



CD/K/556:2010
ICS 67.120.30

EAST AFRICAN STANDARD

Tuna canned in oil — Specification



EAST AFRICAN COMMUNITY

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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East African Community

P O Box 1096

Arusha

Tanzania

Tel: 255 27 2504253/8

Fax: 255-27-2504481/2504255

E-Mail: eac@eachq.org

Web: www.each.int

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Introduction

Canned tuna promises a vast scope for the development of the internal trade of this commodity. Besides, there is also good international market for canned tuna, if proper quality control measures are taken. The formulation of this standard has been considered necessary in order to help in exercising proper quality control.

In the preparation of this East African Standard, the following sources were consulted extensively:

IS 4304:1976(R2005), *Specification for Tuna Canned in Oil*

CAC/RCP 52:2003(Rev. 4:2008), *Code of practice for fish and fishery products*

IS 4303-1:1975, *Code of hygienic conditions for fish industry — Part 1: Pre-processing stage*

IS 4303-2:1975, *Code of hygienic conditions for fish industry — Part 2: Canning stage*

Codex Alimentarius website: http://www.codexalimentarius.net/mrls/vetdrugs/jsp/vetd_q-e.jsp

USDA Foreign Agricultural Service website: <http://www.mrlatabase.com>

USDA Agricultural Marketing Service website: <http://www.ams.usda.gov/AMSV1.0/Standards>

European Union: http://ec.europa.eu/enterprise/sectors/pharmaceuticals/veterinary-use/maximum-residue-limits/index_en.htm

Assistance derived from these sources is hereby acknowledged.

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Tuna canned in oil — Specification

1 Scope

This East African Standard specifies the requirements and the methods of sampling and test for tuna canned in oil

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.

CAC/GL 21, *Principles for the establishment and application of microbiological criteria for foods*

CAC/RCP 1, *Recommended international code of practice — General principles of food hygiene*

CAC/GL 30, *Principles and guidelines for the conduct of microbiological risk assessment*

CAC/GL 31, *Guidelines for the sensory evaluation of fish and shellfish in laboratories*

CD/K/572:2010, *Fish and fisheries products — Methods of sampling*

CAC/RCP 52[CD/K/521:2010], *Code of practice for fish and fishery products*

EAS 35, *Edible salt — Specification*

EAS 12, *Drinking (potable water) — Specification*

EAS 38, *Labelling of prepackaged foods — Specification*

EAS 41, *Fruits, vegetables and derived products — Sampling and methods of test*

EAS 103, *Schedule for permitted food additives*

EAS 123, *Distilled water — Specification*

ISO 4831, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of coliforms — Most probable number technique*

ISO 4832, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coliforms — Colony-count technique*

ISO 4833, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of microorganisms — Colony-count technique at 30 degrees C*

ISO 6579, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Salmonella spp.*

ISO 6887-1, *Microbiology of food and animal feeding stuffs — Preparation of test samples, initial suspension and decimal dilutions for microbiological examination — Part 1: General rules for the preparation of the initial suspension and decimal dilutions*

ISO 6887-3, *Microbiology of food and animal feeding stuffs — Preparation of test samples, initial suspension and decimal dilutions for microbiological examination — Part 3: Specific rules for the preparation of fish and fishery products*

ISO 6888-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Technique using Baird-Parker agar medium*

ISO 6888-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 2: Technique using rabbit plasma fibrinogen agar medium*

ISO 6888-3, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 3: Detection and MPN technique for low numbers*

ISO 7251, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of presumptive Escherichia coli — Most probable number technique*

ISO 7937, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of Clostridium perfringens — Colony-count technique*

ISO 13720, *Meat and meat products — Enumeration of Pseudomonas spp.*

ISO 16654, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Escherichia coli O157*

ISO 17239, *Fruits, vegetables and derived products — Determination of arsenic content — Method using hydride generation atomic absorption spectrometry*

ISO 6634, *Fruits, vegetables and derived products — Determination of arsenic content — Silver diethyldithiocarbamate spectrophotometric method*

ISO 21567, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Shigella spp.*

ISO/TS 21872-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of potentially enteropathogenic Vibrio spp. — Part 1: Detection of Vibrio parahaemolyticus and Vibrio cholerae*

ISO/TS 21872-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of potentially enteropathogenic Vibrio spp. — Part 2: Detection of species other than Vibrio parahaemolyticus and Vibrio cholerae*

ISO 11290-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of Listeria monocytogenes — Part 1: Detection method*

ISO 11290-2, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of Listeria monocytogenes — Part 2: Enumeration method*

3 Description

3.1 Product definition

Canned Tuna and Bonito are the products consisting of the flesh of any of the appropriate species listed below, packed in hermetically sealed containers.

