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SPECIFICATION FOR
325 - ml GLASS BOTTLES WITH 31 . 5 - mm STANDARD ROLL - ON - PILFERPROOF (ROPP) FINISH FOR EDIBLE PRODUCT

SRI LANKA STANDARDS INSTITUTION

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SLS 789:1987

Gr.8

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This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD

SPECIFICATION FOR 325 - ML GLASS BOTTLES WITH 31.5 - MM STANDARD ROLL-ON-PILFERPROOF (ROPP) FINISH FOR EDIBLE PRODUCTS

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 1987-06-19, after the draft, finalized by the Drafting Committee on Glass Products, had been approved by the Chemicals Divisional Committee.

All standard values in this specification are given in SI units.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

1 SCOPE

This specification prescribes the requirements and methods of sampling and test for glass bottles with 31.5 - mm ROPP finish having a nominal capacity of 325 - ml, used for packing edible products.

2 REFERENCES

CS 102 Presentation of numerical values

CS 124 Test sieves

SLS 428 Random sampling methods

SLS 601 Glass container finishes
Part 1 Threaded finishes

3 DEFINITIONS

For the purpose of this specification the following definitions shall apply:

3.1 blisters : Large bubbles in glass

3.2 bloom : A surface film on glass resulting from

a) atmospheric attack;

b) deposition of chemical vapours; or

c) formulation of sulfites and sulfates during the annealing process.

3.3 brimful capacity : The volume of the contents of a bottle when filled to the brim with water at 27 ± 2 °C.

3.4 bubbles : Gas filled cavities in glass.

3.5 cords : Glassy inclusions of different composition particularly in the form of drawn out lines and possessing optical and other properties differing from those of the surrounding glass.

3.6 finish : The top part of the neck of a bottle made to suit the closure.

3.7 hair lines : Fine cords on surface of glass.

3.8 insweep : An inward curved or tapered portion of a bottle which joins the lower part of the sides to the base.

3.9 nominal capacity : The volume normally expected to be filled in the bottle at 27 ± 2 °C.

3.10 push-up : The bottom of a bottle shaped to form a concavity.

3.11 sealing surface : The portion of the finish which makes contact with the sealing gasket or liner of the closure.

3.12 seeds : Small bubbles in glass.

3.13 stones : Imperfections in glass resulting from inclusions from such sources as batch materials, refractories and blow pipes or resulting from devitrification of glass or from any other source.

3.14 verticality : The horizontal deviation of the centre of the bore entrance from a vertical line through the centre of the base when the bottle is standing upright on a horizontal surface.

3.15 wedged bottom (slugged bottom): Bottom of a bottle having thick glass on one side and thin glass on the other side.

4 REQUIREMENTS

4.1 Material and workmanship

The bottles shall be well annealed, free from cords, bubbles, blisters, seeds, stones, hair lines, bloom and any other visible defects that may impair the strength, efficiency or appearance of the bottle.

The bottles shall be well formed with uniform distribution of glass all over the walls, the base and the neck, avoiding any wedged bottom and particularly any uneven thickness in the walls. There shall be no sharp edges inside the neck and the mould seam of the neck finish shall have no protruding edges. The sealing surface of the bottle shall be smooth.

The bottles shall have an insweep at the base of the body and the bottom of the bottles shall have the minimum amount of push-up necessary to prevent the bottles rocking on its base.

4.2 Design and dimensions

4.2.1 *External body*

The external design and dimensions of a botttle shall be as given in Figure 1. The bottle height and body diameter shall be measured as prescribed in **8.1**.

4.2.2 *Neck finish*

The neck finish of a bottle shall conform to the 31.5 - mm standard roll-on-thread-pilferproof (ROPP) finish specified in **SLS 601 : Part 1**. The neck finish diameter and bore dimensions shall be measured as prescribed in **8.1**.

4.3 Brimful capacity

The brimful capacity of a bottle shall be 350 $\pm$ 5 ml.

4.4 Mass

The mass of a bottle shall be 280 $\pm$ 10 g.

4.5 Verticality

The maximum verticality of a bottle when tested in accordance with Appendix B shall be 3.0 mm.

