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**Butter — Determination of moisture,  
non-fat solids and fat contents (Routine  
methods) —**

**Part 3:  
Calculation of fat content**

*Beurre — Détermination des teneurs en eau, en matière sèche non  
grasse et en matière grasse (Méthodes de routine) —*

*Partie 3: Calcul de la teneur en matière grasse*

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E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

International Dairy Federation  
Diamant Building • Boulevard Auguste Reyers 80 • B-1030 Brussels  
Tel. + 32 2 733 98 88  
Fax + 32 2 733 04 13  
E-mail [info@fil-idf.org](mailto:info@fil-idf.org)  
Web [www.fil-idf.org](http://www.fil-idf.org)

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## Foreword

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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 8853-3|IDF 191-3 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*, and the International Dairy Federation (IDF), in collaboration with AOAC International. It is being published jointly by ISO and IDF and separately by AOAC International.

ISO 8851|IDF 191 consists of the following parts, under the general title *Butter — Determination of moisture, non-fat solids and fat contents (Routine methods)*:

- *Part 1: Determination of moisture content*
- *Part 2: Determination of non-fat solids content*
- *Part 3: Calculation of fat content*

## Foreword

**IDF (the International Dairy Federation)** is a worldwide federation of the dairy sector with a National Committee in every member country. Every National Committee has the right to be represented on the IDF Standing Committees carrying out the technical work. IDF collaborates with ISO and AOAC International 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 National Committees casting a vote.

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All work was carried out by the Joint ISO/IDF/AOAC Action Team on *Water*, of the Standing Committee on *Main components of milk*, under the aegis of its project leader, Mr J. Evers (NZ).

# Butter — Determination of moisture, non-fat solids and fat contents (Routine methods) —

## Part 3: Calculation of fat content

### 1 Scope

This part of ISO 8851|IDF 191 specifies a procedure for the calculation of the fat content of butter.

### 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 8851-1|IDF 191-1, *Butter — Determination of moisture, non-fat solids and fat contents (Routine methods) — Part 1: Determination of moisture content*

ISO 8851-2|IDF 191-2, *Butter — Determination of moisture, non-fat solids and fat contents (Routine methods) — Part 2: Determination of non-fat solids content*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### fat content

mass fraction of substances calculated by the procedure specified in this part of ISO 8851|IDF 191

NOTE The fat content is expressed as a percentage by mass.

### 4 Principle

The fat content is calculated by subtracting the mass fraction of substances determined by the procedures specified in ISO 8851-1|IDF 191-1 and ISO 8851-2|IDF 191-2 from 100 %.

### 5 Calculation and expression of results

#### 5.1 Calculation

Calculate the fat content,  $w_f$ , by using the following equation:

$$w_f = 100 \% - (w_m + w_s) \%$$

where

- $w_f$  is the fat content, in percent by mass, of the test sample used in the determinations carried out in accordance with both ISO 8851-1|IDF 191-1 and ISO 8851-2|IDF 191-2;
- $w_m$  is the moisture content, in percent by mass, of the test sample obtained by the procedure described in ISO 8851-1|IDF 191-1, expressed to two decimal places;
- $w_s$  is the non-fat solids content, in percent by mass, of the same test sample as that used in the determination of ISO 8851-1|IDF 191-1, obtained in accordance with ISO 8851-2|IDF 191-2, expressed to two decimal places.

## 5.2 Expression of results

Express the results to one decimal place.

## 6 Precision

### 6.1 Interlaboratory test

The individual values obtained in the interlaboratory tests of ISO 8851-1|IDF 191-1 and ISO 8851-2|IDF 191-2 have been used to calculate mathematically the precision values for this part of ISO 8851|IDF 191. Details of these tests are given in Annex A.

The values derived from these interlaboratory tests may not be applicable to concentration ranges and matrices other than those given.