1. *Euthynnus alletteratus* (little tunny)
2. *Euthynnus lineatus* (little tunny or black skipjack)
3. *Euthynnus yaito* or *Euthynnus affinis* (kawakawa or little tuna)
4. *Katsuwonus pelamis* (skipjack)

5. *Neothunnus macropterus* or *Thunnus albacares* (yellow-fin tuna)
6. *Thunnus tonggol* or *Neothunnus rarus* (longtailed tuna or northern bluefin tuna)
7. *Para thunnus mebachi* or *Thunnus obesus* (big-eyed tuna)
8. *Thunnus atlanticus* (black-fin tuna)
9. *Thunnus germo* or *Thunnus alalunga* (albacore)
10. *Thunnus maccoyii* (southern bluefin tuna)
11. *Thunnus orientalis* (oriental tuna)
12. *Thunnus thynnus* (bluefin tuna)

The species of fish *Sarda chiliensis*, *Sarda lineolata* or *Sarda sarda* after it has been canned, shall be designated as "Bonito" or "Bonito Tuna".

3.2 Process definition

The products shall have received a processing treatment sufficient to ensure commercial sterility.

3.3 Presentation

Tuna, after dressing, shall be properly pre-cooked and the meat freed from skin, bones and large streaks of red meat, drained; dry-salted; and packed into cans with oil. If necessary, additives, such as monosodium glutamate, or cloves and black pepper, whole, may be added.

Tuna meat may be canned in anyone of the following forms:

3.3.1 Solid (skin-on or skinless) — Fish cut into transverse segments to which no free fragments are added. In containers of 450 g (one pound) or less of net contents, such segments are cut into lengths suitable for packing into one layer. In containers of more than 450 g net contents, such segments may be cut into lengths suitable for packing in one or more layers of equal thickness and no layer shall have a thickness less than 2.5 cm. Segments are placed in the can with the planes of their transverse cut ends parallel to the ends of the can. A piece of segment may be added if necessary to fill a container. The proportion of free flakes or chunks shall not exceed 18% of the drained weight of the container.

3.3.2 Chunk — pieces of fish most of which have dimensions of not less than 1.2 cm in each direction and in which the original muscle structure is retained. The proportion of pieces of flesh of which the dimensions are less than 1.2 cm shall not exceed 30% of the drained weight of the container.

3.3.3 Flake or flakes — a mixture of particles and pieces of fish most of which have dimensions less than 1.2 cm in each direction but in which the muscular structure of the flesh is retained. The proportion of pieces of flesh of which the dimensions are less than 1.2 cm exceed 30% of the drained weight of the container.

3.3.4 Grated or shredded — a mixture of particles of cooked fish that have been reduced to a uniform size, in which particles are discrete and do not comprise a paste.

3.4 Fish flesh colour

The labels on all cans of tuna shall indicate the colour of the fish flesh in accordance with the following colour classifications:

- a) **"White Meat Tuna" or "White Tuna"** — Canned tuna of the species *Thunnus alalunga* or *Thunnus germo* (albacore) that has a diffuse luminous reflectance of not less than 33.7% of that of magnesium oxide when that reflectance is measured by a prescribed method. This is approximately equivalent to 6.3 Munsell units.

- b) **"Light Meat Tuna" or "Light Tuna"** — Canned tuna that has a diffuse luminous reflectance of not less than 22.6% of that of magnesium oxide when that reflectance is measured by a prescribed method. This is approximately equivalent to 5.3 Munsell units.
- c) **"Dark Meat Tuna" or "Dark Tuna"** — Canned tuna that does not meet the colour requirements of "Light Meat Tuna".

3.5 Packing media

3.5.1 Oil — Only double refined, pure, clear and deodourized edible vegetable oil having colourless appearance or light golden yellow colour shall be used for canning tuna. The oil shall be free from any foreign matter or mineral oils and objectionable flavour. The free fatty acid content of the oil shall be less than one percent.

3.5.2 Olive oils — In conformity with CODEX STAN 33, *Standard for olive oils and olive pomace oils*

3.5.3 Other vegetable oils — Clear, refined, deodorized, edible vegetable oil in conformity with the relevant East African Standards.

3.5.4 Fish oils — Clear, refined, edible fish (marine) oil. The species from which the oil is derived should be noted on the product label.

3.6 Other presentations

Any other presentation shall be permitted provided that it:

- is sufficiently distinctive from other forms of presentation laid down in this standard;
- meets all other requirements of this standard;
- is adequately described on the label to avoid confusing or misleading the consumer.

3.7 Packing in cans

3.7.1 The tuna shall be packed in suitable, hermetically sealed, round or flat rectangular (Dingley type) or oval cans. If the cans are lacquered, the lacquer used shall be of such quality that it does not impart any foreign taste and smell to the contents of the can and does not peel off during processing and storage of the product. The lacquer shall not be soluble in oil or brine to any extent. The cans shall be free from rust. The cans shall be thoroughly cleaned before filling.

3.7.2 The tuna pieces in any can shall be of fairly uniform size.

3.7.3 The red meat pieces of tuna, if canned separately from white pieces, shall be so labelled on the can.

3.8 Processing

Processing shall be at such temperature and for such length of time as to ensure adequate sterilization of the finished product without burning, scorching or overcooking. The water used for the cooling of cans shall be of potable quality and maintained in clean condition and chlorinated to maintain a minimum free residual chlorine concentration of 1 mg/kg.