4.6 Parallelism between the base and top sealing surface

The base of a bottle shall be parallel to the top sealing surface to within 0.75° when tested in accordance with Appendix C.

4.7 Rocking bottom

A bottle shall be stable, when placed on a flat surface, and when lightly tapped with a finger, it shall not sway to and fro.

4.8 Waviness of the sealing surface

Waviness of the sealing surface of a bottle shall not be greater than 230 µm when determined according to the method given in **8.2**.

4.9 Alkalinity

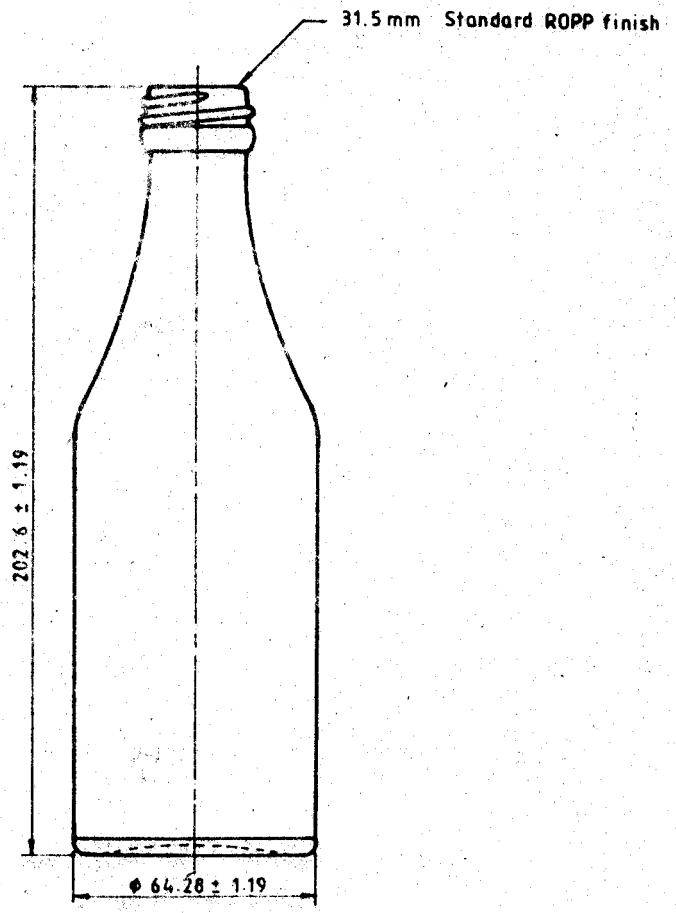
The bottles shall comply with the requirement for alkalinity prescribed in **D.4.1** when tested in accordance with Appendix D.

4.10 Resistance to impact

The resistance of a bottle to impact shall be such that when a bottle is tested in the manner described in Appendix E, it shall not break or crack under the impact stresses specified therein.

4.11 Resistance to thermal shock

The resistance of a bottle to sudden changes in temperature shall be such that a bottle will not be damaged when subjected to thermal shock in the manner described in Appendix F.



(All dimensions in millimetres)

FIGURE 1 - Design and dimensions of a bottle

5 PACKAGING

Bottles shall be packed as agreed to between the purchaser and the supplier.

6 MARKING

6.1 Bottles shall be marked legibly and indelibly on the insweep:

a) The registered trade mark;

b) Mould number; and

c) The year of production or identification number.

6.2 Bottles may also be marked with the Certification Mark of the Sri Lanka Standards Institution illustrated below on permission being granted for such marking by the Sri Lanka Standards Institution.

NOTE - The use of the Sri Lanka Standards Institution Certification Mark (SLS Mark) is governed by the provisions of the Sri Lanka Standards Institution Act and the regulations framed thereunder. The SLS mark on products covered by a Sri Lanka Standard is an assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by the Institution and operated by the producer. SLS marked products are also continuously checked by the Institution for conformity to the relevant standard as a further safeguard. Details of conditions under which a permit for the use of the Certification Mark may be granted to manufacturers or processors may be obtained from the Sri Lanka Standards Institution.

7 SAMPLING

The method of drawing representative samples of bottles for ascertaining conformity to the requirements of this specification shall be as specified in Appendix A.

