

1. -----IND- 2019 0289 CZ- EN- ----- 20190628 --- --- PROJET

Executive summary for the EC (not part of this legislation)

‘Butyrometers’ may be placed on the market and put into use in the Czech Republic as specified measuring instruments pursuant to Act No 505/1990 on metrology, as amended. According to the Act, specified measuring instruments are instruments which are included in the list of the types of specified measuring instruments (Implementing Decree No 345/2002) and, at the same time, intended (by the manufacturer/importer) for measurements of relevance to the protection of public interests in *consumer protection, contractual relations, imposition of sanctions, fees, tariffs and taxes, health protection, environmental protection, occupational safety or the protection of other public interests protected by separate legislation*. This means that their purpose is similar to that used for defining specified products – measuring instruments and non-automatic weighing instruments – under Directives 2014/31/EU and 2014/32/EU. The requirements of this regulation do not apply to measuring instruments placed on the market in the Czech Republic for purposes other than the above purposes defined by Act No 505/1990 on metrology.

The subject matter of this notified regulation is to lay down the metrological and technical requirements for specified measuring instruments of this type. This regulation also lays down the tests for the purposes of type approval and verification of specified measuring instruments of this type.

(End of executive summary)

PUBLIC NOTICE

As the authority with substantive and territorial jurisdiction in the matter of laying down metrological and technical requirements for legally controlled measuring instruments and stipulating the testing methods for type approval and verification of legally controlled measuring instruments pursuant to § 14(1) of Act No 505/1990 on metrology, as amended (hereinafter the ‘Metrology Act’), and in accordance with the provisions of § 172 et seq. of Act No 500/2004, the Code of Administrative Procedure (hereinafter the ‘CAP’), the Czech Metrology Institute (hereinafter the ‘CMI’) commenced ex officio proceedings on 12 February 2016 pursuant to § 46 of the CAP, and, based on supporting documents, issues the following:

I.

DRAFT GENERAL MEASURE

number:0111-OOP-C098-19

laying down the metrological and technical requirements for legally controlled measuring instruments, including testing methods for type approval and verification of the following legally controlled measuring instruments:

‘butyrometers’

1 Basic definitions

For the purposes of this General Measure, terms and definitions pursuant to VIM and VIML¹ and the following must apply:

1.1

volumetric glassware

a glass measuring instrument calibrated for a certain volume of liquid, which is indicated with a gauge mark or scale, and is used, for example, to check volume for laboratory purposes

1.2

butyrometer

a glass instrument with an empirical scale depicting % content of fat

1.2.1

milk butyrometer

used to determine fat content of milk

1.2.2

butyrometer for powdered milk

used to determine fat content of powdered milk

1.2.3

butyrometer for cream and butter

used to determine fat content of cream and of butter

1.2.4

butyrometer for cheese

used to determine fat content of cheese

1.2.5

butyrometer for skim milk

used to determine fat content of skim milk

1.3

meniscus

the curved surface of a liquid in a tube, whose shape depends on the liquid's surface tension

1.4

graduation mark

a visible mark on the volumetric glassware parallel to the reading level, indicating a given volume

1.5

volume mark

a graduation mark corresponding to a certain volume of a given product

¹ TNI 01 0115 International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM) and International Vocabulary of Legal Metrology (VIML) are part of the technical harmonisation compendium 'Terminology in the field of metrology', which is publicly available at www.unmz.cz.

**1.6
scale**

an organised set of graduation marks situated on volumetric glassware

**1.7
nominal volume**

the largest value of volume marked on volumetric glassware

**1.8
true volume**

the volume value of volumetric glassware obtained through measurement

**1.9
volume error**

the measurement result minus the true value of measurement

**1.10
graduation**

the interval between two adjacent graduation marks of a scale

**1.11
waiting time**

a period of time stipulated for volumetric glass calibrated for discharge volume starting from the end of the discharge period. Waiting time data applies only to distilled water.

**1.12
discharge period**

a specified time of continuous liquid discharge from a pipette or burette. It is counted from the complete opening of the pipette's suction opening or the opening of the burette's stopcock to maximum flow until the end of continuous discharge

2 Metrological requirements

2.1 Reference conditions

The reference temperature is 20 °C.

2.2 Measuring instrument types and overall dimensions

Butyrometers must be manufactured with an evenly graduated scale. The scale numbering gives the weight content of fat in per cent. Butyrometers must comply with requirements specified in Figures 1a, 1b, 1c, 1d, 2a, 2b, 3, 4, and Tables 1 to 3 a in Articles 2.2.1.1 and 2.2.4.

2.2.1 Glass butyrometers for milk

The shape and dimensions of butyrometers must match those shown in Figures 1a, 1b, 1c and 1d.

2.2.1.1 Maximum permissible scale errors

Maximum permissible scale errors are as follows:

- a) for a butyrometer with a scale range of 0 % to 0.5 %:
an error in one part of the scale covering at least four fifths of the entire scale must not exceed a value corresponding to plus/minus half of the smallest graduation mark on the scale;
- b) for all other butyrometers:
errors in each of at least three approximately identical and consecutive parts of the scale together covering most of the scale and the algebraic sum of these errors must not exceed a value corresponding plus/minus half of the smallest graduation mark of the scale.

