
Frozen surimi — Specification

Surimi congelé — Spécifications

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Foreword

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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).

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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.

This document was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 6, *Meat, poultry, fish, eggs and their products*.

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.

Frozen surimi — Specification

1 Scope

This document specifies the requirements for frozen surimi and the test methods for its quality control. It also specifies the requirements of packaging, marking, storage and transportation.

This document is applicable to tropical and cold-water surimi.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1442, *Meat and meat products — Determination of moisture content (Reference method)*

ISO 2917, *Meat and meat products — Measurement of pH — Reference method*

AOAC Official Method 925.05, *Sucrose in Animal Feed*

AOAC Official Method 973.28, *Sorbitol in Food Gas Chromatographic Method*

AOAC Official Method 995.11, *Phosphorus (Total) in Foods Colorimetric Method*

CAC/RCP 1, *General Principles of Food Hygiene*

CAC/RCP 8, *Code of Practice for the Processing and Handling of Quick Frozen Foods*

CAC/RCP 52, *Code of Practice for Fish and Fishery Products*

CXS 193, *General Standard for Contaminants and Toxins in Food and Feeds*

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:

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

3.1

frozen surimi

paste of fish myofibrillar protein product processed by pretreatment, cleaning and mechanically separating fish flesh from the skin and bones, and then the fish flesh is washed, minced, refined, dewatered, mixed with *cryoprotectants* (3.2) and quick frozen

Note 1 to entry: The minced fish flesh is washed and refined in order to remove the remnants of bones, scales, skins, black films, viscera, connective tissue and blood clots.

Note 2 to entry: Frozen surimi is an intermediate ingredient that can be further processed into surimi-based products.

3.2

cryoprotectant

food ingredient or food additive to reduce or prevent the frozen denaturation of fish protein during quick freezing and frozen storage

3.3

gel strength

physico-chemical index to characterize the elasticity of surimi, which is expressed by the gel-forming ability of surimi after heating under specified conditions

Note 1 to entry: Gel strength is expressed in g·cm.

3.4

spot

defect

non-exogenous impurity in surimi visible to the naked eye

Note 1 to entry: Spots are mainly tiny broken fish skins, small bones, scales and any matter other than fish flesh, which remain in the surimi during processing.

3.5

whiteness

white colour degree of surimi

Note 1 to entry: The higher the whiteness value, the greater the whiteness.

4 Requirements

4.1 Fish

The fish shall be from a fishing zone designated by the Food and Agriculture Organization of the United Nations (FAO) and captured with permitted fishing gear. Frozen surimi shall be prepared from fresh or frozen fish of a quality fit for human consumption. The eviscerated and headless fish may be used as raw materials.

4.2 Processing requirements

4.2.1 The key steps of frozen surimi processing are: fish flesh separating, washing, refining, dewatering, cryoprotectants mixing and quick freezing.

4.2.2 During the processing of surimi, the temperature of fish flesh should not exceed 10 °C, while the processing temperature for some tropical fish should not exceed 15 °C. The specific parameters of washing and dewatering shall be designed according to the fish species, freshness of raw fish and the desired quality grade of surimi. Cryoprotectants may be added in surimi and thoroughly mixed in order to prevent protein denaturation and lipid oxidation during quick freezing and frozen storage. To enhance the cryoprotection of surimi, very small quantities of egg whites may be added, but it is not permitted to introduce other animal or vegetable proteins or starch into surimi. After suitable preparation, surimi shall be quick frozen to maintain product quality. After quick freezing, the central temperature of frozen surimi shall be lower than -18 °C.

4.3 Organoleptic requirements

Frozen surimi shall conform to the requirements given in [Table 1](#).

Table 1 — Organoleptic requirements of frozen surimi

Characteristic	Requirement
Appearance	The surface of the frozen surimi block is clean, smooth, without cracks or traces of deformation, without signs of thawing, without ice, without weathering. It shows the uniform and viscous appearance of fish paste after thawing.
Colour	From light grey, milky white to slightly pinkish.
Odour/smell	Having a characteristic fresh fish odour. A sour smell, smell of spoilage, extraneous or unusual odours are not allowed.
Impurities	No visible exogenous impurities.

4.4 Physico-chemical requirements

Frozen surimi shall conform to the requirements given in [Table 2](#).