8 METHODS OF TEST

Tests shall be carried out as specified in 8.1, 8.2 and Appendices B to F of this specification.

8.1 Measurement of bottle dimensions

Measure the bottle height and body diameter by a measuring instrument of accuracy sufficient to carry out the measurement, to the precision indicated by the specified dimensions. Measure the bore dimensions using a gauge that enters the neck vertically.

8.2 Determination of waviness of the sealing surface

Place the bottle vertically on the centre of a rotating table (see Note) place a gauge (having a resolution of 01 μm) on the sealing surface and set it to zero. Rotate the table and observe the maximum and minimum reading of the gauge. Sum of the readings is reported as the waviness.

NOTE - The accuracy of the rotating table shall not be less than 10 μm.

9 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this specification, if the following conditions are satisfied :

9.1 Each bottle inspected as in **A.3.1** satisfies the relevant requirements.

9.2 The number of bottles not satisfying one or more requirements specified in **4.2, 4.5, 4.6** and **4.7** in the first stage sample is less than or equal to the first acceptance number given in Column 6 of the table or the number of bottles not satisfying one or more of the same requirements in the second sample (cumulative sample) is less than or equal to the corresponding second stage acceptance number given in Column 6 of the table.

9.3 Each bottle tested in accordance with **A.3.4** satisfies the requirements for the impact test and thermal shock test separately.

9.4 Each bottle tested in accordance with **A.3.5** satisfies the requirement for the alkalinity test.

9.5 The values of the expressions $\bar{x} + 1.3s$ and $\bar{x} - 1.3s$ (see Notes) calculated using the test results on brimful capacity and mass lie between the two specification limits.

9.6 The value of the expression $\bar{x} + 1.3s$ (see Notes) calculated using the test results on waviness is less than the specified value.

NOTES

1. *Average* $(\bar{x}) = \dfrac{\text{Sum of the observed values}}{\text{Number of values}}$

2. *Standard deviation (s) = The positive squareroot of the quotient obtained by dividing the sum of squares of deviations of the observations from their mean by one less than the number of observations in the sample.*

APPENDIX A

SAMPLING

A.1 LOT

In any consignment all the bottles produced in one day under the same conditions of manufacture shall constitute a lot.

A.2 SCALE OF SAMPLING

A.2.1 Samples shall be tested from each lot for ascertaining its conformity to the requirements of this specification.

A.2.2 The number of bottles to be selected from each lot shall be in accordance with Table 1.

TABLE 1 - Scale of sampling

No. of bottles in the lot	Stage of sampling	Sample size	Cumulative sample size	Sample size for mass, capacity and waviness measurements	Acceptance no.	Rejection no.	Sub sample size
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 3 200	1st	20	20	20	0	3	5
	2nd	20	40		3	4	
3 201 to 10 000	1st	32	32	25	1	4	8
	2nd	32	64		4	5	
10 001 to 35 000	1st	50	50	30	2	5	13
	2nd	50	100		6	7	
Above 35 000	1st	80	80	40	3	7	20
	2nd	80	160		8	9	

A.2.3 The bottles shall be selected at random. In order to ensure randomness of selection tables of random numbers given in SLS 428 shall be used.

A.3 NUMBER OF TESTS

A.3.1 Each bottle of the first sample selected in accordance with Column 3 of Table 1 shall be inspected for marking requirements.

A.3.2 From the first stage sample selected in accordance with Column 3 of Table 1, a sub-sample of size as given in Column 5 of the table shall be drawn and examined for the requirements specified in 4.3, 4.4 and 4.8.

A.3.3 Each bottle of the first sample selected in accordance with Column 3 of Table 1 shall be tested for the requirements given in 4.2, 4.5, 4.6 and 4.7.

A.3.3.1 If the number of bottles not satisfying one or more requirements specified in 4.2, 4.5, 4.6 and 4.7 in the first sample lies between the first acceptance number (Column 6 of Table 1) and the first rejection number (Column 7 of Table 1), a second stage sample of the size as given in Column 3 of the table shall be drawn and examined for the same requirements.

A.3.4 If the lot has been found satisfactory with respect to the requirements specified in 4.2 to 4.8 a sub-sample of size as given in Column 8 of the table shall be drawn from the bottles selected in accordance with Column 3 of Table 1 and tested for the requirements specified in 4.10 and 4.11.