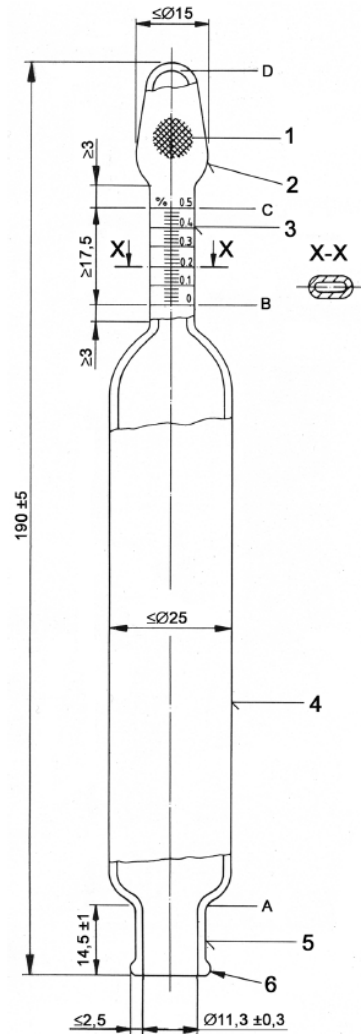


Figure 1a

Butyrometer with a scale range of 0 % to 0.5 % with a plain neck

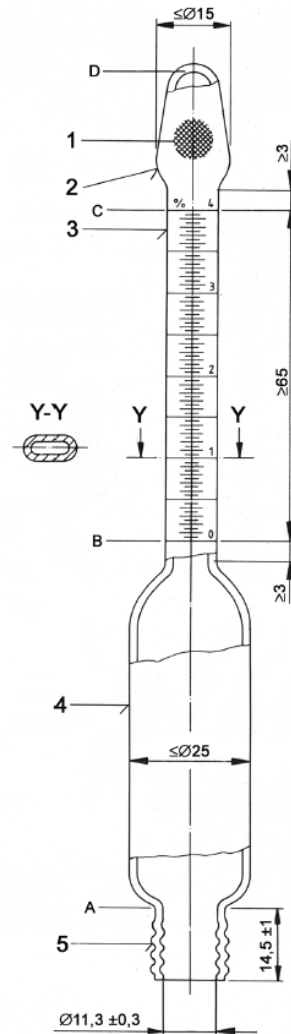


Figure 1b

Butyrometer with a scale range of 0 % to 4 % with a ring neck

Legend: 1 – bulb; 2 – matte surface; 3 – measuring tube; 4 – body; 5 – neck; 6 – edge bead

Figures 1a, 1b - Butyrometer for milk

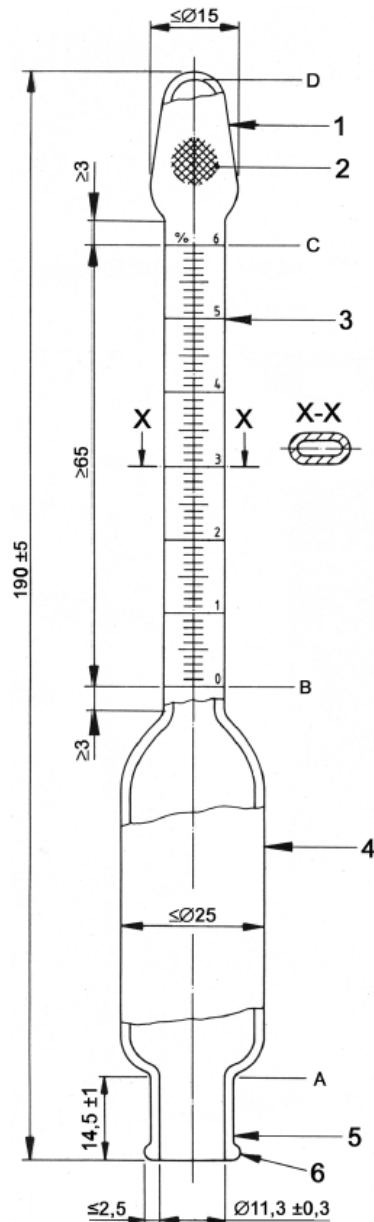


Figure 1c

Butyrometer with a scale range of 0 % to 6 % with a plain neck

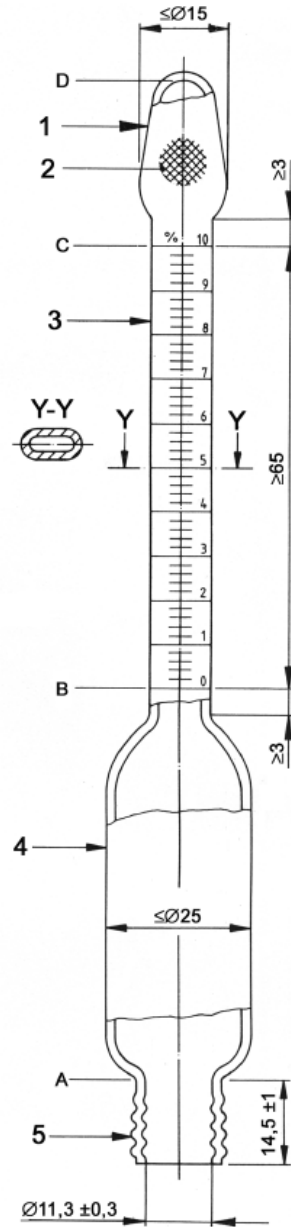


Figure 1d

Butyrometer with a scale range of 0 % to 10 % with a ring neck

Legend: 1 – bulb; 2 – matte surface; 3 – measuring tube; 4 – body; 5 – neck; 6 – edge bead