4 Essential composition and quality factors

4.1 Raw material

4.1.1 Fish — The raw material used for preparation of canned tuna shall be fresh or frozen, sound, wholesome fish, properly cleaned and free from entrails.

4.1.2 Salt — Only refined salt conforming to EAS 35 shall be used for canning.

4.2 Requirements for the finished product

4.2.1 Canned tuna shall have colour characteristic of the variety which may be either white, pink or light brown. The meat shall have a reasonably firm texture and shall have pleasant flavour and odour.

4.2.2 The contents of the can on opening shall not show any appreciable disintegration. Pieces from which portions have been separated out shall be treated as disintegrated units. The percentage of detached portions of fish calculated on the basis of the drained mass shall not exceed 5 percent by mass based on an average of 5 cans.

4.2.3 Vacuum — The can shall give a negative pressure when punctured and the vacuum shall be not less than 150 mm Hg in case of round cans when measured with an electric vacuum recorder or a vacuum gauge of the piercing type.

4.2.4 Drained mass — The drained mass of the contents in each can shall be not less than 70 percent by mass of the water holding capacity of the can when tested by the method given in Annex A of CD/K/551:2010.

4.2.5 The proportion of the brine in oil shall be not more than 5 percent (v/v) when determined by the method given in CD/K/551:2010.

4.2.6 The product shall be free from artificial colouring matter.

4.2.7 The salt content of the tuna chunks or flakes shall be not more than 2 percent, when determined by method in Annex E of CD/K/516:2010 taking 5 to 10 g of the material.

5 Food additive

Only the use of additives complying with EAS 103 is permitted.

6 Hygienic requirements

6.1 The material shall be prepared, filled and processed under hygienic conditions and only in premises maintained in a thoroughly clean and hygienic manner complying with CAC/RCP 52 and CAC/RCP 1 and duly approved or licensed by the concerned authorities.

6.2 The material shall also satisfy the limits for heavy metals and microbiological activity prescribed in Table 1.

Table 1 — Microbiological and heavy metal limits for tuna canned in oil

Type of contaminant		Maximum limit (mg/kg)	Method of test
(i)	Microbiological requirements	Shall be commercially sterile	See J.5.1; CD/K/551:2010
(i)	Arsenic	0.1	EAS 41
(iii)	Copper	0.4	EAS 41
(iv)	Tin	250.0	EAS 41
(v)	Mercury	0.5	EAS 41
(vi)	Lead	0.3	EAS 41
(vii)	Cadmium	0.3	EAS 41
(viii)	Zinc	50.0	EAS 41
(ix)	Histamine content, mg/100 fish meat, max	20.0	Annex B

6.3 When tested by appropriate methods of sampling and examination listed in Clause 2, the product:

- (i) shall be free from micro-organisms capable of development under normal conditions of storage;
- (ii) no sample unit shall contain histamine that exceeds 20 mg per 100 g;
- (iii) shall not contain any other substance including substances derived from microorganisms in amounts which may represent a hazard to health;
- (iv) shall be free from container integrity defects which may compromise the hermetic seal.

6.4 The cans shall be exhausted by heat, steam or mechanical process and sealed in hot condition by double seaming. The sealed cans shall be processed at such temperature and for such length of time as to ensure adequate sterilization of the finished product without burning, scorching or overcooking. The processed cans shall be cooled in water chlorinated to 1 mg/kg available chlorine.

The can exterior, specially seams shall be free from dents, rust, perforations and distortions. The cans shall not show leaking, panelling or swelling. The interior of the can on opening shall not show any visible black discoloration, rusting or pitting and the inside lacquer shall be in good condition.

7 Packaging and marking

7.1 Packing

Unless agreed otherwise between the purchaser and the vendor, the cans shall be packed in cases sufficiently strong to withstand rough handling by rail, road and sea transport without damage to their contents.

7.2 Marking

In addition to the provisions of EAS 38 the following specific provisions apply:

7.2.1 The name of the food

7.2.1.1 The name of the product as declared on the label shall be "tuna" or "bonito", and may be preceded or followed by the common or usual name of the species, both in accordance with the law and custom of the country in which the product is sold, and in a manner not to mislead the consumer.

7.2.1.2 The name of the product may be qualified or accompanied by a term descriptive of the colour of the product, provided that the term "white" shall be used only for *Thunnus alalunga* and the terms "light" "dark" and "blend" shall be used only in accordance with any rules of the country in which the product is sold.

7.2.1.3 Form of presentation

The form of presentation provided for in Section 3.3 shall be declared in close proximity to the common name.