A.3.5 If the lot has been found satisfactory with respect to the requirements specified in 4.2 to 4.8 and 4.10 to 4.11 five bottles shall be drawn from the sub-sample selected as in A.3.4 and shall be tested for the requirements specified in 4.9.

APPENDIX B

TEST FOR VERTICALITY

B.1 APPARATUS

An apparatus incorporating a V-block and dial gauge as shown in Figure 2 shall be used.

B.2 PROCEDURE

Measure the verticality using apparatus incorporating a V-block and a dial gauge. Care shall be taken while turning the bottle in the V-block to compensate for any pressure exerted by the dial gauge, Such pressure exerted to overcome the dial gauge pressure shall be directed downward towards the V-block.

B.2.1 The verticality is expressed as half the difference between the maximum and minimum readings of the dial gauge obtained during rotating of the bottle through 360°.

APPENDIX C

TEST FOR DETERMINING PARALLELISM BETWEEN THE BASE AND THE SEALING SURFACE

C.1 APPARATUS

An acceptable apparatus suitable for determining whether the base of the bottle is parallel to the top sealing surface. Two optically flat plates and a spirit level calibrated to the accuracy required for the purpose may be used.

C.2 PROCEDURE

Test each bottle for compliance with the requirement specified in 4.6.

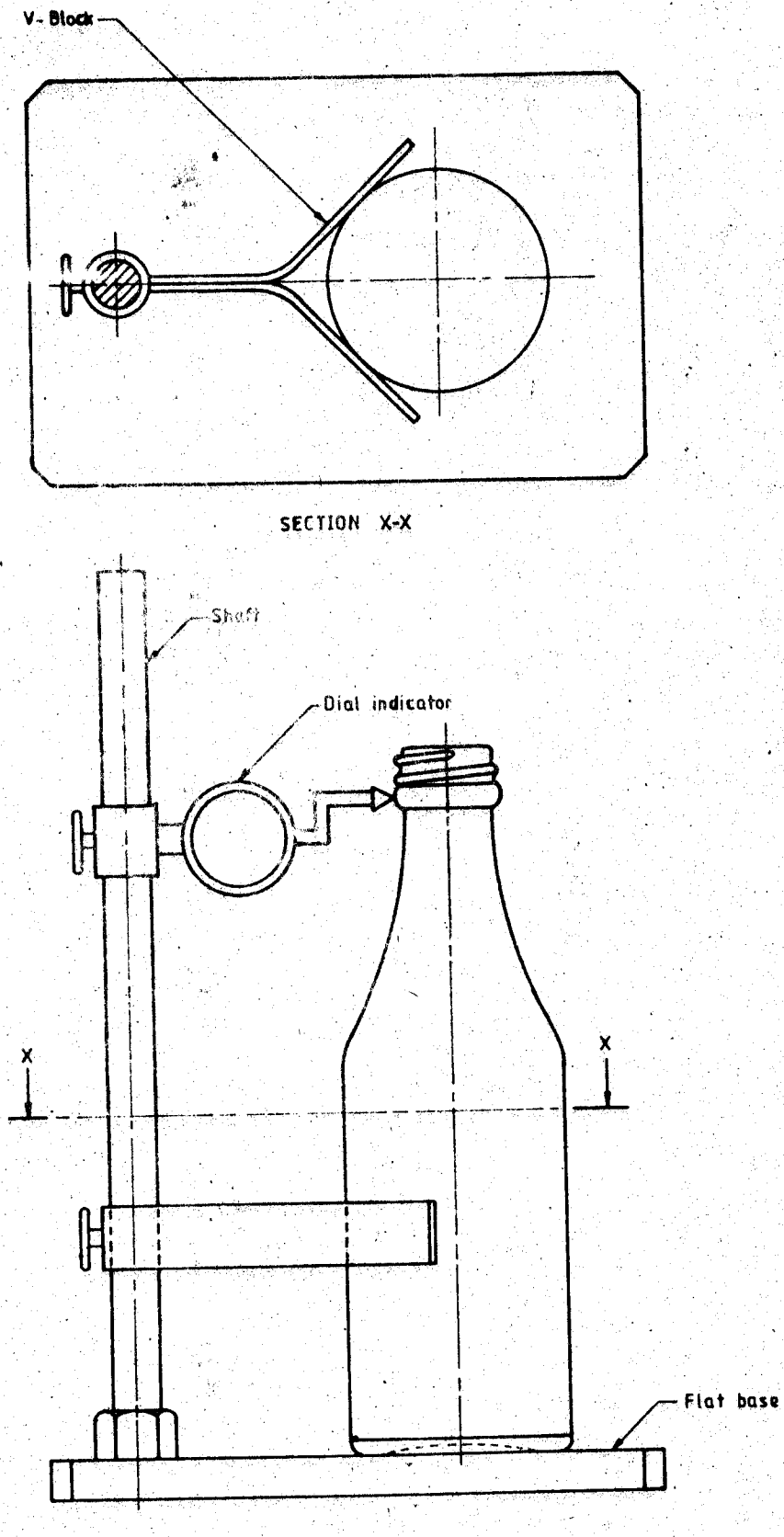


FIGURE 2 - Assembly for the verticality test

APPENDIX D

TEST FOR ALKALINITY

D.1 APPARATUS

D.1.1 *Erlenmeyer flask assembly*, of chemically resistant glass, preferably borosilicate, consisting of Erlenmeyer flask of 250-ml capacity with a suitable reflux condenser with ground glass joints.

D.1.2 *Graduated flask*, of chemically resistant glass, preferably borosilicate, 250-ml capacity.

D.1.3 *Mortar*, a suitable mortar made of steel.

D.1.4 *Test sieves*, of aperture size 425 µm and 600 µm conforming to CS 124.

D.2 REAGENTS

D.2.1 *Hydrochloric acid*, standard volumetric solution, c (HCl)= 0,01 mol/l.

D.2.2 *Ethyl alcohol*, 95 per cent (V/V) solution.

D.2.3 *Methyl red indicator*

Dissolve 0.04 g of methyl red in 75 ml of ethyl alcohol. Add 1,5 ml of 2 g/l sodium hydroxide solution or a quantity sufficient to eusure that the colour of the solution corresponds to pH 5.2, and then dilute to 100 ml with water.