Figures 1c, 1d - Butyrometer for milk

Table 1 - Body capacity by butyrometer type

Scale range (% fat)	Body capacity (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

NOTE The scale numbering gives the weight content of fat in per cent, i.e. grams of fat in 100 cm³ of milk when 11 cm³ is used for analysis.

2.2.2 Glass butyrometers for powdered milk

The basic shape and dimensions of a butyrometer used to determine fat content of powdered milk must correspond to those shown in Figures 2a and 2b.

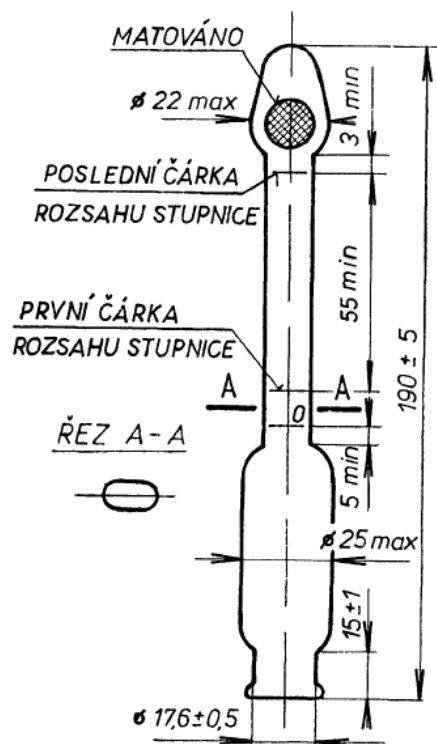


Figure 2a

Butyrometer for powdered milk

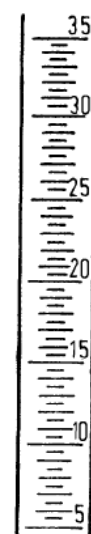


Figure 2b

Scale design

Figures 2a, 2b - Butyrometer for powdered milk

MATOVÁNO	MATTE
POSLEDNÍ ČÁRKA ROZSAHU STUPNICE	LAST MARK OF THE SCALE RANGE
PRVNÍ ČÁRKA ROZSAHU STUPNICE	FIRST MARK OF THE SCALE RANGE
ŘEZ A-A	SECTION A-A

The dimensions and maximum permissible errors of butyrometers used to determine the per cent of fat in powdered milk are specified in Table 2.

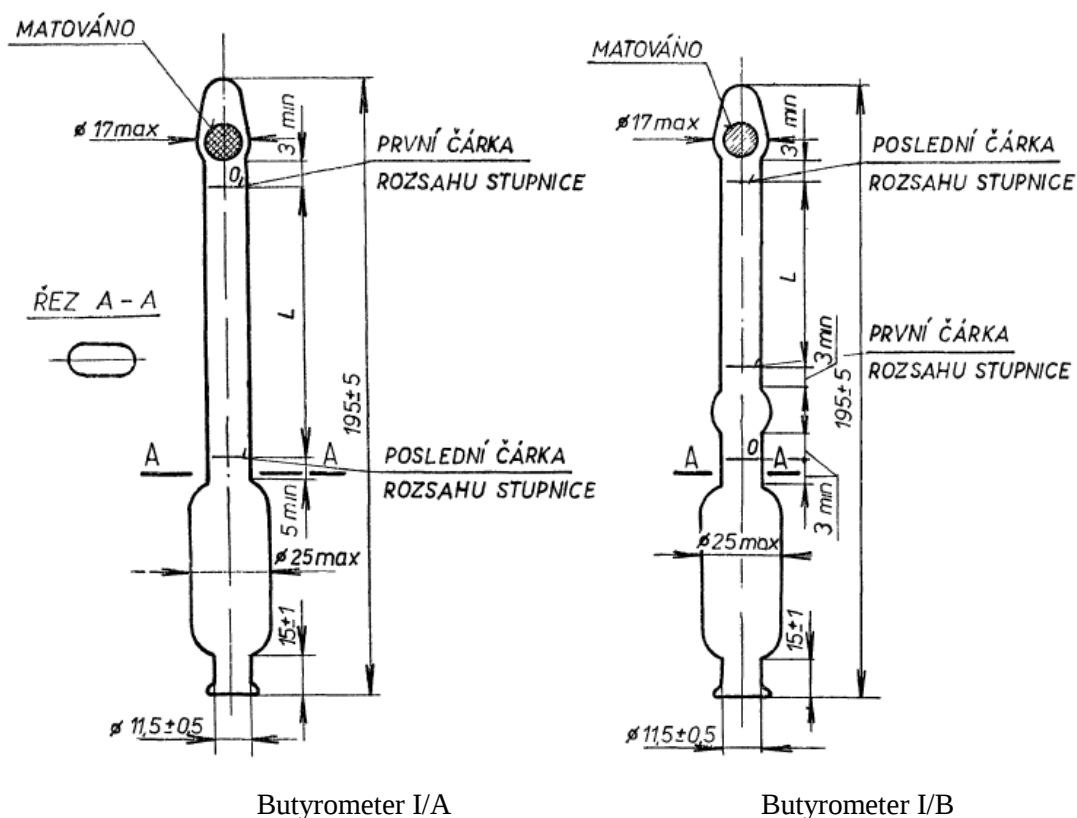
Table 2 - Dimensions and maximum permissible errors of butyrometers for powdered milk