7.2.1.4 The name of the oil used as the packing medium shall form part of the name of the food.

7.2.2 The labelling of the cans may be done either by printing or lithographing on the cans themselves or by attaching labels printed on paper, subject to agreement between the purchaser and the vendor. The labels shall give the following information:

- a) Name of the material along with the form of pack with brand name, if any;
- b) Name and address of the manufacturer;
- c) Net mass of the contents of the can;

- d) Batch or lot number and the date of manufacture to be embossed in code on the can;
- e) The nature of the canning medium used and its ingredients;
- f) Licence number, date and authority, if any, under which the manufacturer has been permitted to can the product; and

7.2.3 The warranty period may also be mentioned subject to agreement between the purchaser and the vendor.

7.2.4 Each container may also be marked with a Certification Mark.

8 Sampling, examination and analyses

8.1 Sampling

8.1.1 The sampling and tolerance plans in CD-K-572:2010 shall be used to determine the acceptability of the lot. The sampling plans dictate the minimum sample size to be taken. If necessary, in the opinion of the inspector, more than the minimum sample size specified may be taken.

8.1.2 Sampling of lots for the sensory examination of the product shall be in accordance with CD-K-572:2010 except that a lower acceptance number for decomposition shall be used as indicated in the sampling tables.

The tables specify the minimum number of sample units to be used for the following types of inspections:

- a) Level I — Sensory examinations of all products subject to inspection other than lots which are subject to reinspection.
- b) Level II — Sensory examinations of all products which are under reinspection.

8.1.3 The sample unit shall consist of a can or pouch of tuna and the contents thereof.

8.2 Sensory and physical examination

Samples taken for sensory and physical examination shall be assessed by persons trained in such examination and in accordance with the procedures set out in Sections 8.3 through 8.5, Annex A and CAC/GL 31.

8.3 Determination of net weight

Net contents of all sample units shall be determined by the following procedure:

- (i) Weigh the unopened container.
- (ii) Open the container and remove the contents.
- (iii) Weigh the empty container, (including the end) after removing excess liquid and adhering meat.
- (iv) Subtract the weight of the empty container from the weight of the unopened container. The resultant figure will be the net content.

8.4 Determination of drained weight

The drained weight of all sample units shall be determined by the following procedure:

- (i) Maintain the container at a temperature between 20 °C and 30 °C for a minimum of 12 hours prior to examination.

- (ii) Open and tilt the container to distribute the contents on a pre-weighed circular sieve which consists of wire mesh with square openings of 2.8 mm x 2.8 mm.
- (iii) Incline the sieve at an angle of approximately 17-20° and allow the fish to drain for two minutes, measured from the time the product is poured into the sieve.
- (iv) Weigh the sieve containing the drained fish.
- (v) The weight of drained fish is obtained by subtracting the weight of the sieve from the weight of the sieve and drained product.

8.5 Determination of washed drained weight (for packs with sauces)

- (i) Maintain the container at a temperature between 20 °C and 30 °C for a minimum of 12 hours prior to examination.
- (ii) Open and tilt the container and wash the covering sauce and then the full contents with hot tap water (approx. 40 °C), using a wash bottle (e.g. plastic) on the tared circular sieve.
- (iii) Wash the contents of the sieve with hot water until free of adhering sauce; where necessary separate optional ingredients (spices, vegetables, fruits) with pincers. Incline the sieve at an angle of approximately 17-20° and allow the fish to drain two minutes, measured from the time the washing procedure has finished.
- (iv) Remove adhering water from the bottom of the sieve by use of paper towel. Weigh the sieve containing the washed drained fish.
- (v) The washed drained weight is obtained by subtracting the weight of the sieve from the weight of the sieve and drained product.

8.6 Examination methods

8.6.1 Procedure for determining compliance for style of pack declaration

8.6.1.1 Scope and application

This procedure is applicable to the determination of the percentage of different styles of pack in canned tuna.

8.6.1.2 Apparatus

- Can opener
- One-half inch (1.2 cm) mesh screen equipped with a collecting pan
- Suitable balance for weighing the samples to the nearest 0.1 g
- Spatula

8.6.1.3 Procedure

- 1) Open the can, drain the contents, weigh the tuna and record the weight.
- 2) Pour the drained can contents onto a tared 1.2 cm mesh screen equipped with a collecting pan.
- 3) Separate the tuna with a spatula being careful not to break the configuration of the pieces. Ensure that the smaller pieces of tuna are moved to the top of a mesh opening to allow them to fall through or be retained on the screen.

- 4) Segregate the material on the pan according to flaked, grated (shredded) and paste and weigh individually in order to establish the weight of each component.
- 5) Weigh the screen with the fish retained and record the weight. This weight will be used, by difference, to establish the weight of solid plus chunk tuna.
- 6) In the case of a "solid" declaration, remove any small pieces (chunks) from the screen and reweigh. This weight can be used to establish the weight of solid tuna by difference.

