
British Standard

Determination of fat content of milk and milk products (Gerber method)

Part 1. Specification for apparatus

Détermination de la teneur en graisse du lait et des produits laitiers (méthode Gerber)
Partie 1. Appareillage — Spécifications

Bestimmung des Fettgehaltes von Milch und Milchprodukten nach dem Gerber-Verfahren
Teil 1. Prüfgeräte

Foreword

This Part of BS 696, having been prepared under the direction of the Dairying Standards Committee, supersedes BS 696 : Part 1 : 1955 which is withdrawn.

BS 696 was first published in 1936 as a result of investigation into the standardization of glassware for testing milk and milk products, which was initiated by the Imperial Agricultural Research Conference of 1927 and was carried out up to 1933 by the Dairy Research Committee of the Empire Marketing Board and subsequently by BSI.

This revision of BS 696 comprises two Parts published separately as:

Part 1 Specification for apparatus

Part 2 Methods

In the preparation of this revision account has been taken of those aspects of ISO 488 'Milk — Determination of fat content — Gerber butyrometers' which are applicable to practice in the UK. ISO 488 was prepared by Technical Committee TC 34 'Agricultural food products' of the International Organization for Standardization (ISO) with the active participation and approval of the UK.

The requirements for the pipettes specified in section four have been specifically selected to provide the accuracy levels required by BS 696 : Part 2, but increasingly automatic dispensers of similar accuracy are used.

The principal changes in this revision are:

- (a) subjective requirements have been replaced by objective requirements;
- (b) a 0.5 % butyrometer has been introduced;
- (c) the 6 % and 7 % butyrometers have been omitted;
- (d) a double quantity milk pipette has been introduced;
- (e) the automatic measures for amyl alcohol and sulphuric acid have been omitted.

CAUTION. Attention is drawn to the Health and Safety at Work etc. Act, 1974, and in particular the need for ensuring that the method using mercury referred to in this British Standard is carried out with suitable precautions.

This Part of BS 696 calls for the use of substances and procedures that may be injurious to health if adequate precautions are not taken. In particular the method of calibration given in appendix A, which involves the use of mercury, is intended to be carried out by qualified chemists or other suitably trained and/or supervised personnel. Normal safety precautions should be observed throughout the use of the procedures.

Particular attention is drawn to the need to avoid breathing mercury vapour or contact with the eyes and skin.

Particular attention is also drawn to the need to avoid mouth pipetting.

This Part of this British Standard refers only to the technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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

Contents

	Page		Page
Foreword		Inside front cover	
Committees responsible		Back cover	
Specification		Appendices	
Section one. General		A Method for calibrating the scales of Gerber butyrometers	17
1 Scope	2	B Determination of delivered capacity	19
2 Definitions	2	Tables	
3 Reference temperature	2	1 Dimensions	3
4 Visibility of graduation lines, figures and inscriptions	2	2 Capacities and scales of Gerber butyrometers for milk and milk products	4
Section two. Butyrometers		3 Limits of error of delivered capacity	10
5 General	3	4 Recommended dimensions	11
6 Construction	3	5 Delivery times	11
7 Graduation and figuring	3	6 Recommended dimensions	14
8 Limits of scale error	5	7 Radii and r/min to produce $350 \pm 50 g_n$	16
9 Inscriptions	5	8 Factor to convert mass of mercury at $t^\circ\text{C}$ to corresponding capacity of scale portion of butyrometer at 20°C	18
Section three. Butyrometer stopper		Figures	
10 Type	9	1 Gerber butyrometer for testing milk showing 8 % scales and 10 % scales	6
Section four. Pipettes		2 Gerber double quantity (0.5 %) butyrometer for testing skimmed milk	7
11 General	10	3 Gerber (4 %) butyrometer for testing partly skimmed milk, separated milk, buttermilk or whey	7
12 Limits of volumetric error	10	4 Gerber (40 %) butyrometer for testing cheese	8
13 Construction	10	5 Gerber (70 %) butyrometer for testing cream	8
14 Graduation line	11	6 Stopper for Gerber butyrometers	9
15 Inscriptions	11	7 Amyl alcohol pipette	12
16 Colour coding	11	8 Sulphuric acid pipette	12
Section five. Funnel for weighing cream or cheese		9 Standard milk pipette	13
17 Construction	14	10 Double quantity milk pipette	13
18 Inscriptions	14	11 Funnel for weighing cream or cheese	15
Section six. Centrifuge			
19 Type	16		
20 Centrifugal acceleration	16		
21 Construction	16		
22 Safety	16		

Section one. General

1 Scope

This Part of BS 696 specifies requirements for a range of six butyrometers and a stopper, an amyl alcohol pipette, a sulphuric acid pipette, a milk pipette, a double quantity milk pipette, a funnel for weighing cream or cheese, and a centrifuge, for use in the determination of the percentage fat in milk and milk products by the Gerber method.

NOTE 1. The procedure for the determination of the percentage of fat in milk and milk products by the Gerber method is given in BS 696 : Part 2.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 696 the following definitions apply.

