CODEX ALIMENTARIUS
INTERNATIONAL FOOD STANDARDS

Food and Agriculture Organization of the United Nations
World Health Organization

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STANDARD FOR QUICK FROZEN FISH STICKS (FISH FINGERS), FISH PORTIONS AND FISH FILLETS - BREADED OR IN BATTER

CODEX STAN 166 – 1989

Adopted 1989. Revisions 1995, 2004.
Amendments 2011, 2013, 2014.

1. SCOPE

This standard applies to quick frozen fish sticks (fish fingers) and fish portions cut from quick frozen fish flesh blocks, or formed from fish flesh, and to natural fish fillets, breaded or batter coatings, singly or in combination, raw or partially cooked and offered for direct human consumption without further industrial processing.

2. DESCRIPTION

2.1 Product Definition

A fish stick (fish finger) is the product including the coating weighing not less than 20 g and not more than 50 g shaped so that the length is not less than three times the greatest width. Each stick shall be not less than 10 mm thick.

A fish portion including the coating, other than products under 2.1.1, may be of any shape, weight or size.

Fish sticks or portions may be prepared from a single species of fish or from a mixture of species with similar sensory properties.

Fillets are slices of fish of irregular size and shape which are removed from the carcass by cuts made parallel to the back bone and pieces of such fillets, with or without the skin.

2.2 Process Definition

The product after any suitable preparation shall be subjected to a freezing process and shall comply with the conditions laid down hereafter. The freezing process shall be carried out in appropriate equipment in such a way that the range of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C or colder at the thermal centre after thermal stabilization. The product shall be kept deep frozen so as to maintain the quality during transportation, storage and distribution.

Industrial repacking or further industrial processing of intermediate quick frozen material under controlled conditions which maintains the quality of the product, followed by the re-application of the quick freezing process, is permitted.

2.3 Presentation

Any presentation of the product shall be permitted provided that it:

- meets all the requirements of the standard, and
- is adequately described on the label to avoid confusing or misleading the consumer.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw Material

3.1.1 *Fish*

Quick frozen breaded or battered fish sticks (fish fingers) breaded or battered fish portions and breaded or battered fillets shall be prepared from fish fillets or minced fish flesh, or mixtures thereof, of edible species which are of a quality such as to be sold fresh for human consumption.

3.1.2 *Coating*

The coating and all ingredients used therein shall be of food grade quality and conform to all applicable Codex standards.

3.1.3 *Frying fat (oil)*

A fat (oil) used in the cooking operation shall be suitable for human consumption and for the desired final product characteristic (see also Section 4).

3.2 Final Product

Products shall meet the requirements of this standard when lots examined in accordance with Section 9 comply with the provisions set out in Section 8. Products shall be examined by the methods given in Section 7.

3.3 Decomposition

The products shall not contain more than 10 mg/100 g of histamine based on the average of the sample unit tested. This shall apply only to species of *Clupeidae, Scombridae, Scombresocidae, Pomatomidae* and *Coryphaenedae* families.

4. FOOD ADDITIVES

Only the use of the following additives is permitted.

Humectants – Moisture/Water Retention Agents		
INS Number	Additive Name	Maximum Level in Product
339(i)	Sodium dihydrogen phosphate	2200 mg/kg as phosphorus, singly or in combination
339(ii)	Disodium hydrogen phosphate	
339(iii)	Trisodium phosphate	
340(i)	Potassium dihydrogen phosphate	
340(ii)	Dipotassium hydrogen phosphate	
340(iii)	Tripotassium phosphate	
341(i)	Calcium dihydrogen phosphate	
341(ii)	Calcium hydrogen phosphate	
341(iii)	Tricalcium phosphate	
450(i)	Disodium diphosphate	
450(ii)	Trisodium diphosphate	
450(iii)	Tetrasodium diphosphate	
450(v)	Tetrapotassium diphosphate	
450(vii)	Calcium dihydrogen diphosphate	
451(i)	Pentasodium triphosphate	
451(ii)	Pentapotassium triphosphate	
452(i)	Sodium polyphosphate	
452(ii)	Potassium polyphosphate	

