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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 preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 488|IDF 105 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*, and the International Dairy Federation (IDF). It is being published jointly by ISO and IDF.

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This second edition cancels and replaces the first edition (ISO 488:1983), of which it constitutes a minor revision.

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Foreword

IDF (the International Dairy Federation) is a non-profit organization representing the dairy sector worldwide. IDF membership comprises National Committees in every member country as well as regional dairy associations having signed a formal agreement on cooperation with IDF. All members of IDF have the right to be represented on the IDF Standing Committees carrying out the technical work. IDF collaborates with ISO in the development of standard methods of analysis and sampling for milk and milk products.

Draft International Standards adopted by the Action Teams and Standing Committees are circulated to the National Committees for voting. Publication as an International Standard requires approval by at least 50 % of the IDF National Committees casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. IDF shall not be held responsible for identifying any or all such patent rights.

ISO 488|IDF 105 was prepared by the International Dairy Federation (IDF) and Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*. It is being published jointly by IDF and ISO.

All work was carried out by the former Joint ISO/IDF/AOAC Group of Experts E40-E301 which is now part of the Joint ISO-IDF Action Team on *Fat* of the Standing Committee on *Main components in milk*.

ISO 488|IDF 105:2008 cancels and replaces IDF 105:1981, of which it constitutes a minor revision.

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Milk — Determination of fat content — Gerber butyrometers

1 Scope

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.

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.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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.

NOTE 1 The 0 % to 0,5 % and 0 % to 4 % butyrometers are also suitable for whey and buttermilk, but this usage is not yet described in ISO 2446.

NOTE 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:

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- 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 also 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 also Clause 6)

The capacity of the small bulb, measured between the top graduation line and the inside of the 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 graduations

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.

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 also 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-points 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 to the left and right for a distance of at least 1 mm beyond the short graduation lines. 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 also Clause 6)

The scale error tolerances shall be as follows: <https://standards.iteh.ai/catalog/standards/sist/d1473946-3d2-4f55-95c7-bcdaa482af60/iso-488-2008>

- 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 the 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 the 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 number of 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 number of 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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