Measuring range	(5 to 35) %
Scale graduation	0.5 %
Scale numbering	5.0 %
Volume of body (b) at 20 °C	(19.5 ± 0.5) ml

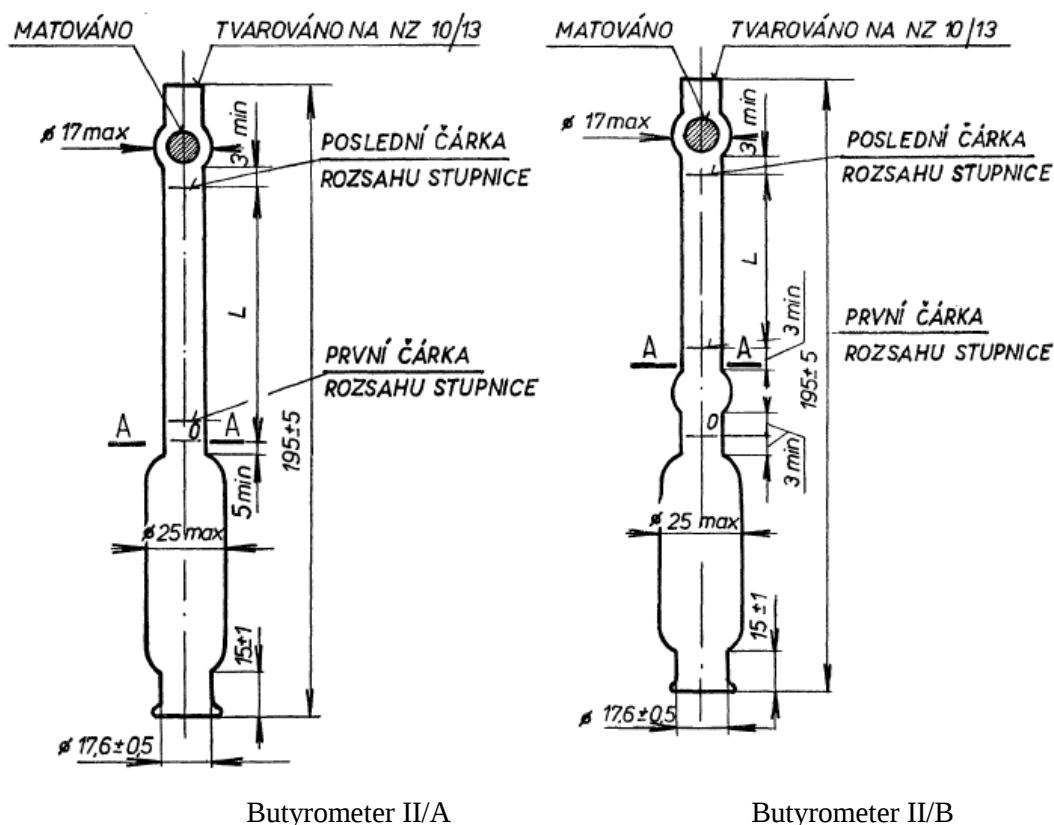
Volume of the measuring tube corresponding to 5 % fat content at 20 °C	
graduated section c_1	0.1426 ml
non-graduated section c_2	0.1346 ml
Maximum permitted errors in measuring tube volume	0.15 % 4.3 μ l

2.2.3 Glass butyrometers for cream and butter

The basic shape and dimensions of a butyrometer used to determine fat content of cream and butter must correspond to those shown in Figure 3. The dimensions and maximum permissible errors of butyrometers used to determine the per cent of fat in cream and butter are specified in Table 3.



