

**Fruit Drinks and Squashes —
Specification**

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Ministry of Health- Food Safety Unit
Ministry of Agriculture, Livestock and Fisheries
Kenya plant health inspectorate services
National Public Health Laboratory services
Coca-Cola East Africa Ltd
Del Monte Kenya Ltd
Agri Pro-pak Ltd
Kenya Fruit Processors Ltd
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Sky foods ltd
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Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

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Fruit Drinks and squashes — Specification

Second edition

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PREFACE

This Kenya Standard was developed by the Technical Committee on Processed Fruits and Vegetables under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

The standard stipulates the essential compositional, quality, microbiological, contaminants and labelling requirements for fruit Squashes, fruit drinks and all other products relating and similar to fruit drinks as defined in this standard.

In the preparation of this standard useful information was derived from members of the technical committee, and local manufacturers

PUBLIC REVIEW DRAFT

KENYA STANDARD

FRUIT DRINKS AND SQUASHES- SPECIFICATION

1. SCOPE

This Kenya Standard specifies requirements and methods of sampling and test for fruit drinks, fruit squashes, blended fruit drinks and squashes, fruit cordial, fruit crush and fruit syrup intended for direct human consumption either as ready to drink or dillutables

This standard does not apply to:

Fruit juices and nectars

Vegetable juices and nectars

Herbal juices

Fruit and herbal infusions

Fruit flavoured drinks

Dairy based fruit Drinks

Carbonated soft Drinks

Fluid milk and dairy products such as skim milk, yoghurt, milk powders, etc

Drink based wholly on pure tea, coffee, mate, cocoa, sassafras, bark, buds, leaves and similar plant materials.

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.

KS EAS 38, labeling of prepackaged foods

KS EAS 39, Code of practice for hygiene in the food and drink manufacturing industry

KS EAS 12, Drinking (Potable) water- Specification

KS EAS 803: 2013. Nutrition labeling – Requirements

KS EAS 804:2013 Claims on foods – Requirements

KS EAS 805: 2013 Use of Nutrition and health claims

KS CAC RCP 3; recommended international code of hygienic practice for dried fruits

Codex Stan 195, General Standard for Food Additives

Codex Stan 193, General Standard for contaminants

KS 38, Plantation (mill) white sugar — Specification

KS 05-344, Specification for honey.

KS EAS 5, Refined white sugar — Specification

KS EAS 217-2, Methods for the microbiological examination of foods - Part 2: General Guidance for the Enumeration of Micro-Organisms-Colony Count Technique at 30°C

KS EAS 217-8, Methods for microbiological examination of foods -Part 8: Enumeration of yeasts and moulds

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

KS ISO 763, Fruits and vegetable products - Determination of ash insoluble in hydrochloric acid

KS ISO 2448, Fruit and vegetable products - Determination of ethanol content

KS ISO 2172, Eruit juice - Determination of soluble solids content - Pyknometric method

KS ISO 2173, Fruit and vegetable products - Determination of soluble solids - Refractometric method

KS ISO 5522, Fruits, vegetables and derived products - Determination of total sulphur dioxide content

3. Terms and definitions

For the purposes of this standard the following terms and definitions shall apply.

3.1

Authenticity

Maintenance of the product's essential physical, chemical, organoleptic, and nutritional characteristics of the fruit(s) from which it is derived

3.2

Brix

Means the percentage (m/m) of total dissolved solids content of the juice as determined either:

Directly by means of a suitable hydrometer calibrated and standardized at 20^oc (no correction of acids) or

Indirectly by means of a refractometer calibrated at 20^o on the international sucrose scales (plus correction for acids calculated as anhydrous citric Acid or the dominant acid of the fruit type concerned)

3.3

Brix acid ratio

Means the ratio of the corrected Brix to the percentage (m/m) of acid calculated as anhydrous acid or the dominant acid of the fruit type

3.4

Dilutables:

Includes squashes, cordials and other concentrates that require dilution to taste by consumers

3.5

Fruit Cordial

Means a syrup concentrated drink which has to be diluted to a minimum ration of one to three, to produce a suitable drink after dilution. The product is obtained by blending clarified fruit juice with nutritive sweeteners & water, with or without salt and peel oil and any other ingredients suitable to the product.

3.6

fruit drink

Means a substance which is intended to be used as a drink, whether with or without addition of any other substances and which is partially prepared from fruit or which in appearance, flavor and taste resembles juice derived from fruit with not less than 10 % of soluble solids. The Unfermented product, intended for direct consumption, obtained by blending the fruit juice (concentrated or unconcentrated) and/or the edible parts of sound, ripe fruit, with water and natural sweeteners and preserved by suitable preservative means.

3.7

Fruit pulp

Means any unfermented pulpy fruit juice product obtained by physical or mechanical methods without the removal of seeds by screening, and preserved in a permitted manner

3.8

Fruit puree

means any unfermented pulpy fruit juice product obtained by finely comminuting and sieving only the edible portion of fruit or the fruit as a whole after removal of the rind and seeds or pits or pips, and preserved in a permitted manner

3.9

Blended fruit drink

Fruit drink obtained by mixing two or more fruit juice pulp and purées from different kinds of fruit species

3.10

Fruit squash

Means cordial, containing after dilution in a minimum of one to three, at least 6% (v/v) fruit juice at standard strength. It is usually fruit-flavoured, made from fruit juice, water, and diluted sugar syrup. Squashes may also contain food colouring and additional flavouring.

