



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 11816-1:2023**

**01-februar-2023**

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**Mleko in mlečni proizvodi - Določanje aktivnosti alkalne fosfataze - 1. del:  
Fluorimetrijska metoda za mleko in pijače na osnovi mleka (ISO/DIS 11816-1:2022)**

Milk and milk products - Determination of alkaline phosphatase activity - Part 1:  
Fluorimetric method for milk and milk-based drinks (ISO/DIS 11816-1:2022)

Milch und Milcherzeugnisse - Bestimmung der Aktivität der alkalischen Phosphatase -  
Teil 1: Fluorimetrisches Verfahren für Milch und flüssige Milchprodukte (ISO/DIS 11816-  
1:2022)

Lait et produits laitiers - Détermination de l'activité de la phosphatase alcaline - Partie 1:  
Méthode fluorimétrique pour le lait et les boissons à base de lait (ISO/DIS 11816-1:2022)

**Ta slovenski standard je istoveten z: prEN ISO 11816-1**

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**ICS:**

67.100.10	Mleko in predelani mlečni proizvodi	Milk and processed milk products
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# DRAFT INTERNATIONAL STANDARD

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## Milk and milk products — Determination of alkaline phosphatase activity —

### Part 1: Fluorimetric method for milk and milk-based drinks

*Lait et produits laitiers — Détermination de l'activité de la phosphatase alcaline —**Partie 1: Méthode fluorimétrique pour le lait et les boissons à base de lait*

ICS: 67.100.10

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## ISO/DIS 11816-1:2022(E)

### Forewords

**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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document 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 the European Committee for Standardization (CEN) Technical Committee CEN/TC 302, *Milk and milk products — Methods of sampling and analysis*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement). It is being published jointly by ISO and IDF.

This fourth edition cancels and replaces the third edition (ISO 11816-1|IDF 155-1:2013), which has been technically revised. The main changes compared with the previous edition are as follows:

The FLM200 required updating of the electronics to meet world regulatory requirements. Therefore, the instrument was discontinued, and we introduce the FLM300 version of the instrument. This version upgraded the electronics and the user interface. The changes in the user interfaced had an impact on some of the instructions for use and the flow of those instructions which are detailed here in the new standard. There was no change to the assay or the test procedure with the changes to the software and interface. The instrument now includes the heater block which was a separate item previously.

A list of all parts in the ISO 11816|IDF 155 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

**IDF (the International Dairy Federation)** is a non-profit private sector organization representing the interests of various stakeholders in dairying at the global level. IDF members are organized in National Committees, which are national associations composed of representatives of dairy-related national interest groups including dairy farmers, dairy processing industry, dairy suppliers, academics and governments/food control authorities.

ISO and IDF collaborate closely on all matters of standardization relating to methods of analysis and sampling for milk and milk products. Since 2001, ISO and IDF jointly publish their International Standards using the logos and reference numbers of both organizations.

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This document was prepared by the IDF *Standing Committee on Analytical Methods for Processing Aids and Indicators* and ISO Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*. It is being published jointly by ISO and IDF.

The work was carried out by the IDF-ISO Action Team P05 of the *Standing Committee on Analytical Methods for Processing Aids and Indicators* under the aegis of its project leader Mr Rick Zampa (US).

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# Milk and milk products — Determination of alkaline phosphatase activity —

## Part 1: Fluorimetric method for milk and milk-based drinks

### 1 Scope

This part of ISO 11816|IDF 155 specifies a fluorimetric method for the determination of alkaline phosphatase (ALP, EC 3.1.3.1) activity in raw and heat-treated whole milk, semi-skimmed milk, skimmed milk and flavoured milks. This method is applicable to milk and milk-based drinks from cows, sheep and goats. It is also applicable to milk powder after reconstitution.

The instrument can read activities up to 7 000 milliunits per litre (mU/l). If the activity is higher than 7 000 mU/l, it is diluted with alkaline phosphatase-free milk (7.1) so as to obtain a measurement not higher than 7 000 mU/l.

### 2 Normative references

There are no normative references in this document.

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### **alkaline phosphatase (ALP) activity**

activity of the alkaline phosphatase present in the product, determined by the specified procedure

Note 1 to entry: The alkaline phosphatase activity is expressed as milliunits of enzyme activity per litre of sample (mU/l).

#### 3.2

##### **unit of alkaline phosphatase activity**

amount of alkaline phosphatase enzyme that catalyses the transformation of 1  $\mu$ mol of substrate per minute

### 4 Principle

The alkaline phosphatase activity of the sample is measured by a continuous fluorimetric direct kinetic assay. A non-fluorescent aromatic monophosphoric ester substrate, 2'-[2-benzothiazolyl]-6'-hydroxybenzothiazole phosphate, in the presence of any alkaline phosphatase derived from the sample, undergoes hydrolysis of its phosphate radical, producing a highly fluorescent product. Fluorimetric measurement of alkaline phosphatase (ALP) activity is measured at 38 °C over a 3 min period when

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using Fluorophos®<sup>1)</sup>. This includes pre-incubation of substrate and sample, followed by multiple kinetic readings of the reaction rate.

NOTE Although this is a 3 min test, the first minute is an equilibration period to ensure that the sample is at 38 °C. Measurements of activity are actually made from the beginning of the second minute to the end of the third minute (i.e. over a 2 min period).

### 5 Reagents

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and distilled or demineralized water or water of equivalent purity.