MATOVÁNO	MATTE
POSLEDNÍ ČÁRKA ROZSAHU STUPNICE	LAST MARK OF THE SCALE RANGE
PRVNÍ ČÁRKA ROZSAHU STUPNICE	FIRST MARK OF THE SCALE RANGE
ŘEZ A-A	SECTION A-A



MATOVÁNO	MATTE
TVAROVÁNO NA NZ 10/13	SHAPED TO NZ 10/13
POSLEDNÍ ČÁRKA ROZSAHU STUPNICE	LAST MARK OF THE SCALE RANGE
PRVNÍ ČÁRKA ROZSAHU STUPNICE	FIRST MARK OF THE SCALE RANGE

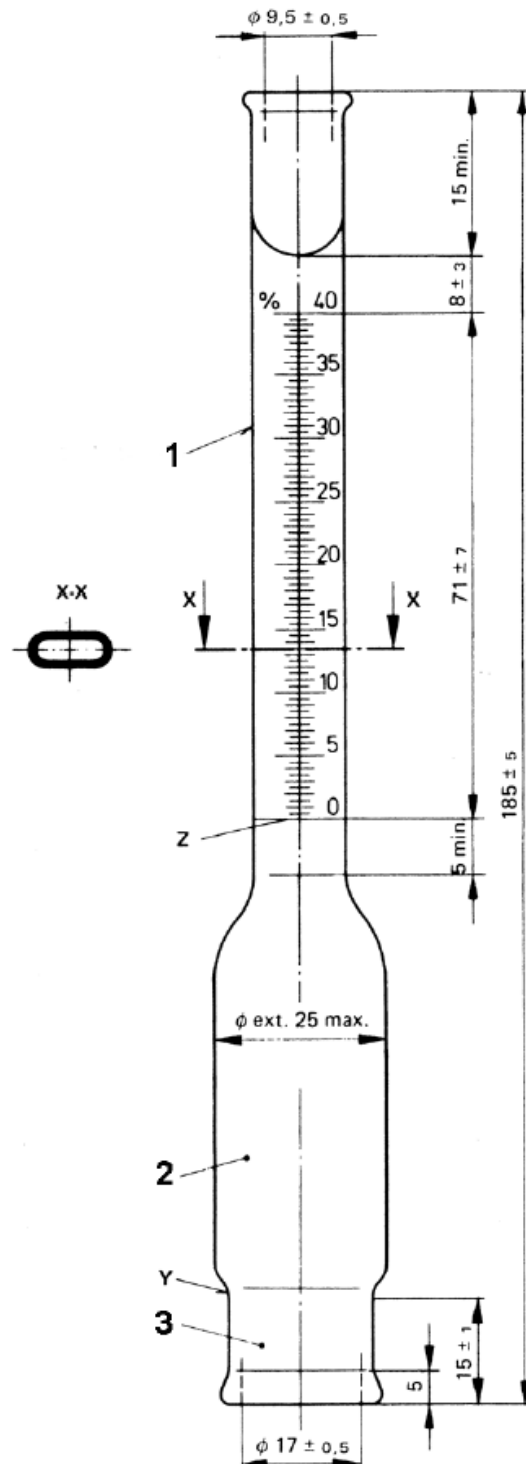
Figure 3 - Glass butyrometers for cream and butter (design types)

Table 3 - Dimensions and maximum permissible errors of butyrometers for cream and butter

Sample size		5 ml			5 g			
Type		I/A	I/A	I/B	II/A	II/A	II/B	II/B
Measuring range	%	0–20	0–40	30–55	5–20	5–40	30–55	75–90
Scale graduation	%	0.5			0.5			
Scale numbering	%	5	10	5	5	10	5	5
Scale length L min.	mm	65	72	50	48	63	50	45
Volume of body (b) at 20 °C	ml	20±0.5	19±0.5	18±0.5	24.5±0.5	23.5±0.5	22.5±0.5	20.5±0.5
Measuring tube volume at 20 °C	ml							
graduated section c ₁		0.289 3	0.284 4	0.273 0	0.286 6			
corresponding to 5 % fat non-graduated section c ₂		-	-	1.706 3	0.278 6	0.269 5	1.702 5	4.288 0
Permitted errors in measuring tube volume	%	±0.1	±0.2	±0.2	±0.1	±0.2		
	ml	±5.7	±11.5	±10.9	±5.7	±11.5		

2.2.4 Glass butyrometers for cheese

The basic shape and dimensions of a butyrometer used to determine fat content of cheese must correspond to those shown in Figure 4.



Legend: 1 – measuring tube; 2 – body; 3 – neck; X-X – section; Y – level Y; Z – level Z

Figure 4 – Butyrometer for cheese (dimensions in millimetres)

The dimensions and maximum permissible errors of butyrometers used to determine the per cent of fat in cheese are specified in Table 4 plus as follows: Openings must be cylindrical, smooth and have a bead on the outer edge of their end.

The inner diameter of the neck must not exceed 25 mm.

The scale must be graduated as follows:

- | | |
|---|---|
| • Scale length, mm | (71 ± 7) mm |
| • Scale range, fat in % by weight | 0 to 40 |
| • Number of graduations | 80 |
| • Graduation | in each 0.5 % |
| • Medium length marks | at each 1 %, i.e. every two graduations |
| • Longest scale marks | at each 5 %, i.e. every 10 graduations |
| • Numbering | at every 5 %, i.e. every 10 graduations |
| • Maximum deviation from desired volume | 0.25 %, i.e. half of a graduation of the measuring tube scale between every two graduations of the scale (i.e. 0.25 g of fat per 100 g of sample) |

3 Technical requirements

3.1 Material and design

3.1.1 Material

Butyrometers must be made of clear glass free of visible defects. The internal stress of the glass must be reduced through cooling to minimise the chance of cracks appearing due to thermal or physical shock. The glass must be resistant to chemicals used by methods used to determine fat content.