452(iii)	Sodium calcium polyphosphate	
452(iv)	Calcium polyphosphate	
452(v)	Ammonium polyphosphate	
542	Bone phosphate	
401	Sodium alginate	GMP
Antioxidants		
INS Number	Additive Name	Maximum Level in Product
300	Ascorbic acid	GMP
301	Sodium ascorbate	
303	Potassium ascorbate	
304	Ascorbyl palmitate	1 g/kg
In Addition, for Minced Fish Flesh Only		
Acidity Regulators		
INS Number	Additive Name	Maximum Level in Product
330	Citric acid	GMP
331	Sodium citrate	
332	Potassium citrate	
Thickeners		
INS Number	Additive Name	Maximum Level in Product
412	Guar gum	GMP
410	Carob bean (Locust bean) gum	
440	Pectins	
466	Sodium carboxymethyl cellulose	
415	Xanthan gum	
407	Carrageenan and its Na, K, NH4 salts (including Furcelleran)	
407a	Processed Eucheuma Seaweed (PES)	
461	Methyl cellulose	
Food Additives for Breaded or Batter Coatings		
Raising Agents		
INS Number	Additive Name	Maximum Level in Product
339(i)	Sodium dihydrogen phosphate	440 mg/kg as phosphorus, singly or in combination
340(iii)	Tripotassium phosphate	
341(i)	Calcium dihydrogen phosphate	
341(ii)	Calcium hydrogen phosphate	
341(iii)	Tricalcium phosphate	
450(i)	Disodium diphosphate	
450(ii)	Trisodium diphosphate	
450(iii)	Tetrasodium diphosphate	
450(v)	Tetrapotassium diphosphate	

450(vi)	Dicalcium diphosphate	
450(vii)	Calcium dihydrogen diphosphate	
452(i)	Sodium polyphosphate	
452(ii)	Potassium polyphosphate	
452(iii)	Sodium calcium polyphosphate	
452(iv)	Calcium polyphosphate	
500	Sodium carbonates	GMP
501	Potassium carbonates	
503	Ammonium carbonates	
Flavour Enhancers		
INS Number	Additive Name	Maximum Level in Product
621	Monosodium glutamate	GMP
622	Monopotassium glutamate	
Colours		
INS Number	Additive Name	Maximum Level in Product
160b(i)	Annatto extracts bixin-based	25 mg/kg expressed as bixin or norbixin
160b(ii)	Annatto extract (norbixin-based)	
150a	Caramel I (plain)	GMP
160a(i)	β-carotene (Synthetic)	100 mg/kg singly or in combination
160e	β-apo-carotenal	
Thickeners		
INS Number	Additive Name	Maximum Level in Product
412	Guar gum	GMP
410	Carob bean (Locust bean) gum	
440	Pectins	
466	Sodium carboxymethyl cellulose	
415	Xanthan gum	
407	Carrageenan and its Na, K, NH4salts (including Furcelleran)	
407a	Processed Euchema Seaweed (PES)	
461	Methyl cellulose	
400	Alginic acid	
401	Sodium alginate	
402	Potassium alginate	
403	Ammonium alginate	
404	Calcium alginate	
463	Hydroxypropyl cellulose	
464	Hydroxypropyl methylcellulose	
465	Methylethylcellulose	
Emulsifiers		
INS Number	Additive Name	Maximum Level in Product

471	Monoglycerides of fatty acids	GMP
322	Lecithins	
Modified Starches		
1401	Acid treated starches	GMP
1402	Alkaline treated starches	
1404	Oxidized starches	
1410	Monostarch phosphate	
1412	Distarch phosphate esterified with sodium trimetaphosphate; esterified with phosphorus oxychloride	
1414	Acetylated distarch phosphate	
1413	Phosphated distarch phosphate	
1420	Starch acetate esterified with acetic anhydride	
1421	Starch acetate esterified with vinyl acetate	
1422	Acetylated distarch adipate	
1440	Hydroxypropyl starch	
1442	Hydroxypropyl starch phosphate	