6.1.4 Calculations

- 1) Express the weight of flaked, grated (shredded) and paste as a percentage of the total drained weight of tuna.

$$\% \text{ Flakes} = \frac{\text{Weight of flakes}}{\text{Total weight of drained tuna}} \times 100$$

- 2) Calculate the weight of solid and chunk tuna retained on the screen by difference and express as a % of the total drained weight of tuna.

$$\% \text{ Solid and chunk} = \frac{\text{Weight of solid and chunk}}{\text{Total weight of drained tuna}} \times 100$$

- 3) Calculate the weight of solid tuna retained on the screen by difference and express as a % of the total drained weight of tuna.

$$\% \text{ Solid tuna} = \frac{\text{Weight of solid tuna}}{\text{Total weight of drained tuna}} \times 100$$

8.6.1.5 Determination of compliance

Refer to 9.4 to determine the defect classification of the sample unit.

8.6.2 Procedure for Determining Percentage of Honeycombing in Canned Tuna

8.6.2.1 Scope

This method shall be used to assess the extent of honeycombing in canned tuna.

The canned tuna standard stipulates that a sample unit shall be considered defective because of decomposition if the weight of honeycombed flesh exceeds 5% of the drained weight of the contents of the can.

8.6.2.2 Laboratory Apparatus

- Can opener
- Electronic Scale
- Beakers or Draining Trays
- Vacuum Gauge
- Clock or other suitable timing device
- Warming Cabinet
- Tared Collecting Dishes
- Tweezers or Forceps
- Spatula

- Appropriate forms

8.6.2.3 Procedure

- 1) Determine the drained weight of each sample unit, using the approved method.
- 2) After draining, transfer the contents of the can to an inspection tray or, if style of pack is to be determined, a 1.2 cm mesh screen equipped with a collecting pan.
- 3) Separate the tuna with a spatula being careful not to break the configuration of the pieces. If the contents are to be evaluated for style of pack, that procedure must be performed first, using the method outlined in section 6.1 of this standard.
- 4) Using tweezers or forceps remove all pieces of honeycombed fish flesh and place these in a tared collecting dish.
"Any piece of tuna flesh showing evidence of pitting, whether on the surface of the cut or between the layers of fish flesh, shall be considered to be affected by honeycombing."
- 5) Weigh the collecting dish with the honeycombed flesh and record the total weight. Subtract the weight of the collecting dish from the total weight of the dish and honeycombed flesh to obtain the weight of honeycombed flesh.

8.6.2.4 Calculations

Express the weight of the honeycombed flesh as a percentage of the drained weight of the can contents.

8.6.2.5 Determination of compliance

- 1) If the result exceeds 5% of the drained weight of the can contents, the sample unit is considered defective.
- 2) Repeat the above procedure and determine the status of the remaining sample units in the sample. A sample shall consist of at least the minimum number of sample units outlined in the sampling plans.
- 3) Determine the status of the lot by comparing the total number of defective sample units with the acceptance number for decomposition.

8.6.3 Classification of defectives

A sample unit which contains defects as described in section 5 is classified as a "defective".

8.7 Determination of histamine

See Annex B.

9 Description of defectives

5.1 Taint

A unit will be considered tainted when any of the following conditions exist:

- a) Rancid
 - Odour characterized by the distinct or readily detectable persistent odour of oxidized oil, (this may be characterized by a pungent sensation in the nasal passage); or
 - Flavour characterized by distinct flavours present individually or in combination as follows: bitter, sour, metallic flavours detected at the sides and back of the tongue leaving a lingering aftertaste.

- b) **Abnormal** — Distinct and persistent odours and/or flavours that are burnt or acrid, (e.g. as associated with excess scorch).
- c) **Contaminated** — Odours and/or flavours resulting from contamination by solvents, soaps, fuel, oil, grease, etc. that are organoleptically detectable.

5.2 Decomposition

A unit will be considered decomposed when any of the following conditions exist:

- a) Persistent, distinct and uncharacteristic odour characterized by:
- 1) fruity (aldehyde odours similar to pineapple or other fruits);
 - 2) vegetable odours — (e.g. turnip and cabbage-like but not associated with packing medium);
 - 3) sour, yeasty fermented odours;
 - 4) ammonia odours, hydrogen sulphide odours; or
 - 5) other pungent odours such as putrid or faecal.
- b) Persistent distinct and uncharacteristic flavours characterized by:
- 1) sweet fruity flavours (e.g. pineapple-like); or
 - 2) vegetable flavours (e.g. turnip and cabbage-like but not associated with packing medium); or
 - 3) putrid or sour or faecal flavours.
- c) **Texture** — Breakdown of muscle structure characterized by muscle fibers no longer being detectable resulting in the presence of small particles and/or granular, gritty or pasty texture exceeding 20% of the drained content.
- d) **Appearance**
- 1) Discoloration characterized by persistent flushed pink, orange or green colours in the flesh exceeding 5% of drained contents.
 - 2) True Honeycombing exceeding 5% of drained contents.