3.11

Ready-to-drink

Means that the fruit drink is of a single strength or that the fruit drink which had been concentrated into a solid or liquid form, has been reconstituted or diluted according to the instructions on the container

3.12

Standardized strength or single fruit juice

Means the strength of natural juice puree or pulp calculated on degree brix, as the case may be (see Table 1 below)

4. Product Description

The products shall be soft drinks beverage intended for human consumption which contains, fruit juice, fruit pulp or other edible parts of the fruits. It may be made from a 'single or a mixture of two or more fruits. It may be sweetened with nutritive and/or non-nutritive (intense) sweeteners and water, with or without salt and peel oil, without added carbon dioxide and other permitted food additives. These beverages may be clear, cloudy, or may contain particulate matter (for example, fruit pieces, crushed pips, seeds and/or peel of the fruit) and may have restored aromatic substances and volatile flavour components, all of which shall be obtained by suitable physical means, and all of which shall be recovered from the same kind of fruit.

The product shall be prepared by suitable processes, which maintain the essential physical, chemical, organoleptical and nutritional characteristics of the juices of the fruit from which it is derived

The water used shall comply with KS EAS 12, Potable water- specification

5. Essential composition and quality factors

5.1 Essential composition Requirements

Table 1: Requirements for Fruit drinks and squashes

Name of the products	Min (%) of fruit juice/ puree in the final product	Total Solids (brix)	Soluble Min (%)	Acidity expressed as Citric Acid Max (%)
Fruit Squash	25 (in the undiluted form)	40		3.5
Fruit drink	10(in the ready to drink	10		4.5

	form)		
Fruit Crush	25	55	3.5
Fruit Syrup	25	65	3.5
Fruit Cordial	25	30	3.5

Note: Blended fruit drink (in the ready to drink form) and Blended fruit squash (undiluted form) shall comply with the requirements for fruit squash and drink in table 1

Any syrup containing a minimum of 10 percent of dry fruits shall also qualify to be called as fruits syrups.

The fruit content (or the equivalent derived from concentrated fruit) in the product shall not be less than 10% (M/M).

5.1.1 Ethanol content shall not exceed 0.03% in the final product.

5.2. Permitted ingredients

5.2.1. Sweetening Agents

Sucrose, glucose (dextrose anhydrous) or fructose, natural sweeteners exceeding 5% (m/m), non-nutritive sweeteners and honey with less than 2 % moisture may be added.

The quality of honey used shall comply with KS 344, Specification for honey.

Note: only permitted natural sweeteners not exceeding 10% (m/m) in case of grape juice and 15% (m/m) in case of lemon juice shall be permitted

5.2.3. Syrups

Syrups (as defined in the Standard for Sugars), liquid sucrose, invert sugar solution, invert sugar syrup, fructose syrup, liquid cane sugar, isoglucose and high fructose syrup may be added only to fruit juice from concentrate

5.2.4. Lemon and lime juice

Lemon juice or lime juice, or both, may be added for acidification purposes for juice drinks

5.2.5. Citrus *reticulata* juice

The juice from *Citrus reticulata* and/or hybrids with *reticulata* may be added to orange juice drink in an amount not to exceed 10 % of soluble solids of the *reticulata* to the total of soluble solids of orange juice.

Natural citrus oil and natural citrus essence may be added to orange and lemon juice drinks; and shall contain not more than 0.03% recoverable oil

5.2.6. Salt and spices and aromatic herbs

Salt and spices and aromatic herbs (and their natural extracts) may be added.

5.2.7 Nutrients

For the purpose of product fortification, essential nutrients such as vitamins and minerals may be added to products in table 1. Such additions shall comply with national legislation established for this purpose.

NOTE: any optional ingredients added are subject to ingredient labelling requirements (see Clause 10)

6.3 Quality criteria

- Shall contain no additives except those stipulated in Table 3 and those prescribed in Codex STAN 192
- Shall be prepared by suitable process which maintain the essential physical, chemical, organoleptical and nutritional characteristics of the juices of the fruit from which it is derived
- The fruit drinks and squashes shall have the essential physical, chemical, nutritional characteristics, colour, aroma and flavour of juice from the same kind of fruit from which it is made.

- d) The product shall be free from seeds, bits of seed or bits of peel
- e) Shall be free from deterioration or spoilage
- f) The product shall be clean and free from foreign matter
- g) The fruit drinks and squashes shall conform to the requirements in Table 1.

6.4 Verification of composition, quality and authenticity

The product covered by this standard shall be subject to testing for authenticity, composition, and quality where applicable and where required.

The verification of a sample's authenticity/quality may be assessed by comparison of data for the sample, generated using appropriate methods included in the Standard, with that produced for fruit of the same type and from the same region, allowing for natural variations, seasonal changes and for variations occurring due to processing.

7. Food additives and processing aids

In addition to the food additive in table 3 below; Food additives established by the Codex Alimentarius Commission for these products in Codex Stan 192, General Standard for Food Additives may be used

Table 2: Food Additives

Food Additive	Maximum Level mg/kg
Fruit drink	
PHOSPHATES	1000 mg/kg
SODIUM ASCORBATE	GMP
SORBATES	1000 mg/kg
SULFITES	50 mg/kg
TARTRATES	4000 mg/kg
ASCORBIC ACID, L-	GMP
BENZOATES	1000 mg/kg
CARBON DIOXIDE	GMP
CALCIUM ASCORBATE	GMP
CITRIC ACID	3000 mg/kg
MALIC ACID, DL-	GMP
PECTINS	GMP
SODIUM ASCORBATE	GMP

Table 3 - Maximum level of use of food processing aids in line with good manufacturing practices

Food processing aids listed in Table 4 below may be used in the processing of products subject to this standard.

