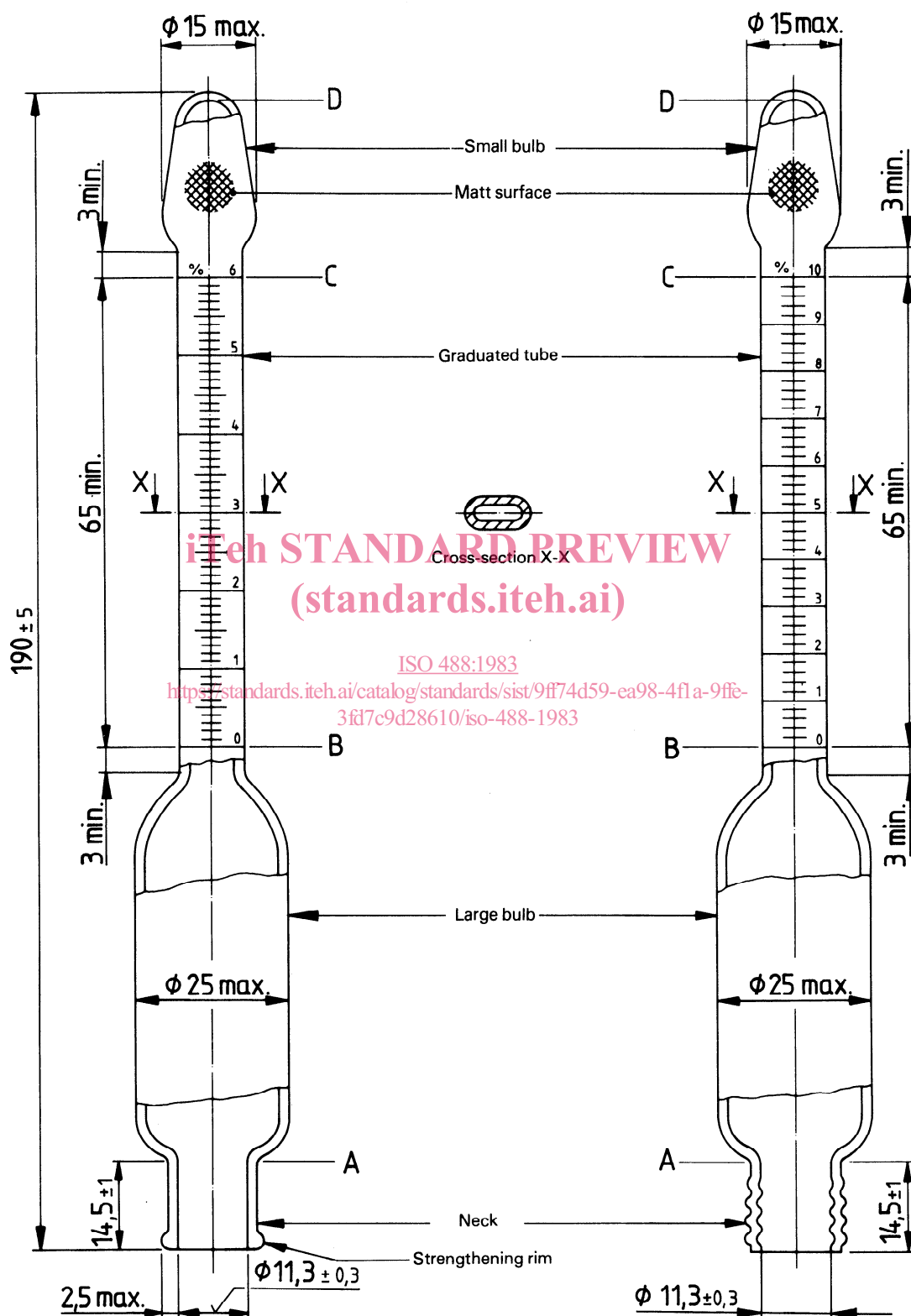


Figure 3 — 0 to 6 % butyrometer with plain neck

Figure 4 — 0 to 10 % butyrometer with corrugated neck

Annex A

Recommended stoppers

(This annex does not form part of the Standard.)

A.0 Introduction

Various types of stopper can be used with the butyrometers specified in this International Standard. Those recommended in this annex are the types most commonly used. The shapes and dimensions given are for the general guidance of manufacturers, but should be adhered to as closely as practicable.

A.1 Types of stopper

The recommended types of stopper are shown in figure 5. The following points should be noted:

- a) single-ended and double-ended stoppers should be made from a suitable grade of rubber or plastics material having a hardness of 38 ± 5 IRHD (International Rubber Hardness Degrees);
- b) the construction of the double-ended stopper should be such that it can be screwed into the butyrometer until the widest part is at least level with the rim of the neck;
- c) lock stoppers and keys should be such that, in use, the position of a fat column in the graduated tube of a butyrometer can be easily adjusted for readings to be taken.