5.3 Unwholesome

- a) **Critical foreign material** — A lot will be considered defective when any of the following conditions exist:
- the presence of any material which has not been derived from tuna (and packing media) and which poses a threat to human health (such as glass, etc.); or
 - distinct and persistent odour or flavour of any material which has not been derived from tuna (and packing media) and which poses a threat to human health (such as solvents, fuel oil, etc.).
- b) **Foreign material** — A unit will be considered defective when the following condition is found:
- the presence of any material which has not been derived from tuna (and packing media) but does not pose a threat to human health (such as insect pieces, sand, etc.).

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- c) **Other defects** — A unit will be considered defective when any of the following conditions exist:
- 1) **Struvite crystals** (magnesium ammonium phosphate crystals) — Any struvite crystal greater than 5 mm in length.
 - 2) **Sulphide blackening** — Staining of the meat exceeding 5% of the drained contents.

5.4 Labelling

A unit will be considered defective when any of the following conditions exist:

- a) **Style of pack**
 - 1) Solid — Greater than 18% chunk and/or flaked.
Chunk — Greater than 50% flaked.
Flaked — Greater than 20% grated or shredded.
 - 2) Shredded, grated or paste in solid or chunk pack.
- b) **Fish flesh colour**
 - 1) White Meat Tuna or White Tuna of the species *Thunnus alalunga* or *Thunnus germon* (albacore) that has a diffuse luminous reflectance less than 33.7% of that of magnesium oxide. This is approximately equivalent to 6.3 Munsell units.
 - 2) Light Meat Tuna or Light Tuna that has a diffuse luminous reflectance less than 22.6% of that of magnesium oxide. This is approximately equivalent to 5.3 Munsell units.

NOTE Dark Meat Tuna or Dark Tuna is canned tuna that does not meet the colour requirements of Light Meat Tuna.

10 Lot acceptance

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

- (i) not any single instance of critical foreign matter occurs; or
- (ii) the total number of sample units found defective for taint, decomposition or unwholesomeness, individually or in combination, does not exceed the acceptance number for the sample size designated in the sampling plans in CD-K-572:2010; or
- (iii) the total number of sample units found defective for decomposition does not exceed the acceptance number (c) shown in parentheses for the sample size designated in the sampling plans in CD-K-572:2010; or
- (iv) the total number of sample units found defective for standards of identity (colour, style of presentation) exceeds the acceptance number for the sample size designated in the sampling plans.
- (v) the Food Additives, Hygiene and Labelling requirements of Sections 5, 6, and 7 are met.



Canned tuna meat



Canned tuna chunks in vegetable oil



Canned bonito — Example

Standard

to be

to be

Draft for



Canned light meat tuna — Example



Canned tuna meat

Draft for comment

Standard



Canned tuna



Bonito canned in oil

Draft for comments

African Standard



Bonito canned in oil

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Annex A (normative)

Sampling of tuna canned in oil

A.1 General requirements for sampling

A.1.1 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

A.1.2 Samples may be tested at a laboratory agreed to between the purchaser and the vendor.

A.2 Scale of sampling

A.2.1 Lot — In any consignment, all the cases containing cans of the same size and from the same batch of manufacture shall be grouped together to constitute a lot.

A.2.1.1 Samples shall be tested for each lot for ascertaining conformity of the material to the requirements of this standard.

A.2.2 The number of cases to be selected from each lot shall be in accordance with col 1 and 2 of Table A.1.

TABLE A.1 — Selection of packing cases

Number of cartons in the lot (1)	Sample Size (2)
Up to 8	2
9 to 25	4
26 to 40	5
41 to 65	6
66 to 110	7
111 to 180	8
181 to 300	9
301 to 500	10

A.2.3 The cases shall be selected at random. In order to ensure randomness of selection, random number tables shall be used. In case such tables are not available, the following procedure may be adopted:

Starting from any case count them as 1, 2, 3, ..., r and so on in a systematic manner. Every r th case thus counted shall be withdrawn, r being the integral part of N/n , where N is the total number of cases in the lot, and n the number of cases to be selected, till the requisite number is obtained.

A.2.4 From each of the cases selected as in A.2.2, draw at random one can for testing the physical and chemical requirements.

A.2.5 In addition to the cans selected as in A.2.4, 8 cans shall be selected at random as far as possible from all the cases chosen (see A.2.2), for testing for microbiological activity.

A.3 Number of tests

A.3.1 Each of the cans selected as in A.2.4 for testing the physical and chemical requirements shall

be tested for vacuum.

A.3.2 After testing for vacuum the contents of all the cans shall be taken and mixed together to form a composite sample. The composite sample so formed shall be tested for heavy metals.

A.3.3 Tests for microbiological activity

A.3.3.1 Incubation at 37 °C — All the cans selected (see A.2.5) for testing the microbiological activity, shall be incubated at 37 °C for not less than 14 days and subjected to microbiological examination (see Annex J; CD/K/551:2010).

A.4 Criteria for conformity

A.4.1 The lot shall be considered as conforming to the requirements of this specification if the criteria mentioned under A.4.1 to A.4.4 are all satisfied.

A.4.2 For physical requirements — The lot shall be declared as conforming to the physical requirements of vacuum if all the individual samples tested (see A.3.1) satisfy the requirements specified in 4.2.3 and 4.2.4.