5. PROCESSING AIDS – Maximum Level of Use in line with Good Manufacturing Practices

Function	Substance
Antifoaming Agent	Polydimethylsiloxane ⁵
Clarifying Agents Filtration Aids Flocculating Agents	Adsorbent clays (bleaching, natural or activated earths)
	Adsorbent resins
	Activated carbon (only from plants)
	Bentonite
	Calcium hydroxide ⁶
	Cellulose
	Chitosan
	Colloidal silica
	Diatomaceous earth
	Gelatin (from skin collagen)
	Ion exchange resins (cation and anion)
	Isinglass ⁷
	Kaolin
	Perlite
	Polyvinylpyrrolidone
	Potassium caseinate ⁷
	Potassium tartrate ⁶
	Precipitated calcium carbonate ⁶
	Rice hulls
	Silicasol
	Sodium caseinate ⁷
	Sulphur dioxide ^{6, 8}
	Tannin

⁵ 10 mg/l is the maximum residue limit of the compound allowed in the final product.

⁶ Only in grape juice.

⁷ Use of these processing aids should take into account their allergenic potential. If there is any carry-over of these processing aids into finished product, they are subject to ingredient declaration in accordance with Sections 4.2.1.4 and 4.2.4 of the of KS EAS 38; *General Standard for the Labelling of Prepackaged Foods*.

⁸ 10 mg/l (as residual SO₂)

8. Contaminants

8.1 Pesticide residues

In addition to the maximum limits in table 4 below; the products covered by the provisions of this standard shall conform to those maximum limits for pesticides established by the Codex Alimentarius Commission for these products in codex Stan 193;

TABLE 4- Pesticide Residues

Fruit Juice	Pesticide	MRL (mg/kg)
Citrus fruit juices Pear Juice Citrus pulp, dry Orange juice	56-2-phenylphenol	10 mg/kg 20 mg/kg 60 mg/kg 0.5 mg/kg
Orange Juice Apple juice Grape juice	Propargite propargate- (113)	0.3 mg/kg 0.2 mg/kg 1 mg/kg
Tomato Juice	Carbaryl- (8) Malathion- (44) Piperonyl butoxide- (62)	3 mg/kg 0.01 mg/kg 0.3mg/kg
Apple juice	Diphenylamine - (30)	0.5 mg/kg
Grape Juice	Clothianidin- (238)	0.2 mg /kg
Citrus juices	Piperonyl butoxide- (62)	0.05 mg/kg

Where other crop protection products have been used and no codex MRL exists, acceptable levels of residues of such substances shall be at the LOD of 0.01 mg/kg

8.2 Heavy Metal Contaminants

The products covered by the provisions of this standard shall conform to those maximum limits for Heavy metals contaminants established by the Codex Alimentarius Commission for these products in table 5 below

TABLE 5- Heavy Contaminants

CONTAMINANTS	MAXIMUM LEVEL	Method of Analysis
Arsenic (As)	0.2 mg/kg	
Lead (Pb)	0.3 mg/kg	
Copper (Cu)	5.0 mg/kg	
Zinc (Zn)	5.0 mg/kg	
Iron (Fe)	15 mg/kg	
Tin (Sn)	200 mg/kg	
Mercury (Hg)	0.01	

Cadmium (cd)	0.05 mg/kg	
Sum of copper, zinc and iron	20.0 ppm	

8.3 Other contaminants

The products covered by the provisions of this standard shall conform to those maximum levels for contaminants established by the Codex Alimentarius Commission for these products

9. Hygiene

9.1 The products covered by the provisions of this Standard shall be prepared and handled in accordance with Code of Hygienic practice in food and drink industry, *Recommended International Code of Practice – General Principles of Food Hygiene* (CAC/RCP 1-1969), and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

9.2 The products shall conform to microbiological criteria in Table 6 and those provided in KS KS 2455; Food Safety -general standard

Table 6 - Microbiological limits for fruit drinks and squashes

<u>Microorganism</u>	<u>Limit (CFU/G)</u>	<u>Method of Test</u>
<u>Total Plate Count (cfu/g), max</u>	<u>50</u>	<u>KS ISO 4833</u>
<u>coliforms count per 100 ml</u>	<u>Not Detected</u>	<u>KS ISO 4831 or KS ISO 4832</u>
<u>Escherichia coli per 25g, (cfu/g), maxi</u>	<u>Not Detected</u>	<u>KS ISO 7251</u>
<u>Yeasts and Moulds (cfu/g), max</u>	<u>10</u>	<u>KS ISO 7954</u>
<u>Staphylococcus .aureas per 25g</u>	<u>Not detected</u>	<u>KS ISO 6888-1</u>
<u>Clostridium botulinum per 25g</u>	<u>Not Detected</u>	<u>KS ISO 4833</u>
<u>Shigella per 25g</u>	<u>Not Detected</u>	<u>KS ISO 4833</u>
<u>Salmonella per 25g</u>	<u>Not detected</u>	<u>KS ISO 6579</u>
<u>Vibro cholera per 25g</u>	<u>Not detected</u>	

10. Packaging and Labelling

10.1 Packaging

The products covered by the provisions of this standard shall be packaged in suitable, sound and clean food grade packaging material to protect the product from contamination. The packaging materials and process shall not contaminate the product or otherwise affect its technological, nutritional or sensory quality.