5. HYGIENE

It is recommended that the products covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of the *General Principles of Food Hygiene* (CAC/RCP 1-1969), the *Code of Practice for Fish and Fishery Products* (CAC/RCP 52-2003), the *Code of Practice for the Processing and Handling of Quick Frozen Foods* (CAC/RCP 8-1976) and other relevant Codex Codes of Hygienic Practice and Codes of Practice:

The products should comply with any microbiological criteria established in accordance with the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CAC/GL 21-1997).
The final product shall be free from any foreign material that poses a threat to human health.

When tested by appropriate methods of sampling and examination prescribed by the Codex Alimentarius Commission, the product:

(i) shall be free from microorganisms or substances originating from microorganisms in amounts which may present a hazard to health in accordance with standards established by the Codex Alimentarius Commission;

(ii) shall not contain histamine that exceeds 20 mg/100 g. This applies only to species of *Clupeidae, Scombridae, Scombresocidae, Pomatomidae* and *Coryphaenedae* families;

(iii) shall not contain any other substance in amounts which may present a hazard to health in accordance with standards established by the Codex Alimentarius Commission.

6. LABELLING

In addition to Sections 2, 3, 7 and 8 of the *General Standard for the Labelling of Prepackaged Foods* (CODEX STAN 1-1985) the following specific provisions apply:

6.1 The Name of the Food

The name of the food to be declared on the label shall be "breaded" and/or "battered", "fish sticks" (fish fingers), "fish portions", or "fillets" as appropriate or other specific names used in accordance with the law and custom of the country in which the food is sold and in a manner so as not to confuse or mislead the consumer.

The label shall include reference to the species or mixture of species.

The proportion of fish content should be declared on the label.

In addition there shall appear on the label either the term "quick frozen" or the term "frozen" whichever is customarily used in the country in which the food is sold, to describe a product subjected to the freezing processes as defined in subsection 2.2.

The label shall show whether the products are prepared from minced fish flesh, fish fillets or a mixture of both in accordance with the law and custom of the country in which the food is sold and in a manner so as not to confuse or mislead the consumer.

The label shall state that the product should be maintained under conditions that will maintain the quality during transportation, storage and distribution.

6.2 Storage Instructions

The label shall include terms to indicate that the product shall be stored at a temperature of -18°C or colder.

6.3 Labelling of Non-Retail Containers

Information specified above shall be given either on the container or in accompanying documents, except that the name of the food, lot identification, and the name and address of the manufacturers or packer, as well as storage instructions, shall always appear on the container. However, lot identification, and the name and address may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

7. SAMPLING, EXAMINATION AND ANALYSIS

7.1 Sampling

(i) Sampling of lots for examination of the product shall be in accordance with an appropiate sampling plan with an AQL of 6.5. For prepackaged goods the sample unit is the entire container. For products packed in bulk the sample unit is at least 1 kg of fish sticks (fish finger), fish portions or fillets.

(ii) Sampling of lots for examination of net weight shall be carried out in accordance with an appropriate sampling plan meeting the criteria established by the Codex Alimentarius Comission.

7.2 Determination of Net Weight

The net weight (exclusive of packaging material) is determined on each whole primary container of each sample representing a lot and shall be determined in the frozen state.

7.3 Sensory and Physical Examination

Samples taken for sensory and physical examination shall be assessed by persons trained in such examination and in accordance with procedures elaborated in Sections 7.4 through 7.7, Annex A and the *Guidelines for the Sensory Evaluation of Fish and Shellfish in Laboratories (CAC/GL 31 - 1999)*.

7.4 Estimation of Fish Content

Codex-Adopted Method

AOAC Method 996.15. (End Product Method)

(1) Chemical Analysis Method (Nitrogen Factor End-Product Method)

Appropriate in cases where there is reason to doubt the composition of the fish core (i.e., appears to contain non-fish ingredients).