Table 2 — Physico-chemical requirements of frozen surimi

Characteristic	Requirement									Analysis method
	TA	SSA	SA	FA	AAA	AA	A	AB	B	
Gel strength (g·cm)	≥ 900	≥ 700	≥ 600	≥ 500	≥ 400	≥ 300	≥ 200	≥ 100	< 100	See Annex A for information
Spots (count per 5 g)	≤ 8	≤ 10	≤ 12			≤ 15			≤ 20	See Annex B for information
Moisture (%)	≤ 75,0	≤ 76,0			≤ 78,0			≤ 80,0		ISO 1442
pH	6,5 to 7,4									ISO 2917
Central temperature (°C)	≤ -18,0									See Annex C for information
Whiteness ^a	Conform to the agreement									See Annex D for information
^a According to the requirements for whiteness agreed by both trade parties.										

4.5 Requirements for the use of cryoprotectants

Where the following cryoprotectants are used, the requirements given in [Table 3](#) shall be followed.

Table 3 — Requirements for the use of cryoprotectants

Cryoprotectants	International Numbering System for Food Additives	Maximum level
Sorbitol, sorbitol syrup	420(i), 420(ii)	Good manufacturing practice
Phosphates	339(i)-(iii); 340(i)-(iii); 341(i)-(iii); 342(i)-(ii); 343(i)-(iii); 450(i)-(iii),(v)-(vii),(ix); 451(i),(ii); 452(i)-(v); 542	2 200 mg/kg (naturally present and added, as total phosphorus)
Sucrose	—	Good manufacturing practice

4.6 Contaminant

Contaminant content of products covered by this document shall conform to the maximum levels given by CXS 193.

4.7 Hygienic requirements

Frozen surimi shall be prepared and handled in accordance with the appropriate sections of CAC/RCP 1, CAC/RCP 52, CAC/RCP 8 and other relevant CODEX codes of hygienic practice and codes of practice.

5 Test methods

5.1 General

If not specified, the reagents used for each test method are all analytical reagents and the water used is distilled water.

5.2 Procedure for thawing

Put between 2 kg and 10 kg of frozen surimi blocks in a chilled thawing chamber with a temperature of 0 °C to 4 °C for 10 h to 18 h, until the central temperature of surimi sample rises to between –5 °C and –2 °C. The equivalent thawing method can be equally accepted.

5.3 Organoleptic evaluation

Put the sample (100 g) on a clean white porcelain dish and conduct organoleptic evaluation item by item in a well-lit and odour-free environment in accordance with the requirements given in [4.3](#).

5.4 Test methods of physico-chemical requirements

5.4.1 Gel strength

[Annex A](#) provides information on a suitable method for detecting gel strength.

5.4.2 Spots (defects)

[Annex B](#) provides information on a suitable method for detecting spots.

5.4.3 Moisture

The test method of mass fraction of moisture shall be carried out as specified in ISO 1442.

5.4.4 pH

The test method of pH of surimi shall be carried out as specified in ISO 2917.

5.4.5 Central temperature

For the test method of central temperature of product, see [Annex C](#) for detailed information.

5.4.6 Whiteness

For the test method of whiteness, see [Annex D](#) for detailed information.

5.5 Test methods of cryoprotectants

5.5.1 Sorbitol and sorbitol syrup

The test method of sorbitol and sorbitol syrup shall be carried out as specified in AOAC Official Method 973.28.

5.5.2 Phosphates

The test method of phosphates shall be carried out as specified in AOAC Official Method 995.11.

5.5.3 Sucrose

The test method of sucrose shall be carried out as specified in AOAC Official Method 925.05.

6 Packaging, marking, storage and transportation

6.1 Packaging

Packaging in contact with frozen surimi shall be fit for direct contact with food. The packaging shall not transmit any odour or flavour to the product and shall not contain substances which can damage the product or have a health risk. Packaging material shall not be disjointed during freezing.

6.2 Marking

The packages shall be marked or labelled as required by the country of destination. At least the name and grade of the product, the scientific name or the FAO 3-alpha code of fish species or both shall be marked. The surimi made from more than three kinds of fish species can be marked as "mix fish surimi". If food cryoprotectants, egg whites or both are added to the surimi, the type and usage amounts shall also be clearly labelled.