10.2 Labelling

In addition to the provisions of the General Standard for the Labelling of Prepackaged Foods; KS EAS 38, the following specific provisions apply:

10.2.1 Name of the product

The name of the product shall be the name of the fruit used as defined in Section 4.2. The fruit name shall be filled in the blank of the product name mentioned under this Section. These names may only be used if the product conforms to the definition in Section 4.2. Or which otherwise conform to this Standard.

10.2.2 Fruit drink and fruit drink blends defined under Section 3

- a. for fruit drink, the name of the product shall be “ ___ fruit drink” or “ ___ and ___ fruit drink”, where a blend of fruits is used;
- b. The ‘word blend’ can be substituted by ;the words ‘punch’ or fruit punch’ if the fruit drink from more than two species is contained in the blend
- c. the words ‘cocktail’ or fruit cocktail, in the case of a fruit drink from one fruit species, flavouring matter, spices and herbs are added and in the case of a blend of more than one fruit species, the product, complies with the requirements for blended fruit drink
- d. A blend of fruit species belonging to the same genus may be identified by only that genus provided that a complete ingredients list appears on the label.

10.2.1.3 In the case of fruit drink products (as defined in Section 4.2) manufactured from two or more fruits, the product name shall include the names of the fruit drinks comprising the mixture in descending order of proportion by weight (m/m) or the words "fruit drink blend", " a fruit drink mixture", "mixed fruit drink" or other similar wording.

Note: in the case of fruit squash, the word ‘drink’ shall be substituted with the word ‘Squash’

10.2.2 Additional Requirements

The following additional specific provisions apply:

10.2.1 Varietal denomination - Distinct varietal denominations may be used in conjunction with the common fruit names on the label where such use is not misleading.

10.2.2 Juice content declaration- Fruit drinks ,squashes and blended fruit drinks must be conspicuously labelled with a declaration of “juice content ___%” with the blank being filled with the percentage of purée and/or fruit juice computed on a volume/volume basis. The words “juice content ___%” shall appear in close proximity or in conjunction to the name of the juice.

10.2.2.3 Ingredient declaration - An ingredient declaration of “ascorbic acid” when used as an antioxidant does not, by itself, constitute a “Vitamin C” claim.

10.2.2.4 Nutrition declaration - Any added essential nutrients declaration should be labelled in accordance with the *Nutrition labeling – Requirements* (KS EAS 503), *Claims on foods – Requirements* (KS EAS 504) and the *KS EAS 805: 2013 Use of Nutrition and health claims*

10.2.2.5 Pictorial representations- A pictorial representation of fruit(s) on the label should not mislead the consumer with respect to the fruit so illustrated.

10.2.3 Non-retail containers

Information for non-retail containers not destined to final consumers shall be given either on the container or in accompanying documents, except that the name of the product, lot identification, net contents and the name and address of the manufacturer, packer, distributor or importer, as well as storage instructions, shall appear on the container, except that for tankers the information may appear exclusively in the accompanying documents.

However, lot identification, and the name and address of the manufacturer, packer, distributor or importer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents. For non-retail containers, the information required shall be given either on the container or in accompanying documents, except that the name of the product, lot identification, and the name and address of the manufacturer or packer shall appear on the container.

10.2.4 List of Ingredients — a complete list of ingredients including added syrup shall be declared on the label in descending order of proportion;

i) In the case of blends; List of the names of the various fruit species used in the blend in descending order of the percentage of juice (v/v) of standard strength used in the blend followed by the words 'drink blend'

If the blend is made of up of three or more fruit species, only the two main fruit species may be named; provided further that the words and other fruits shall appear in close proximity or in conjunction to the name of the drink.

ii) In the case of fruit drink blends, the words 'fruit drink blend' can be used provided that the word 'fruit' may be substituted by the name of a specific fruit if (i) in the case of the flavoured ingredients used in the blends, the blend has the characteristic appearance, flavor and taste of the specific ingredient and not less than 10% (v/v) juice at standard strength of the specific ingredient is present in the blend

iii) In the case of all other blends, at least 50% (v/v) juice at standard strength of the total juice content of the blend is made up of that specific fruit species and if the blend has the characteristic appearance, flavor and taste of the fruit species concerned

vi) The names of the fruit species used in the label shall appear on the main panel in close proximity or in conjunction to the name of the drink: provided that in the case of blends made up of three or more species, only main fruit species need to be declared on the main panel if the words and fruits follows immediately and if a complete ingredient list appears on the label. (v) The term "Carbonated" shall be declared on the label if the product contains

more than 2 g/kg of carbon dioxide.

(vi) In case of a product made wholly or partially from concentrated juice, the following statement shall be declared: "Fruit Drink Made from Concentrate".

10.2.4 Net Contents — the net contents shall be declared by volume in metric units (*Systeme Internationale*).

10.2.5 Name of business and Address of the manufacturer, packager, distributor, importer, exporter or vendor of the product, whichever may apply, shall be declared.

10.2.6 Instructions for use shall be declared

10.2.7 Storage conditions

10.2.8 Lot Identification — each container shall be embossed or otherwise permanently marked in code or in clear identity the producing factory and the lot.

10.2.9 Place/country of origin

10.2.8 Date of expiry

10.2.9 Irradiation status, where applicable

11. Methods of Analysis and sampling

The products covered by the provisions of this standard shall be tested using appropriate standard methods declared in this standard. Other test may be performed as per the methods given in the latest edition of AOAC/ Codex/ ISO and other internationally recognized methods.