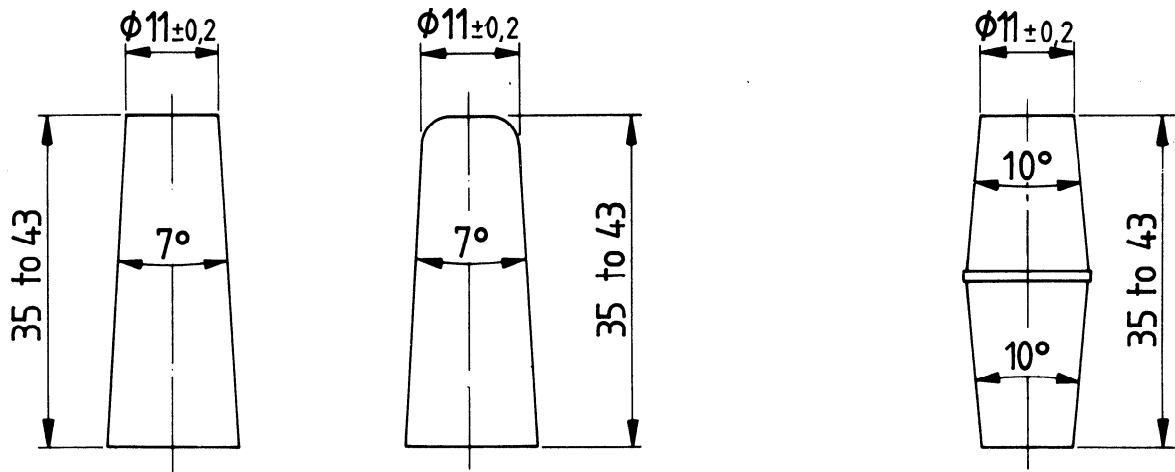
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A.2 Usage

The type of stopper to be used is a matter for the personal preference of the user but the following suggestions are made:

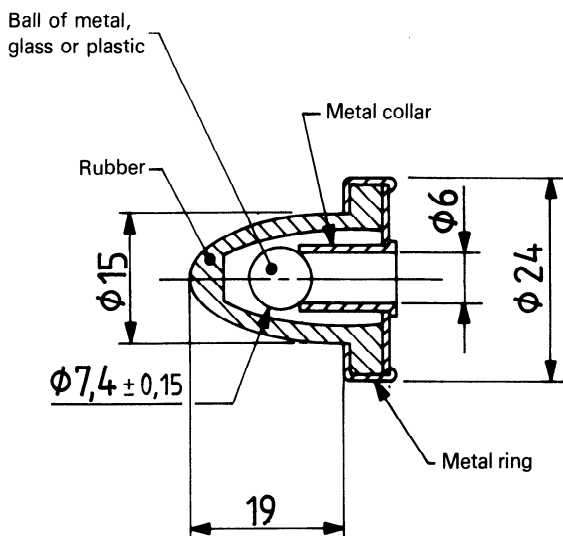
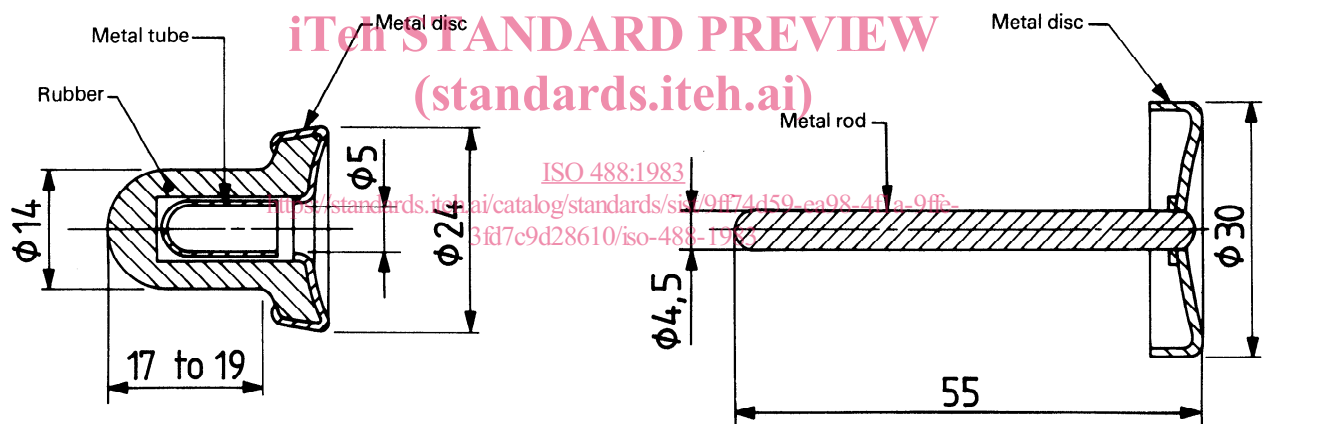
- a) when a small number of butyrometers is to be used, any of the recommended stoppers is suitable;
- b) when a large number of butyrometers is to be used, lock stoppers may be found advantageous. Although lock stoppers can be used with either plain-neck or corrugated-neck butyrometers, it is preferable that these stoppers are used with plain-neck butyrometers;
- c) although single-ended or double-ended stoppers can be used with either plain-neck or corrugated-neck butyrometers, the double-ended stoppers may be found preferable with corrugated-neck butyrometers.

Dimensions in millimetres



a) Single-ended stoppers

b) Double-ended stopper



c) Examples of lock stoppers and keys

Figure 5 — Recommended stoppers