2.1 standard reference temperature. The temperature at which the article is calibrated.

2.2 delivery time. The time taken for the descent of the water meniscus, at the standard reference temperature,

from the graduation line to the point at which it appears to come to rest in the jet.

2.3 delivered capacity. The volume, in millilitres, of water at the standard reference temperature delivered by the pipette, when determined in accordance with BS 6696, modified by the information in appendix B.

3 Reference temperature

The standard reference temperature shall be 20 °C.

4 Visibility of graduation lines, figures and inscriptions

All figures and inscriptions shall be of size and form as to be clearly legible under normal conditions of use.

The graduation lines, figures and inscriptions shall be clearly visible and permanent.

Section two. Butyrometers

5 General

The butyrometers shall be of the following types:

- (a) Gerber double quantity (0.5 %) butyrometer for testing skimmed milk;
- (b) Gerber (4 %) butyrometer for testing partly skimmed milk, buttermilk or whey;
- (c) Gerber (8 %) butyrometer for testing milk;
- (d) Gerber (10 %) butyrometer for testing milk;
- (e) Gerber (40 %) 3 g butyrometer for testing cheese;
- (f) Gerber (70 %) 5 g butyrometer for testing cream.

6 Construction

6.1 Material

The butyrometers shall be manufactured from colourless soda-lime-silica, neutral, or borosilicate glass of class 3 or better, complying with BS 3473 : Part 2.

NOTE. The butyrometers should be as free as possible from visible defects and be reasonably free from internal stress.

6.2 Dimensions

The dimensions of the butyrometers shall be as given in table 1.

6.3 General design

The general design of the butyrometers shall be as shown in figures 1 to 5.

6.4 Neck

The neck of the butyrometers shall be plain and constructed as shown in figures 1 to 5. The rim at the top shall be a maximum of 2.5 mm.

6.5 Body

The capacity of the butyrometer between the base of the neck and the 0 % graduation mark (i.e. between the points A and B in figures 1 to 5) shall be as shown for the appropriate butyrometer in table 2.

6.6 Graduated tube

The graduated tubes of all butyrometers shall be of the flat bore type as shown in cross section in figures 1 to 5.

6.7 Bulb

The capacity of the bulb of the butyrometers up to the graduation mark nearest to the bulb (i.e. between the points C and D in figures 1 to 5) shall be at least 1.5 mL.

The bulb shall be conical and tapered, as illustrated in figures 1 to 5, so that liquids can flow freely from the bulb into the graduated tube when the butyrometer is inverted.

A small patch of matt surface shall be provided on the bulb on which temporary marking can be placed when necessary.

7 Graduation and figuring

7.1 General

All graduations and figuring shall be permanent.

7.2 Basis of graduation

The basis of graduation shall be as shown for the appropriate butyrometers in table 2.

NOTE. If the capacity of the graduated portion of the butyrometer is correct at 20 °C, the increase in capacity when the temperature of the butyrometer is 65 °C (149 °F) (i.e. the temperature at which the fat is read) is only one-fifth of the total error allowed on the butyrometer. The increase is therefore negligible for practical purposes.

7.3 Length of scale

The total length of the scale from 0 % graduation mark to the graduation mark nearest the bulb shall be not less than the value given for the appropriate butyrometer in table 2.

7.4 Position of scale

The graduated tube shall remain uniform in cross section for at least 3 mm beyond each end of the scale.

7.5 Graduation lines

7.5.1 Graduation lines shall be clean permanent lines of uniform thickness between 0.1 mm and 0.2 mm.

7.5.2 All graduation lines shall lie in planes perpendicular to the axis of the graduated tube.

7.6 Spacing of the graduation lines

There shall be no obvious irregularity in the spacing of the graduation lines.

Table 1. Dimensions						
Overall length	Internal diameter of neck	Length of neck	Maximum external diameter of body	Maximum external diameter of bulb	Minimum wall thickness, except the neck	Minimum wall thickness of the neck
mm	mm	mm	mm	mm	mm	mm
190 ± 5	11.5 ± 0.5	14.5 ± 1.5	25	15	1.0	1.5

Table 2. Capacities and scales of Gerber butyrometers for milk and milk products

Product tested	Scale in % fat	Nominal quantity tested	Basis of graduation	Capacity of body	Length of scale to be at least	Short graduated line at each	Graduations of intermediate length at each	Numbered at each
Skimmed milk, double quantity	% 0.5	21.88 mL	0.125 mL corresponds to 0.05 % fat	mL 43.5 ± 0.5	mm 20	% 0.02	% —	% 0.1
Partly skimmed milk, buttermilk or whey	4	10.94 mL	0.125 mL corresponds to 1 % fat	21.9 ± 0.4	65	0.05	0.1	1
Milk	8	10.94 mL	0.125 mL corresponds to 1 % fat	21.5 ± 0.4	65	0.1	0.5	1
Milk	10	10.94 mL	0.125 mL corresponds to 1 % fat	21.5 ± 0.4	65	0.2	—	1
Cheese	40	3 g	1.350 mL corresponds to 40 % fat	21 ± 0.5	65	1	5	10
Cream	70	5 g	3.974 mL corresponds to 70 % fat	21 ± 0.5	65	1	5	10

7.7 Range of scale and scheme of graduation

The range and graduation of the scale shall be as given in table 2 and as shown in figures 1 to 5.