APPENDIX A

(Clause 3.5.3)

METHOD 1

A1. DETERMINATION OF SPECIFIC GRAVITY

A1.1 Apparatus

A1.1.1 Specific Gravity Bottle

A1.2 Procedure — Clean and thoroughly dry the specific gravity bottle and weigh it. Fill it up to the mark with freshly boiled and cooled distilled water which has been maintained at a temperature of $20 \pm 1^\circ\text{C}$, and weigh. Remove the water, dry the bottle again and fill it with the material maintained at the same temperature. Weigh the bottle again.

A1.3 Calculation

A1.3.1 Specify the temperature of testing

A1.3.2 Calculate as follows:

$$\text{Specific gravity at } 20^\circ\text{C}/20^\circ\text{C} = \frac{C - A}{B - A}$$

where,

C = mass in g of the specific gravity bottle with the material.

A = mass in g of the empty specific gravity bottle, and

B = mass in g of the specific gravity bottle with water.

A1.3.2.1 To find out the degrees brix the table given in Appendix A shall be used.

METHOD 2

A2. REFRACTOMETRIC METHOD

A2.1 Principle — This involves measurement of the refractive index of a test solution at 20°C, using a refractometer, and use of tables correlating refractive index with soluble solids content (expressed as sucrose) or direct reading of the soluble solids content on the refractometer.

A2.2 Apparatus — Usual laboratory apparatus, and in particular:

A2.2.1 Refractometer indicating the refractive index by means of a scale graduated in 0.001, in order to allow readings to be estimated to 0.002. This refractometer shall be adjusted so that at 20°C it registers for distilled water a refractive index of 1.333 0.

A2.2.2 Alternative refractometer indicating the percentage by mass of sucrose by means of the scale graduated in 0.50 per cent, in order to allow readings to be estimated to 0.25 per cent.

This refractometer shall be adjusted so that at 20°C it registers for distilled water a soluble solids (sucrose) content of zero.

A2.2.3 Means for circulating water to maintain the temperature of the prisms of the refractometer (**A2.2.1** or **A2.2.2**) constant to within $\pm 0.5^\circ\text{C}$, in the neighbourhood of 20°C, which is the reference temperature (see **A2.4.1**).

A2.2.4 Beaker, capacity 250 ml.

A2.3 Procedure

A2.3.1 Preparation of Test Solution

A2.3.1.1 Clear liquid products — Thoroughly mix the laboratory sample and use it directly for the determination.

A2.3.1.2 Semi-thick products (pure'e, etc.) — Thoroughly mix the laboratory sample. Press a part of the sample through a gauze folded in four. Reject the first drops of the liquid and reserve the remainder of the liquid for the determination.

A2.3.1.3 Determination — Adjust the water circulation (**A2.2.3**) in order to operate at the required temperature (between 15°C and 25°C) and allow it to flow to bring the prisms of the refractometer (**A2.2.1** or **A2.2.2**) to the same temperature, which shall remain constant to within $\pm 0.5^\circ\text{C}$ during the determination.

Bring the test solution (**A2.3.1**) to the measuring temperature. Put a small quantity of the test solution (2 or 3 drops are sufficient) on the fixed prism of the refractometer (**A2.2.1** or **A2.2.2**) and immediately adjust the movable prism. Suitably, illuminate the field of view. The use of a sodium vapour lamp allows more precise results to be obtained (especially in the case of coloured and dark products).

Bring the line dividing the light and dark parts of the surface in the view to the crossing of the thread and read the value of the refractive index or the percentage by mass of sucrose, according to the instrument used.

A2.3.1.4 Number of determinations — Carry out two determinations on the same laboratory sample.

A2.4 Expression of Results

A2.4.1 Corrections — If the determination has been carried out at a temperature other than $20 \pm 0.5^\circ\text{C}$, the following corrections are required:

(a) For the scale indicating the refractive index (see **A2.2.1**) apply the formula:

$$n_D^{20} = n_D^t + 0.00013(t - 20)$$

where,

t = the temperature of measurement in degrees Celcius.

(b) For the scale indicating the percentage by mass of sucrose (see **A2.2.2**), correct the result according to Table B1 (Appendix B).

A2.4.2 *Method of Calculation and Formula* — The double solids content, expressed as a percentage by mass, is obtained as follows:

A2.4.2.1 *Refractometer with refractive index scale* — Read from Table B2 (Appendix B) the percentage by mass of sucrose corresponding to the value and read in accordance with **A2.3.1.3**, corrected, if necessary, in accordance with **A2.4.1** (a). In the case of liquid or semi-thick products (**A2.3.1.1** or **A2.3.1.2**), the soluble solids content is equal to the number found.

A2.4.2.2 *Refractometer with sucrose scale* — In the case of liquid or semi-thick products (**A2.3.1.1** or **A2.3.1.2**), the soluble solids content, as percentage by mass of sucrose, is equal to the value, read in accordance with **A2.3.1.3**, corrected, if necessary, in accordance with **A2.4.1** (b).

Take as the result the arithmetic mean of the two determinations, if the requirement of repeatability (see **A2.4.3**) is satisfied.

Express the result to one decimal place.

A2.4.3 *Repeatability* — The difference between the results of two determinations carried out in rapid succession by the same analyst shall not exceed 0.5 g of soluble solids per 100 g of product.

A2.5 **Test Report** — The test report shall show the method used and the result obtained. It shall mention any operational details not specified in this standard or regarded as optional, as well as any incidents which may have influenced the results.

The result shall given all information required for complete identification of the sample.