3.1.2 Design

The inner surface of butyrometers must be smooth and free of defects so that when used they do not prevent the fat from entering the measuring tube.

The outer surface of butyrometers must be axially symmetrical, and changes in cross-section must be smooth, especially at the point where the body meets the measuring tube.

A butyrometer's walls must be sufficiently thick at all points, and thus appropriate for its intended purpose. Minimum wall thickness at any point must be 0.9 mm.

The butyrometer's neck must be cylindrical or conical.

Marks, numbering and inscriptions must be clear and resistant to conditions of use.

Marks must be perpendicular to the longitudinal axis of the measuring tube, symmetrical along this axis, and must not exhibit any visible irregularity in spacing.

Numbers accompanying marks must be permanent and clearly legible, the numerals must be situated immediately above the mark to which they refer, and must lie to the right of the longitudinal axis of the scale and be oriented upward if the butyrometer is standing vertically with its head pointing up.

The per cent symbol (%) must be permanent, clearly legible and must be located to the left of the highest numeral of the scale.

4 Measuring instrument markings

Each butyrometer must be clearly marked with the following information:

- the manufacturer;
- the purpose of the butyrometer;
- identification of the relevant technical standard.

4.1 Official mark placement

The official mark can be etched or sandblasted onto the rear side of the butyrometer body.

5 Measuring instrument type approval

These measuring instruments are subject to type approval pursuant to Act No 505/1990 on metrology, as amended. Type approval of butyrometers must be performed on at least three specimens. The conformity of measuring instruments with requirements in Chapters 2, 3 and 4 is assessed, and the tests specified in this chapter and Chapter 6 are performed.

5.1 Number of specimens for testing

The number of specimens needed for type tests is determined by the entity performing the test.

5.2 Visual inspection

During the visual inspection, the butyrometer is checked to ensure it complies with submitted documentation, and special attention must be paid to checking that markings, volume marks and volume indication are correct. Butyrometers must not be physically damaged or deformed and must be entirely clean.

5.3 Functional test

A functional test for butyrometer type approval includes:

- a) a check of the butyrometer's dimensions;
- b) a check that the butyrometer's volume is correct.

5.3.1 Test equipment accuracy requirements

For volume and dimension tests, regular laboratory equipment is used along with the following measuring instruments:

- a) a slide gauge with 0.01 mm graduations;
- b) a 300 mm flat steel ruler with millimetre or 0.5 mm graduations;
- c) a 25 ml graduated pipette of accuracy class A, maximum permissible error of ± 0.1 ml, and 0.2 ml graduations;
- d) a glass thermometer (0 to 30) °C with 0.1 °C graduations;
- e) a burette with 0.1 ml graduations, to which a long, thin capillary with a tip must be connected, or an automatic burette;
- f) a microburette, to which a long, thin capillary with a tip and a filling apparatus must be connected;
- g) Class II reference scales with an upper weighing limit of 200 g;
- h) a set of weights up to 200 g, a secondary Class II reference (F 1);
- i) a special automatic water dispenser;
- j) distilled water;
- k) a suitable test medium.

Measuring instruments specified in Article 5.3.1(a) to (i) must have valid calibration.

5.3.2 Check of dimensions

A check is performed to determine whether the design and dimensions of the butyrometer complies with requirements and technical documentation.

5.3.3 Volume check

Pursuant to Chapter 6, the following volumes are checked:

- a) of the butyrometer body;
- b) of the measuring tube (that the scale is correct).

6 Initial verification

6.1 Initial verification is performed on butyrometers of approved type.

The following is performed during initial verification of the measuring instrument:

- a) a check of prescribed essentials as per dimension tables;
- b) preparation for measurement;
- c) a volume check.

6.1.2 Given the different volumes of butyrometer measuring tubes, special microburettes must be used for the measurement of individual types of butyrometers (see Figure 5).