A.4.3 For chemical reagents — For declaring the conformity of the lot to the chemical requirements regarding heavy metals, the test results on the composite sample (see A.3.2) shall satisfy the relevant requirements specified in 6.2.

A.4.4 For Microbiological activity — For declaring the conformity of the lot to microbiological activity the test results (see A.3.3.1) shall satisfy the requirements specified in 6.2.

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Annex B (normative)

Determination of histamine

B.1 Introduction

B.1.1 Principle — Histamine is extracted with methanol and derivatized with o-phthalaldehyde (OPT) to generate the fluorescent product. This method is used to determine the histamine content in raw, pre-cooked, and canned tuna.

B.1.2 Interference — All methods of histamine determination are overwhelmed with interfering substances which have to be removed in order to accurately measure the histamine present. The two naturally occurring substances that cause the most interference are histamine and spermidine since they also react with OPT to form fluorescent products. However, spermidine, the major contaminant in extracts can be separated from histamine on cellulose phosphate cation-exchange columns. There is also variability due to the pH and temperature sensitivity of the o-phthalaldehyde-histamine fluorophor. Because of the ubiquity of interfering fluorophors, all reagents used must be of the highest obtainable purity. Exposure of any of the materials involved to rubber or silicones may produce erratic results. It is recommended that polyethylene labware be used in place of glass, due to an observed loss of fluorescence. All labware should be acid-washed and rinsed in distilled water prior to use. New solution must be prepared after four to seven days, due to an observed increase in blank readings.

B.1.3 Summary of method — The histamine-containing material are homogenized and extracted with methanol. The extract can then be passed through an anion exchange column to remove any remaining interfering substances. The elutant is reacted with the OPT reagent and allowed to stand for 4 minutes. The mixture is acidified with H_3PO_4 and the corresponding fluorescence is read on a calibrated instrument.

B.2 Material required

TD-360 Min-Fluorometer with U.V. optical configuration of (P/N 36000-010) 10 mm x 10 mm Methacrylate fluorescence cuvettes (P/N 7000-959).

B.2.1 Labware — All re-usable labware (glass, polyethylene, Teflon etc.) should be cleaned by soaking in laboratory grade detergent and water for 4 h, rinsed with tap water, deionized water, and methanol. It is recommended that polyethylene ware be used due to absorbency observed when using glass.

B.2.1.1 Assorted Class A calibrated pipettes

B.2.1.2 Graduated cylinder — 100 ml.

B.2.1.3 Assorted Volumetric Flasks — For preparing dilution standards.

B.2.2 Chromatographic Columns (Kontes M.K 422250).

B.3 Reagents and standards

B.3.1 Ion Exchange Resin — Sigma 1 x 8-200, chloride form 100-200 mesh: or BioRad AG1- x 8, 50-100 mesh, chloride form, Cat. No. 140-1431, or equivalent.

B.3.2 Ion Sodium Hydroxide — Dissolve 40 g NaOH in 1 Litre of distilled water.

B.3.3 2.0N Sodium Hydroxide — Dissolve 80 g NaOH in 1 Litre of distilled water.

B.3.4 Histamine Dihydrochloride — MCB X 0440 or J.T. Baker 1-N330.

B.3.5 1.0N Hydrochloric Acid — Add 83 ml concentrated HCL to about 500 ml distilled water. Cool and bring to 1-litre volume with distilled water.

B.3.6 0.1N Hydrochloric Acid — Add 100-mL 1N HCl to about 500-mL distilled water. Cool and bring to 1-Litre volume with distilled water.

B3.7 Methanol Reagent Grade

B3.8 0.1 % o-phthalaldehydol (OPT reagent) — Phthalic dicarboxaldehyde (Aldrich, Milwaukee, WI), or o-phthaldialdehyde (Sigma, St. Louis, MO) $C_6H_4(CHO)_2$. F.W, 134.13. Dissolve 0.10 g OPT in 100-mL methanol. Store in an amber bottle and refrigerate when not in use. Prepare fresh weekly.

B.3.9 3.57N Phosphoric Acid — Add 121.8 ml of 85 % H_3PO_4 to about 500-mL distilled water. Bring to 1- litre volume with distilled water.

B.3.10 Histamine Standard Solution A, 1 mg Hm/ml — Weigh 0.1656 g of histamine dihydrochloride into 100-ml volumetric flask. Dissolve in, and dilute to volume with 0.1N HCl.

B.3.11 Histamine Standard Solution B, 10 μ g Hm/ml — Dilute 1.0 ml Solution A to 100 ml with 0.1N HCL.

B.3.12 Histamine Standard Solution A1 (This is our control solution) — Dilute 1.0 ml Solution A to 100 ml with methanol.

B.3.13 Histamine Standard Solution C, 0.1 mg Hm/ml — Dilute 1.0 ml Solution B to 100 ml with 0.1N HCl.