**5.1 Fluorophos® substrate**,<sup>2)</sup> in bottles, each containing 144 mg of Fluorophos® substrate powder, molecular weight 580 grams per mole.

This is a non-fluorescent aromatic monophosphoric ester substrate, 2'-[2-benzothiazolyl]-6'-hydroxybenzothiazole phosphate (Fluorophos®). The Fluorophos® substrate remains stable for two years from the date of manufacture, provided it is stored in unopened bottles at between 2 °C and 8 °C. Protect against light.

**5.2 Substrate buffer solution**, diethanolamine (DEA) buffer solution,  $c(\text{DEA}) = 2,4 \text{ mol/l}$ , with pH 10,0, in bottles of 240 ml each. The substrate buffer solution remains stable for two years from the date of manufacture, provided it is stored in unopened bottles at between 2 °C and 8 °C. Protect against light.

**5.3 Working substrate**

Allow the Fluorophos® substrate (5.1) and the substrate buffer solution (5.2) to come to room temperature. Add the content of one bottle of substrate buffer solution (240 ml) (5.2) to that of one bottle of Fluorophos® substrate (144 mg) (5.1), and mix well by inversion for 3 min to create a ~1,0 millimolar (pH 10) solution. Use amber glass to protect against light.

Allow the obtained solution to stand at room temperature for at least 30 min prior to use.

Use the A/D (analogue-to-digital) test given in 9.2 to test the suitability of the ready-to-use working substrate. Do not use the working substrate if a reading above 1 200 FLU (fluorescence units) is obtained.

The working substrate remains stable for 60 days when protected from light and stored at between 2 °C and 8 °C, or for 8 h when stored at 38 °C.

NOTE The volume of the working substrate (240 ml) obtained is sufficient for approximately 115 tests.

**5.4 Calibrator solutions**, Fluoroyellow®(FY) [2'-(2-benzothiazolyl)-6'-hydroxybenzothiazole] in substrate buffer solution (5.2).

The calibrator solutions remain stable for 18 months from the date of manufacture, provided they are stored in unopened bottles at between 2 °C and 8 °C. Mix gently prior to use to ensure optimal results.

1) Fluorophos is a registered trademark. This information is given for the convenience of users of this document and does not constitute an endorsement by either ISO or IDF of these products. Equivalent products may be used if they can be shown to lead to the same results.

2) The reagents specified in 5.1 to 5.5 and the apparatus specified in 6.1 to 6.4 (except 6.3.3) comprise the Fluorophos Test System, which is the trade name of a product supplied by Advanced Instruments, LLC, Two Technology Way, Norwood, Massachusetts 02062, USA. The manufacturer may change the packaging configurations supplied with Fluorophos Test system. The user should refer to the manufacturer's instructions for preparing reagents if different from those specified herein. Fluorophos and Fluoroyellow are trademarks of Advanced Instruments, Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IDF of the products named. Equivalent products may be used if they can be shown to lead to the same results.

**5.4.1 Calibrator solution A**, containing 0  $\mu\text{mol/l}$  of Fluoroyellow®.

**5.4.2 Calibrator solution B**, containing  $17,24 \times 10^{-3} \mu\text{mol/l}$  of Fluoroyellow®.

**5.4.3 Calibrator solution C**, containing  $34,48 \times 10^{-3} \mu\text{mol/l}$  of Fluoroyellow®.

**5.5 Daily instrument control solution**, containing  $34,48 \times 10^{-3} \mu\text{mol/l}$  of Fluoroyellow®.

The daily instrument control solution remains stable for 18 months from the date of manufacture, provided it is stored in unopened bottles at between 2 °C and 8 °C. Mix gently prior to use to ensure optimal results.

## 6 Apparatus

Usual laboratory equipment and, in particular, the following.

**6.1 Filter fluorimeter**, with thermostatically controlled cuvette holder, capable of operating at  $38 \text{ °C} \pm 1 \text{ °C}$  and right-angle optics, allowing excitation at a wavelength of 440 nm and emission at between 520 nm and 560 nm [e.g. Fluorophos® instrument<sup>1)</sup>].

**6.2 Cuvettes**, disposable, non-fluorescent glass, of diameter 12 mm and of length 75 mm.

**6.3 Pipettes**

**6.3.1 Fixed-volume dispenser**, capable of dispensing 2,0 ml.

**6.3.2 Positive-displacement or air displacement pipette**, of capacity 0,075 ml.

Follow strict instructions for pipetting technique as this is a critical step in generating accurate results. Ensure that piston of pipette bore is tightly secured prior to use.

**6.3.3 Pipettes**, of capacity 2 ml and 3 ml.

**6.4 Incubator block**, capable of maintaining a temperature of  $38 \text{ °C} \pm 1 \text{ °C}$ , suitable for holding cuvettes.

**6.5 Suitable laboratory-grade film.**

**6.6 Vortex mixer.**

**6.7 Water bath**, capable of maintaining a temperature of  $63 \text{ °C} \pm 1 \text{ °C}$  and  $95 \text{ °C} \pm 1 \text{ °C}$ .

**6.8 One-mark volumetric flasks**, of capacity 100 ml.

## 7 Sampling

Sampling is not part of the method specified in this part of ISO 11816|IDF 155. A recommended sampling method is given in ISO 707|IDF 50 <sup>[1]</sup>.

A presentative sample should have been sent to the laboratory. It should not have been damaged or changed during transport or storage.