A3. DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
0.0	1.000 00	0.998 234	0.00
0.2	1.000 78	0.999 010	0.11
0.4	1.001 55	0.999 786	0.22
0.6	1.002 33	1.000 563	0.34
0.8	1.003 11	1.001 342	0.45
1.0	1.003 89	1.002 120	0.56
1.2	1.004 67	1.002 897	0.63
1.4	1.005 45	1.003 675	0.79
1.6	1.006 23	1.004 453	0.90
1.8	1.007 01	1.005 234	1.01
2.0	1.007 79	1.006.015	1.12
2.2	1.008 58	1.006 796	1.23
2.4	1.009 36	1.007 580	1.34
2.6	1.010 15	1.008 363	1.46
2.8	1.010 93	1.009 148	1.57
3.0	1.011 72	1.009 934	1.68

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
3.2	1.012 51	1.010 721	1.79
3.4	1.013 30	1.011 510	1.90
3.6	1.014 09	1.012 298	2.02
3.8	1.014 88	1.013 089	2.13
4.0	1.015 67	1.013 881	2.24
4.2	1.016 47	1.014 673	2.35
4.4	1.017 26	1.015 467	2.46
4.6	1.018 06	1.016 261	2.57
4.8	1.018 86	1.017 058	2.68
5.0	1.019 65	1.017 854	2.79
5.2	1.020 45	1.018 652	2.91
5.4	1.021 25	1.019 451	3.02
5.6	1.022 06	1.020 251	3.13
5.8	1.022 86	1.021 053	3.24

DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS (Cont'd)

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
6.0	1.023 66	1.021 855	3.35
6.2	1.024 47	1.022 659	3.46
6.4	1.025 27	1.023 463	3.57
6.6	1.026 08	1.024 270	3.69
6.8	1.026 89	1.025 077	3.80
7.0	1.027 70	1.025 885	3.91
7.2	1.028 51	1.026 694	4.02
7.4	1.029 32	1.027 504	4.13
7.6	1.030 13	1.028 316	4.24
7.8	1.030 95	1.029 128	4.35
8.0	1.031 76	1.029 942	4.46
8.2	1.032 58	1.030 757	4.58
8.4	1.033 40	1.031 573	4.69
8.6	1.034 22	1.032 391	4.80
8.8	1.035 04	1.033 209	4.91
9.0	1.035 86	1.034 029	5.02
9.2	1.036 68	1.034 850	5.13
9.4	1.037 50	1.035 671	5.24
9.6	1.038 33	1.036 494	5.35
9.8	1.039 15	1.037 318	5.46
10.0	1.039 98	1.038 143	5.57
10.2	1.040 81	1.038 970	5.68
10.4	1.041 64	1.039 797	5.80
10.6	1.042 47	1.040 626	5.91
10.8	1.043 30	1.041 456	6.92
11.0	1.044 13	1.042 288	6.13
11.2	1.044 97	1.043 121	6.24
11.4	1.045 80	1.043 954	6.35

11.6	1.046 64	1.044 788	6.46
11.8	1.047 47	1.045 625	6.57
12.0	1.048 31	1.046 462	6.68
12.2	1.049 15	1.047 300	6.79
12.4	1.049 99	1.048 140	6.90
12.6	0.050 84	1.048 980	7.02
12.8	1.051 68	1.049 822	7.13
13.0	1.052 52	1.050 665	7.24
13.2	1.053 37	1.051 510	7.35
13.4	1.054 22	1.052 356	7.46
13.6	1.055 06	1.053 202	7.57
13.8	1.055 91	1.054 050	7.68

DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS (Cont'd)

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
14.0	1.056 77	1.054 900	7.79
14.2	1.057 62	1.055 751	7.90
14.4	1.058 47	1.056 602	8.01
14.6	1.059 33	1.057 455	8.12
14.8	1.060 18	1.058 310	8.23
15.0	1.061 04	1.059 165	8.34
15.2	1.061 90	1.060 022	8.45
15.4	1.062 76	1.060 880	8.56
15.6	1.063 62	1.061 738	8.67
15.8	1.064 48	1.062 598	8.78
16.0	1.065 34	1.063 460	8.89
16.2	1.066 21	1.064 324	9.00
16.4	1.067 07	1.065 188	9.11
16.6	1.067 94	1.066 054	9.22
16.8	1.068 81	1.066 921	9.33
17.0	1.069 68	0.067 789	9.45
17.2	1.070 55	1.068 658	9.56
17.4	1.071 42	1.069 529	9.67
17.6	1.072 29	1.070 400	9.78
17.8	1.073 17	1.071 273	9.89
18.0	1.074 04	1.072 147	10.00
18.2	1.074 92	1.073 023	10.11
18.4	1.075 80	1.73 900	10.22
18.6	1.076 68	1.074 777	10.33
18.8	1.077 56	1.075 657	10.44
19.0	1.078 44	1.076 537	10.55
19.2	1.079 32	1.077 419	10.66
19.4	1.080 21	1.078 302	10.77
19.6	1.081 10	1.079 187	10.88

19.8	1.081 98	1.080 072	10.99
20.0	1.082 87	1.080 959	11.10
20.2	1.083 76	1.081 848	11.21
20.4	1.084 65	1.082 737	11.32
20.6	1.085 54	1.083 628	11.43
20.8	1.086 44	1.084 520	11.54
21.0	1.087 33	1.085 414	11.65
21.2	1.088 23	1.086 309	11.76
21.4	1.089 13	1.087 205	11.87
21.6	1.090 03	1.088 101	11.98
21.8	1.090 93	1.089 000	12.09
22.0	1.091 83	1.089 900	12.20
22.2	1.092 73	1.090 802	12.31
22.4	1.093 64	1.091 704	12.42
22.6	1.094 54	1.092 607	12.52
22.8	1.095 45	1.093 513	12.63

DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS (Cont'd)

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
23.0	1.096 36	1.094 420	12.74
23.2	1.097 27	1.095 328	12.85
23.4	1.098 18	1.096 236	12.96
23.6	1.099 09	1.097 147	13.07
23.8	1.100 00	1.098 058	13.18
24.0	1.100 92	1.098 971	13.29
24.2	1.101 83	1.099 886	13.40
24.4	1.102 75	1.100 802	13.51
24.6	1.103 67	1.101 718	13.62
24.8	1.104 59	1.102 637	13.73
25.0	1.105 51	1.103 557	13.84
25.2	1.106 43	1.104 478	13.95
25.4	1.107 36	1.105 400	14.06
25.6	1.108 28	1.106 324	14.17
25.8	1.109 21	1.107 248	14.28
26.0	1.110 14	1.108 175	14.39
26.2	1.111 06	1.109 103	14.49
26.4	1.112 00	1.110 033	14.60
26.6	1.112 93	1.110 963	14.71
26.8	1.113 86	1.111 895	14.82
27.0	1.114 80	1.112 828	14.93
27.2	1.115 73	1.113 763	15.04
27.4	1.116 67	1.114 697	15.15
27.6	1.117 61	1.115 635	15.26
27.8	1.118 55	1.116 572	15.37
28.0	1.119 49	1.117 512	15.48
28.2	1.120 43	1.118 453	15.59
28.4	1.121 38	1.119 395	15.69
28.6	1.122 32	1.120 339	15.80
28.8	1.123 27	1.121 284	15.91
29.0	1.124 22	1.122 231	16.02
29.2	1.125 17	1.123 179	16.13
29.4	1.126 12	1.124 128	16.24

29.6	1.127 07	1.125 079	16.35
29.8	1.128 02	1.126 030	16.46
30.0	1.128 98	1.126 984	16.57
30.2	1.129 93	1.127 939	16.67
30.4	1.130 89	1.128 896	16.78
30.6	1.131 85	1.129 853	16.89
30.8	1.132 81	1.130 812	17.00
31.0	1.133 78	1.131 773	17.11
31.2	1.134 74	1.132 785	17.22
31.4	1.135 70	1.133 698	17.33
31.6	1.136 67	1.134 663	17.43
31.8	1.137 64	1.135 628	17.54

DEGREES BRUX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS (Cont'd)

DEGREES BRUX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
32.0	1.138 61	1.136 596	17.65
32.2	1.139 58	1.137 565	17.76
32.4	1.140 55	1.138 534	17.87
32.6	1.141 52	1.139 506	17.96
32.8	1.142 50	1.140 479	18.08
33.0	1.143 47	1.141 453	18.19
33.2	1.144 45	1.142 429	18.30
33.4	1.145 43	1.143 405	18.41
33.6	1.146 41	1.144 384	18.52
33.8	1.147 39	1.145 363	18.63
34.0	1.148 37	1.146 345	18.73
34.2	1.149 36	1.147 328	18.84
34.4	1.150 34	1.148 313	18.95
34.6	1.151 33	1.149 298	19.06
34.8	1.152 32	1.150 286	19.17
35.0	1.153 31	1.151 275	19.28
35.2	1.154 30	1.152 265	19.38
35.4	1.155 30	1.153 256	19.49
35.6	1.156 29	1.154 249	19.60
35.8	1.157 29	1.155 242	19.71
36.0	1.158 28	1.156 238	19.81
36.2	1.159 28	1.157 235	20.03
36.4	1.160 28	1.158 233	20.03
36.6	1.161 28	1.159 233	20.24
36.8	1.162 28	1.160 233	20.25

37.0	1.163 29	1.161 236	20.35
37.2	1.164 30	1.162 240	20.46
37.4	1.165 30	1.163 245	20.57
37.6	1.166 31	1.164 252	20.68
37.8	1.167 32	1.165 259	20.78
38.0	1.168 33	1.166 269	20.89
38.2	1.169 34	1.167 281	21.00
38.4	1.170 36	1.168 293	21.11
38.6	1.171 38	1.169 307	21.21
38.8	1.172 39	1170 322	21.32

DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR SOLUTIONS (Cont'd)

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
39.0	1.173 41	1.171 340	21.43
39.2	1.174 43	1.172 359	21.54
39.4	1.175 45	1.173 379	21.64
39.6	1.176 48	1.174 400	21.75
39.8	1.177 50	1.175 423	21.86
40.0	1.178 53	1.176 447	21.97
40.2	1.179 56	1.177 473	22.07
40.4	1.180 58	1.178 501	22.18
40.6	1.181 62	1.179 527	22.29
40.8	1.182 65	1.180 560	22.39
41.0	1.183 68	1.181 592	22.50
41.2	1.184 72	1.182 625	22.61
41.4	1.185 75	1.183 660	22.72
41.6	1.186 79	1.184 496	22.82
41.8	1.187 83	1.185 734	22.93
42.0	1.188 87	1.186 773	23.04
42.2	1.189 92	1.187 814	23.14
42.4	1.190 96	1.188 856	23.25
42.6	1.192 01	1.189 901	23.36
42.8	1.193 05	1.190 946	23.46
43.0	1.194 10	1.191 993	23.57
43.2	1.195 15	1.193 041	23.68
43.4	1.196 20	1.194 090	23.78
43.6	1.197 26	1.195 141	23.89
43.8	1.198 31	1.196 153	24.00
44.0	1.199 36	1.197 247	24.10
44.2	1.200 42	1.198 303	24.21
44.4	1.201 48	1.199 360	24.32
44.6	1.202 54	1.200 420	24.42
44.8	1.203 60	1.201 480	24.53