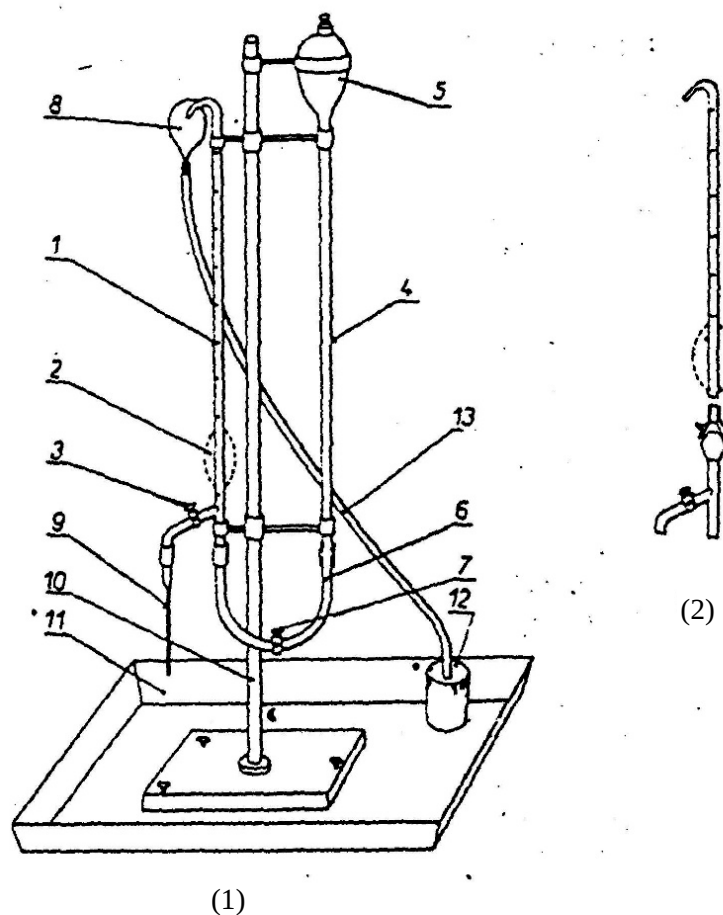


Figure 5 - Microburette

Table 4 stipulates classification of butyrometer types for specific purposes, measuring range requirements and basic information on microburettes as reference devices for butyrometer verification.

Table 4 - Classification of butyrometer types for specific purposes and basic information on reference devices (microburettes).

Butyrometer				Microburette		
Specification		Measuring range	Note	Volume of one per cent of fat	Scale graduation	Scale range
		%		ml	%	%
For milk		0–10	---	0.125	1	10 to 0
For powdered milk		5–35	The section from 5 to 0 is without graduation, is shorter and has a volume of 0.1346 ml	0.02852	5	35 to 0
Na cream	KF	0–20	---	0.05786	5	20 to 0
		0–40	---	0.05688	10	40 to 0
		30–55	The section from 30 to 0 is replaced by expansion of the capillary by a volume of 1.7063 ml	0.05460	5	55 to 0
	R	5–20	The section from 5 to 0 is without graduation, is shorter and has a volume of 0.2786 ml	0.05732	5	20 to 0
		5–40	The section from 5 to 0 is without graduation, is shorter and has a volume of 0.2695 ml	0.05732	10	40 to 0
		30–55	The section from 30 to 0 is replaced by expansion of the capillary by a volume of 1.7025 ml	0.05732	5	55 to 0
For butter		75–90	The section from 75 to 0 is replaced by expansion of the capillary by a volume of 4.2876 ml	0.05732	5	90 to 0
For cheese		0–20	---	0.034 16	5	20 to 0

	5–40	The section from 5 to 0 is without graduation, is shorter and has a volume of 0.1617 ml	0.03454	5	40 to 0
--	------	---	---------	---	---------

6.1.2.1 Microburette description

The microburette (1) is a glass capillary tube with inner diameter of 1 to 3 mm (depending on butyrometer type), with a scale. The scale is designed to also take into account some irregular volume divisions of the given butyrometer type. In some cases, if a certain part of the butyrometer's measuring tube has a wider portion without graduation, the microburette also has a corresponding wider portion (2). The microburette scale is graduated according to the scale of the relevant butyrometer. It spans a length of 350 mm to 500 mm (depending on butyrometer type). Graduations are either every 1 % or every 5 %. Table 4 gives the approximate main dimensions of microburettes for individual butyrometer types. The upper end of the microburette has a curved overflow spout; the bottom section, under the scale, has a side-mounted stopcock with its outlet aiming downward. The open bottom end of the microburette is connected to a filling apparatus. For quick use, it is possible to terminate the connecting tube above the side-mounted stopcock with a ground glass joint to which a microburette with a corresponding ground glass joint is simply connected, and the entire assembly is secured by binding it together across glass projections fused to both parts.

The filling apparatus consists of a narrow tube (4) with a larger container on its upper end (5) that can be sealed with a ground glass stopper. Both parts – the microburette and the filling apparatus – are joined using short rubber hoses in a "U" shape (6) with an open stopcock (7). This "U" tube can be fused directly to both the filling apparatus and the microburette so that both parts make up a continuous whole. A small collector (8) is attached or fused to the overflow spout allowing collection of mercury that has overflowed. A short piece of hose is used to attach a long, thin capillary tube (9) to the outlet of the stopcock (3) on the lower part of the microburette; this capillary tube can be inserted all the way into the body of the butyrometer. The microburette is filled with clean, dry mercury. The container supplying the filling apparatus (5) situated above the level of the overflow spout of the microburette should have a volume of at least 10 ml. The entire device is situated on a suitable stable stand (10), high enough above the workbench to make it possible to comfortably attach the butyrometer to the capillary tube on the stopcock of the microburette (9). The entire device is placed on a relatively wide, non-metallic pan with raised edges that are about 50 mm high (11).

6.1.2.2 Finishing and marking of microburettes

The measuring range of the microburette, specified in Table 4, is indicated downward from the upper graduation mark on the microburette. Smaller sections of the scale without graduations, and therefore also wider sections, are in the lower part of the microburette scale. The upper graduation mark is situated under the overflow spout of the microburette; the overflow cannot be considered, i.e. used past the end of the scale as an endpoint.