### 6.2 Repeatability

The absolute difference between two independent single test results, obtained using the same method on identical test material in the same laboratory, by the same operator using the same equipment within a short interval of time, will in not more than 5 % of cases be greater than 0,35 %.

### 6.3 Reproducibility

The absolute difference between two single test results, obtained using the same method on identical test material in different laboratories with different operators using different equipment, will in not more than 5 % of cases be greater than 0,54 %.

## 7 Test report

The test report shall specify:

- a) all the information required for the complete identification of the sample;
- b) the sampling method used, if known;
- c) the test method used, together with reference to this part of ISO 8851|IDF 191;
- d) all operating details not specified in this part of ISO 8851|IDF 191, or regarded as optional, together with details of any incident that may have influenced the result(s);
- e) the test result(s) obtained or, if the repeatability has been checked, the final quoted results obtained.

## Annex A (informative)

### Results of interlaboratory trials

The results obtained from two collaborative studies [4], [5] were subjected to statistical analysis in accordance with ISO 5725-1 and ISO 5725-2. Additionally, a meta-analysis was performed to calculate pooled precision estimates for repeatability and reproducibility using the following equation [5]:

$$x_p^2 = \frac{\sum v_i x_i^2}{\sum v_i}$$

where

- $x_p$  is the pooled estimate for repeatability or reproducibility;
- $x_i$  is the  $i$ th estimate of repeatability or reproducibility for each study;
- $v_i$  is the number of degrees of freedom associated with estimate  $x_i$ .

**Table A.1 — Results of interlaboratory tests**

Sample	Bibliographic reference	Number of labs.	Mean % <sup>a</sup>	$r$ <sup>b</sup> % <sup>a</sup>	$R$ <sup>c</sup> % <sup>a</sup>	RSD(r) <sup>d</sup> %	RSD(R) <sup>e</sup> %
Salted Ammix	[4]	8	81,62	0,42	0,58	0,18	0,25
Low salt Ammix	[4]	8	81,89	0,38	0,56	0,16	0,24
Unsalted Fritz	[4]	8	81,63	0,28	0,60	0,12	0,26
Salted Fritz	[4]	8	82,56	0,29	0,48	0,13	0,21
Salted Fritz	[4]	8	81,19	0,35	0,62	0,15	0,27
Salted Fritz	[4]	8	82,92	0,65	0,68	0,28	0,29
Unsalted Fritz	[4]	8	81,63	0,34	0,62	0,15	0,27
Salted Fritz	[5]	8	81,50	0,11	0,37	0,05	0,16
Unsalted Fritz	[5]	8	82,91	0,27	0,48	0,12	0,21
Salted Fritz	[5]	8	81,71	0,52	0,92	0,23	0,40
Salted Fritz	[5]	8	81,21	0,41	0,46	0,18	0,20
Salted Fritz	[5]	8	81,03	0,18	0,34	0,08	0,15
Salted Ammix	[5]	8	81,30	0,17	0,36	0,08	0,16
Low salt Ammix	[5]	8	81,97	0,26	0,45	0,11	0,19
Salted Ammix	[5]	8	81,58	0,24	0,48	0,11	0,21

<sup>a</sup> Mass fraction.  
<sup>b</sup> Repeatability limit ( $2,8 s_r$ ).  
<sup>c</sup> Reproducibility limit ( $2,8 s_R$ ).  
<sup>d</sup> Relative repeatability standard deviation.  
<sup>e</sup> Relative reproducibility standard deviation.

## Bibliography

- [1] ISO 707, *Milk and milk products — Guidance on sampling*<sup>1)</sup>
- [2] ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*
- [3] ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*
- [4] EVERS, J.M., CRAWFORD, R.A., WIGHTMAN, L.M. and KISSLING, R.C. Routine methods for the determination of solids-not-fat, moisture and fat (by difference) in butter — robustness, bias and precision. *International Dairy Journal*, **11**(3), 2001 pp. 127-136
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1) Corresponds to IDF 50.