B.3.14 Histamine Standard Solution D, 0.2 M 0.2 M Hm/ml — Dilute 2.0 ml Solution B to 100 ml with 0.1 N HCl.

B.3.15 Histamine Standard Solution E, 0.3 mg Hm/ml — Dilute 3.0 ml Solution B to 100 ml with 0.1N HCl.

NOTE Prepare Solution A and B monthly. Prepare Solutions C, D, E, and A1 weekly. Refrigerate solutions when not in use.

B.4 Preparation

B.4.1 Resin preparation

B.4.1.1 Place 20 g of ion exchange resin in a beaker.

B.4.1.2 Add 2 N sodium hydroxide to the resin in a ratio of 15 ml per gram of resin.

B.4.1.3 Mix well and allow the resin to settle for a minimum of 15 minutes, but no more than 30 minutes. Decant liquid and repeat with additional 2 N sodium hydroxide.

B.4.1.4 Wash resin thoroughly with distilled water to remove traces of the sodium hydroxide until pH is less than or equal to 8.5.

B.4.1.5 Slurry resin with distilled water and transfer to a funnel containing a fluted filter paper. Thoroughly wash with distilled water.

B.4.1.6 Transfer resin to a suitable container and make sure the distilled water level is above the resin level at all times.

B.4.2 Column preparation

B.4.2.1 Slurry sufficient prepared resin into each column to form a bed 8 cm in height. Maintain a liquid level above the top of the resin at all times.

B.4.2.2 Refill columns with fresh resin at least twice per week.

B.5 Instrument set-up

B.5.1 Check that light source and filter holder are installed in your TD-360 Mini-Fluorometer. Turn on the instrument and allow to warm-up. For additional assistance, refer to your TD-360 Operating Manual.

B.5.2 Blank with a reagent blank — Calibrate instrument with the prepared histamine standard Solution E. Enter standard value of 3 000 mg/lm. Remember later to divide all reading by 10 000 to get mg Hm/ml of sample.

B.5.3 Analyze Histamine Standard Solutions C and D like you would a sample. You now have a standard curve for your samples.

B.6 Procedure

B.6.1 Sample preparation

B.6.1.1 Blend fish in a warring blender with an equal weight of deionized water to produce a 1:1 slurry.

B.6.1.2 Transfer 10.0 g of the slurry to a 150-ml beaker. Add 40.0 ml of methanol and mix thoroughly.

B.6.1.3 Using Whatman No.1 filter paper, or equivalent, filter the mixture into a suitable container. If the filtrate is to be saved for later analysis, refrigerate in a closed container.

NOTE Evaporation of methanol from the filtrate can cause erroneous results.

B.6.2 Histamine Elusion

B.6.2.1 Pass 15-20-ml distilled water through the exchange column and discard.

B.6.2.2 Place a 50-ml volumetric flask containing 5 ml in HCl at the column outlet.

B.6.2.3 Pipette 1.0 ml of filtrate (methanol extract) onto the resin bed with 5.10 ml distilled water.

B.6.2.4 Immediately initiate column flow. Flow should be maintained at a rate grater than 3 ml/min.

B.6.2.5 When liquid level is slightly above the resin, add about 5-ml distilled water and allow it to flow through the resin. Repeat with distilled water in larger increments until total water through column is about 40 ml.

B.6.2.6 *Discontinue Column Flow*

B.6.2.7 Remove volumetric flask and bring to 50-ml volume with distilled water. Store column effluent in the refrigerator if necessary to postpone determination for more than 2 h.

B.6.3 Controls and blanks

B.6.3.1 At the beginning of a set of analysis, and again at the end, pass 1 ml of Solution A1 through one of the columns and proceed through the procedure as though it were a fish extract. Fluorescence readings should be very similar to Solution D reading. If readings are not within 20 per cent of Solution D, all analysis performed at the same time are suspect and should be repeated.

B.6.4 Histamine determination

B.6.4.1 Into separate 25-ml glass stoppered flask, pipette 5.0 ml of 0.1 HCl (Blank); Solutions C, D and E: and each diluted column effluent.

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B.6.4.2 Add 10 ml 0.1N HCl to each flask.

B.6.4.3 Add 3 ml in NaOH. Mix thoroughly.

B.6.4.4 Within 5 minutes, add 1 ml OPT solution and mix thoroughly.

B.6.4.5 After exactly 4 minutes, add 3 ml 3.57 N H₃PO₄ and mix immediately.

B.6.4.6 Let solutions stand for 15-20 minutes and then determine the fluorescence intensities on the TD-360 Min-fluorometer. If a sample reading is greater than that of Solution E, dilute 25 ml of the column effluent to 100 ml with 0.1N HCl and proceed from B.6.4.1.

CAUTION! Fish with high salt content may cause problems with the resin necessitating more frequent changing of columns.

B.6.4.7 If sample dilution was necessary in B.6.4.6, multiply the obtained result by 4.

B.6.4.8 After all readings are obtained, divide all results by 10, 1 000 to get histamine concentration in mg Hm/ml

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