6.1.2.3 Special automatic water dispenser

A butyrometer scale open at both ends can also be measured out with an automatic dispenser using distilled water. A butyrometer terminated with a heart is checked before it is fused shut. The dispenser is of piston type, always adjusted for the type of butyrometer being measured out. Prior to butyrometer verification, it must always be adjusted according to a reference measured out by weighing, and during verification of a series must be checked as soon as a discrepancy appears between the correctness of the butyrometer under verification and the dispenser.

6.2 Test procedure

6.2.1 Visual inspection

A visual inspection of the butyrometer is used to determine the following:

- a) whether the quality of the glass and the build of the butyrometer comply with requirements prescribed in relevant tables for individual butyrometers;
- b) whether the information on the butyrometer, the graduation, execution and numbering of the scale are valid according to relevant scales provided in Chapter 2 of this Measure.

The visual inspection is performed in diffuse daylight without the use of any other tools.

The butyrometer is measured to determine whether it is the proper length, the size of the smallest graduation and the length of the scale according to relevant tables.

6.2.2 Preparation for measurement

If the butyrometer complies with the above requirements, its volume is checked.

The butyrometer must be completely clean, degreased and dry. Particulates are rinsed off with water. To degrease the butyrometer, a 5–10 % solution of potassium dichromate in concentrated sulphuric acid can be used, which is poured into the butyrometer and allowed to stand for 2 to 3 hours. It is then thoroughly rinsed with distilled water. Use of alkaline solutions is not recommended. The washed butyrometers are dried in an oven for at least one hour at about 150 °C to 200 °C.

6.2.3 Tests using the volume method (direct)

Volumetric measurement determines whether the butyrometer body, measured from the scale graduation mark by the body to the point where the neck meets the body, and the volume of the measuring tube comply with requirements stipulated in Chapter 2 of this Measure. The accuracy of the butyrometer scale is checked using the appropriate microburette (see Table 4). The meniscus of the medium must match the level of the relevant graduation mark.

6.2.4 Tests using the mass (gravimetric) method

During gravimetric verification of a butyrometer, its body is filled with an appropriate test medium to the nearest graduation mark on the scale. The butyrometer is then placed upright into a suitable beaker and placed on a weighing scale. Weighing is performed on a single-bowl reference scale with a weighing range of up to 200 g.

7 Subsequent verification

Butyrometers are not subject to subsequent verification.

8 Measuring instrument check

When checking measuring instruments pursuant to § 11a of the Metrology Act at the request of an entity that could be affected by its incorrect measurement, Chapter 6 is followed. The maximum permissible error used is the maximum permissible error pursuant to Chapter 2.

9 Notified standards

For the purposes of specifying the metrological and technical requirements for measuring instruments and specifying the testing methods for their type approval and verification arising from this general measure, the CMI shall notify Czech technical standards, other technical standards or technical

documents of international or foreign organisations, or other technical documents containing more detailed technical requirements (hereinafter referred to as 'notified standards'). The CMI will publish a list of these notified standards attached to the relevant measures, together with the general measure, in a manner accessible to the public (on www.cmi.cz).

Compliance with notified standards or parts thereof is to be considered, to the extent and under the conditions laid down in the general measure, as compliance with those requirements laid down in this measure to which these standards or parts thereof apply.

Compliance with notified standards is one way of demonstrating compliance with the requirements. These requirements may also be met by using another technical solution guaranteeing an equivalent or higher level of protection of legitimate interests.

II.

GROUND S

Pursuant to § 14(1)(j) of the Metrology Act, the CMI has issued this Measure of a General Nature toward the implementation of § 6(2), § 9(1) and (9), and § 11a(3) of the Metrology Act, laying down metrological and technical requirements for specified measuring instruments and tests for type approval and verification of specified measuring instruments – 'butyrometers'.

Decree No 345/2002 specifying measuring instruments for mandatory verification and measuring instruments subject to type approval, as amended, classifies the measuring instruments under item 1.3.7 in the annex entitled 'List of specified measuring instruments' as measuring instruments subject to type approval and mandatory verification.

This legislation (Measure of a General Nature) will be notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.

III.

INSTRUCTIONS

In accordance with § 172(l), in conjunction with § 39(l) APC, the CMI has stipulated a time limit for comments of 30 days as of the date of posting on the official notice board. Comments submitted after this time limit will not be considered.

The persons concerned are hereby invited to comment on this draft Measure of a General Nature. With a view to the provisions of § 172(4) of the APC, the comments shall be submitted in writing and meet the requirements for submissions in accordance with § 37 of the APC.

The comments shall include the particulars referred to in § 37(2) APC and clearly state the following: who is making the comments; which general measure they concern; to what extent the comments challenge the measure; how the general measure runs contrary to legislation or how the general measure or the procedure that preceded it is inaccurate; which matters the comments concern and what is being proposed. Said comments must also identify the administrative authority to which they are addressed and be signed by the person making them.

The supporting documents for this draft general measure may be consulted at the Czech Metrology Institute, Legal Metrology Department, Okružní 31, 638 00 Brno, after making arrangements by telephone.

This draft general measure shall be posted for 15 days.

Czech Metrology Institute
Director General