45.0	1.204 67	1.202 540	24.63
45.2	1.205 73	1.203 603	24.74
45.4	1.206 80	1.204 668	24.85
45.6	1.207 87	1.205 733	24.95
45.8	1.208 94	1.206 801	25.06

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DEGREES BRIX, SPECIFIC GRAVITY AND DEGREES BAUME OF SUGAR
SOLUTIONS (Cont'd)

DEGREES BRIX OR PER CENT BY WEIGHT OF SUCROSE	SPECIFIC GRAVITY AT 20°C/20°C	SPECIFIC GRAVITY AT 20°C/4°C	DEGREES BAUME (MODULUS 145)
46.0	1.210 01	1.207 870	25.17
46.2	1.211 08	1.208 940	25.27
46.4	1.212 15	1.210 013	25.38
46.6	1.213 23	1.211 086	24.48
46.8	1.214 31	1.212 162	25.59
47.0	1.215 38	1.213 238	25.70
47.2	1.216 46	1.214 317	25.80
47.4	1.217 55	1.215 395	25.91
47.6	1.218 63	1.216 476	26.01
47.8	1.219 71	1.217 559	26.12
48.0	1.220 80	1.218 643	26.23
48.2	1.221 89	1.219 929	26.33
48.4	1.222 98	1.220 815	26.44
48.6	1.224 06	1.221 904	26.54
48.8	1.225 16	1.222 995	26.65
49.0	1.226 25	1.224 086	26.75
49.2	1.227 35	1.225 180	26.86
49.4	1.228 44	1.226 274	26.96
49.6	1.229 54	1.227 371	27.07
49.8	1.230 64	1.228 469	27.18
50.0	1.231 74	1.229 567	27.28
50.2	1.232 84	1.230 668	27.39
50.4	1.233 95	1.231 770	27.49
50.6	1.235 06	1.232 874	27.60
50.8	1.236 16	1.233 979	27.70

APPENDIX B

(Clause A2.4)

TABLE B1. CORRECTION OF READINGS OF THE REFRACTOMETER WITH SCALE INDICATING SUCROSE FOR A TEMPERATURE DIFFERENT FROM 20 ± 0.5°C

Temp. °C	Scale reading for soluble solids content, per cent (m/m)									
	5	10	15	20	25	30	40	50	60	70
	Corrections to be subtracted									
15	0.29	0.31	0.33	0.34	0.34	0.35	0.37	0.38	0.39	0.40
16	0.24	0.25	0.26	0.27	0.28	0.28	0.30	0.30	0.31	0.32
17	0.18	0.19	0.20	0.21	0.21	0.21	0.22	0.23	0.23	0.24
18	0.13	0.13	0.14	0.41	0.14	0.14	0.15	0.15	0.16	0.16
19	0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08
	Corrections to be added									
21	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08
22	0.13	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.16
23	0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24
24	0.27	0.28	0.29	0.30	0.30	0.31	0.31	0.31	0.32	0.32
25	0.35	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.40	0.40

TABLE B2. REFRACTIVE INDEX AND CORRESPONDING PERCENTAGE BY MASS OF SOLUBLE SOLIDS (SUCROSE)

Refractive index	Soluble solids (sucrose) content	Refractive index	Soluble solids (sucrose) content	Refractive index	Soluble solids (sucrose) content	Refractive index	Soluble solids (sucrose) content
n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)
1.333 0	0	1.376 2	22	1.407 6	44	1.455 8	66
1.334 4	1	1.368 9	23	1.409 6	45	1.458 2	67
1.335 9	2	1.370 6	24			1.460 6	68
1.337 3	3	1.372 3	25	1.411 7	46	1.463 0	69
1.338 8	4			1.413 7	47	1.465 4	70
1.340 3	5	1.374 0	26	1.415 8	48		
		1.375 8	27	1.417 9	49	1.467 9	71
1.341 8	6	1.377 5	28	1.420 1	50	1.470 3	72
1.343 3	7	1.379 3	29			1.472 8	73
1.344 8	8	1.381 1	30	1.422 2	51	1.475 3	74
1.346 3	9			1.424 3	52	1.477 8	75
1.347 8	10	1.382 9	31	1.426 5	53		
		1.384 7	32	1.428 6	54	1.480 3	76
1.349 4	11	1.386 5	33	1.430 8	55	1.482 9	77
1.350 9	12	1.388 3	34			1.485 4	78
1.352 5	13	1.390 2	35	1.433 0	56	1.488 0	79
1.354 1	14			1.435 2	57	1.490 6	80
1.355 7	15	1.392 0	36	1.437 4	58		
		1.393 9	37	1.439 7	59	1.493 3	81
1.357 3	16	1.395 8	38	1.441 9	60	1.495 9	82
1.358 9	17	1.397 8	39			1.498 5	83
1.360 5	18	1.399 7	40	1.444 2	61	1.501 2	84
1.362 2	19			1.446 5	62	1.503 9	85
1.363 8	20	1.401 6	41	1.448 8	63		
		1.403 6	42	1.451 1	64		
1.365 5	21	1.405 6	43	1.453 5	65		