The percentage fish content, corrected for the non-fish flesh nitrogen contributed by the carbohydrate coating, is calculated as follows.

$$\%\text{Fish} = \frac{(\%\,\text{total nitrogen} - \%\,\text{non - fish flesh nitrogen}}{\text{N factor}^{*}} x100$$

*appropriate N (nitrogen) factor
The non-fish flesh nitrogen is calculated as follows:
% non-fish flesh nitrogen = % carbohydrate X 0.02
Where the carbohydrate is calculated by difference:
% carbohydrate = 100 – (%water + % fat + % protein + % ash)

References
Determination of nitrogen: ISO 937:1978
Determination of moisture: ISO 1442:1997
Determination of total fat: ISO 1443:1973
Determination of ash: ISO 936:1978

(2) Rapid Method Used during Production
The fish content of a fish finger (fish stick) is calculated by using the following equation

$$\%\text{Fish Content} = \frac{\text{Weight of ingoing fish}}{\text{Weight of final product}} x100$$

For most products, therefore, the fish ingredient weight is that of the raw ingredient. Any figure placed or declared on a product label would be a typical quantity reflecting the producer's normal manufacturing variations, in accordance with good manufacturing practice."

Table: Average Nitrogen factors to be used for fish flesh used as raw material for the product

Species	**Nitrogen %**
White fish:	
Cod	2.66
Minced Cod	2.61
Coley/Saithe	2.69
European Hake	2.64
Haddock	2.72
Ling	2.78
Plaice	2.46
Alaskan Pollack	2.59
Whiting	2.68
South Atlantic Hake (mixture of *Merluccius capensis* and *M. paradoxus*)	2.46
Minced South Atlantic Hake (mixture of *Merluccius capensis* and *M. paradoxus*)	2.38
Other species:	
Tilapia	2.88

note: ±10% of variation is allowed due to natural variety (e.g., state of maturity, nutritional status, season)

7.5 Determination of Gelatinous Conditions

According to the AOAC Methods - "Moisture in Meat and Meat Products, Preparation of Sample Procedure"; 983.18 and "Moisture in Meat" (Method A); 950.46.

7.6 Estimation of Proportion of Fish Fillets and Minced Fish Flesh

See Annex B.

7.7 Cooking Methods

The frozen sample shall be cooked prior to sensory assessment according to the cooking instructions on the package. When such instructions are not given, or equipment to cook the sample according to

the instructions is not obtainable, the frozen sample shall be cooked according to the applicable method(s) given below:

Use procedure 976.16 of the A.O.A.C. It is based on heating product to an internal temperature of 65-70°C. Cooking times vary according to size of product and equipment used. If determining cooking time, cook extra samples, using a temperature measuring device to determine internal temperature.

7.8 Determination of histamine

Methods meeting the following method performance criteria may be used:

ML (mg/100g)	Minimum applicable range (mg/100 g)	LOD (mg/100 g)	LOQ (mg/100g)	RSDR (%)	Recovery	Applicable methods that meet the criteria
10 (average)	8 – 12	1	2	16.0	90 – 107	AOAC 977.13 | NMKL 99, 2013 NMKL 196, 2013
20 (each unit)	16 – 24	2	4	14.4	90 – 107	AOAC 977.13 | NMKL 99, 2013 NMKL 196, 2013

8. DEFINITION OF DEFECTIVES

The sample unit shall be considered defective when it exhibits any of the properties defined below:

8.1 Foreign Matter (Cooked State)

The presence in the sample unit of any matter which has not been derived from fish (excluding packing material), does not pose a threat to human health, and is readily recognized without magnification or is present at a level determined by any method including magnification that indicates non-compliance with good manufacturing and sanitation practices.