Short graduation lines shall be at least 2 mm in length for the 0.5 % and 4 % butyrometers, and at least 3 mm in length for all other butyrometers.

Graduation lines of intermediate length shall project beyond the left and right of the short graduation lines for a distance of at least 1 mm.

The numbered graduation lines shall be carried completely across the front face of the 'flat scale'.

8 Limits of scale error

When determined in accordance with appendix A, errors in the scale, at the standard reference temperature, shall be as follows.

- (a) For the 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.

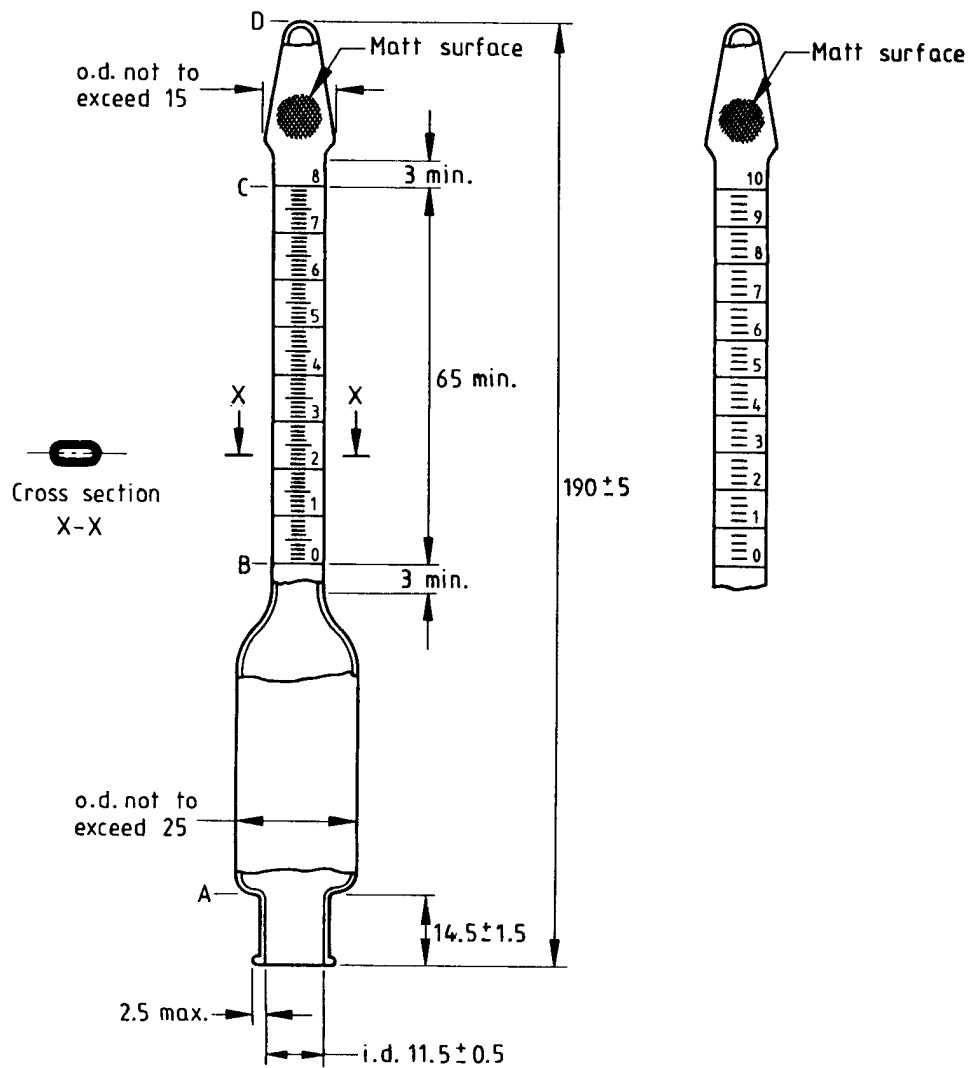
9 Inscriptions

9.1 The following inscriptions shall be marked on each butyrometer:

- (a) an indication of the use of the butyrometer, i.e. skimmed milk, partly skimmed milk, milk, cheese or cream;
- (b) an indication of the quantity, i.e. double quantity, 10.94 mL (or ml), 3 g or 5 g;
- (c) the manufacturer's and/or vendor's name or mark;
- (d) the number 'BS 696' to indicate a claim of compliance with BS 696 : Part 1*;
- (e) the type of glass, if it is not soda-lime-silica glass.

NOTE. If required, an identification number may also be inscribed on the butyrometer.

* Marking BS 696 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.



All dimensions are in millimetres.

Figure 1. Gerber butyrometer for testing milk showing 8 % scales and 10 % scales