6.3 Storage

The product shall be stored in a hygienic, odour-free and cold storage with a temperature lower than $-18\text{ }^{\circ}\text{C}$. Frozen surimi produced in different specifications and batches should be stacked separately. The bottom-layer products should be separated from the ground by pallets.

6.4 Transportation

Use a closed, clean and hygienic refrigerated vehicle to transport products. The temperature of the vehicle shall not be higher than $-18\text{ }^{\circ}\text{C}$ during transportation. It shall not be transported with toxic or corrosive material, material with a peculiar smell or material that can produce pollution.

Annex A (informative)

Determination of gel strength

A.1 Principle

Add edible salt to the semi-thawed surimi and prepare the surimi gel after chopping, mixing, stuffing, heating and cooling. When the probe moves to the sample deck of the elastometer or texture analyser at a constant speed, the probe squeezes surimi gel until it breaks. The breaking force and breaking strain are measured. The gel strength of surimi is obtained by the multiplication of these two values.

A.2 Apparatus

The usual laboratory apparatus and, in particular, the following shall be used.

A.2.1 Elastometer or texture analyser, with a test range not less than 60 mm/min and a spherical probe with a diameter of 5 mm.

A.2.2 Thermostatic water bath, with a probe descent velocity from room temperature to 100 °C.

A.2.3 Thermometer, with a range of -20 °C to 110 °C.

A.2.4 Sausage stuffer, where the diameter of the filling tube is less than 33 mm.

A.2.5 Chopper.

A.2.6 Polyvinyl chloride (PVC) casing, where the folding diameter is no more than 48 mm.

A.3 Operation steps

A.3.1 The preparation of surimi gel

A.3.1.1 Thawing

Refer to [5.2](#).

A.3.1.2 Chopping

The sample volume necessary for fish paste preparation depends on the consistency of testing and the capacity of the chopper. Generally, 500 g or more of surimi sample is chopped with a pre-cooled chopper. When the sample temperature is between 0 °C and 3 °C, a mass fraction of 3 % edible salt is evenly sprinkled into it. Further grind and mash the sample until a homogenized, viscous and delicate fish paste is formed. During the whole process, keep the temperature at 10 °C or less for surimi paste made from cold-water fish and at 15 °C or less from tropical fish.

A.3.1.3 Stuffing

Immediately stuff the fish paste into a PVC casing uniformly, with both ends of the tube tied without air pockets.

A.3.1.4 Heating and cooling

Place the filled sausage tube in a water bath, previously equilibrated to $90\text{ °C} \pm 1\text{ °C}$, for 30 min. Remove and quickly put into ice water for about 30 min to cool completely, then leave it at room temperature (not higher than 25 °C) for between 12 h and 24 h.

A.3.1.5 Segment

Remove the casing off the cooled surimi gel and cut it into a 15 mm-to-30 mm-long test sample. The cut shall be neat and smooth without cracks.

A.3.2 Measurement of gel strength

Put the test sample of surimi gel on the sample deck of the tester so the centre of the sample comes just under the probe. The probe is moving to the sample deck at a constant speed of 60 mm/min. When the probe is inserted into the surimi gel, the breaking force (the maximum force required to break surimi gel, which is expressed in grams by an integral number) and the breaking strain (the displacement distance of probe from touching surimi gel until the gel is broken, which is expressed in 0,01 cm) are measured, and 10 parallel samples shall be tested continuously.

A.3.3 Calculation

The gel strength is calculated by [Formula \(A.1\)](#). When calculating, the maximum and minimum values are removed and the average value of the remaining parallel samples is calculated by an integral number.

$$X = \frac{1}{n} \sum_{i=1}^n W_i \times L_i \quad (\text{A.1})$$

where

X is gel strength, in g·cm;

W is breaking force, in g;

L is breaking strain, in cm;

n is the tested number of parallel samples;

i is the sequence number of parallel samples.

A.3.4 Precision

Relative deviation of parallel experiments shall not be more than 10 %.

Annex B (informative)

Determination of spots

B.1 Operation steps

Weigh 5 g of test sample which has been prepared according to [5.2](#) and place it in a colourless, transparent film bag. Spread the test sample to the thickness of 1 mm or less and count the number of visible spots in it.

B.2 Calculation

Counting rules:

- a spot of 2 mm or larger shall be counted as one;
- a spot between 1 mm and 2 mm shall be counted as one half;
- any unnoticeable matter smaller than 1 mm shall be disregarded.

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