8.2 Bones (Cooked State) (In packs designated boneless)

More than one bone per kg greater or equal to 10 mm in length, or greater or equal to 1 mm in diameter; a bone less than or equal to 5 mm in length, is not considered a defect if its diameter is not more than 2 mm. The foot of a bone (where it has been attached to the vertebra) shall be disregarded if its width is less than or equal to 2 mm, or if it can easily be stripped off with a fingernail.

8.3 Odour and Flavour (Cooked State)

A sample unit affected by persistent and distinct objectionable odour and flavours indicative of decomposition, or rancidity or of feed.

8.4 Flesh abnormalities

Objectionable textural characteristics such as gelatinous conditions of the fish core together with greater than 86% moisture found in any individual fillet or sample unit with pasty texture resulting from parasites affecting more than 5% of the sample unit by weight.

9. LOT ACCEPTANCE

A lot shall be considered as meeting the requirements of this standard when:

(i) the total number of defectives as classified according to Section 8 does not exceed the acceptance number (c) of an appropriate sampling plan with an AQL of 6.5;

(ii) the average percent fish flesh of all sample units is not less than 50% of the frozen weight;

(iii) the average net weight of all sample units is not less than the declared weight, provided there is no unreasonable shortage in any container; and

(iv) the Food Additives, Hygiene and Labelling requirements of Sections 4, 5 and 6 are met.

ANNEX A

SENSORY AND PHYSICAL EXAMINATION

The sample used for sensory evaluation should not be the same as that used for other examinations.

1. Complete net weight determination, according to defined procedures in Section 7.2.
2. Complete fish core determination on one set of the sample units according to defined procedures in Section 7.4.
3. Complete the estimation of the proportion of fillets and minced flesh, if required.
4. Cook the other set of sample units and examine for odour, flavour, texture, foreign matter, and bones.
5. In cases where a final decision on gelatinous conditions cannot be made in the thawed uncooked state, the disputed material is sectioned from the product and gelatinous condition confirmed by cooking as defined in Section 7.7 or by using the procedure in Section 7.5 to determine if greater than 86% moisture is present in any product unit. If a cooking evaluation is inconclusive, then procedure in 7.5 would be used to make the exact determination of moisture content.

ANNEX B

ESTIMATION OF PROPORTION OF FISH FILLETS AND MINCED FISH FLESH

(West European Fish Technologists Association - WEFTA Method)

a) Equipment

Balance, sensitive to 0.1 g

Circular sieve - 200 mm diameter, 2.5 or 2.8 mesh opening (ISO) soft rubber edge (or blunt) spatula, forks, suitable sized plates, water tight plastic bags.

b) Preparation of Samples

Fish Portions/Sticks: Take as many portions as needed to provide a fish core sample of about 200g (2kg). If breaded and/or battered firrst strip coating according to the method describer in section 7.4.

c) Detemination of Weights "A" of the Frozen Fish Samples

Weight the single fish portions/decoated fish cores while they are still frozen. Smaller portions are combined to a sample sub-units of about 200 g (e.g. 10). fish sticks of about 20 g each). Record the weight "A" n of the sub-units. Place the pre-weighed sample sub-units into water tight bags.

d) Thawing

Thaw the samples by immersing the bags into a gently agitated water bath of about 20ºC, but not more than 35ºC.

e) Draining

After thawing has been completed (duration about 20-30 min.) take each sample unit, one at a time, and drain the exuded fluid (thaw drip) for 2 minutes on a pre-weighed circular sieve incluned at an angle of 17-20 degrees. Remove adhering drip from the bottom of the sieve by use of a paper towel when draining is completed.

f) Determination of weight "B" of the Drained Fish Sample and Weight ”C” of the Thaw Drip

Determine the weight of the drained fish sample "B" - sieve plus fish minus sieve weight. The difference of "A" - "B" is the weight of exuded fluid - thaw drip.

g) Separation

Place the drained fish core on a plate and separate the minced flesh from the fillet using a fork to hold the fillet flesh and a soft, rubber edge spatula to scrape off the minced flesh.