D.2.4 *Test solution*

Take 1.0 ml of standard hydrochloric acid (D.2.1) and 1.0 ml of methyl red indicator (D.2.3) in a previously tested Erlenmeyer flask and add 240 ml of water. Boil for five minutes. Cool quickly under running water and make up to 250 ml in the graduated flask.

D.3 TESTING OF ERLENMEYER FLASK ASSEMBLY

D.3.1 Transfer 100 ml of test solution to the Erlenmeyer flask to be tested. Place the flask quickly in a bath of boiling water so that the level of the solution in the flask is below the level of the water in the bath and attach a small reflux condenser. Continue boiling for one hour and at the end of this period observe the colour of the solution. Reject the flask if any change of colour of the test solution has taken place.

D.3.2 Erlenmeyer flask assemblies which have once passed the test for suitability may fail to do so after prolonged storage. In such a case, they may be re-used by washing with 5 per cent (m/V) solution of glacial acetic acid followed by washing with water until free from acid before use.

D.4 PROCEDURE

Use Erlenmeyer flasks as tested under D.3.1.Rinse the bottles selected for this test with distilled water, dry in a stream of dry air and crush them in the mortar such that the glass particles pass through a sieve of aperture size 600 µm, but fail to pass through a sieve of aperture size 425 µm. The crushing and sieving should be done in three to four stages to avoid too much fines. Spread the sieved particles weighing more than 5 g on a glazed paper and pass a magnet over them to remove any particles of iron which may have been introduced during crushing. Wash the sieved glass, free from dust

in an Erlenmeyer flask with four successive 30-ml portions of ethyl alcohol and dry the flask and contents at 100 ± 2 °C. Take two more Erlenmeyer flasks and transfer 5 g of the sieved, clean, dry glass weighed to the nearest 0.001 g to one of the two flasks. Transfer a 100-ml portion of the freshly prepared test solution to both flasks. Place the flasks quickly in a bath of boiling water so that the levels of the contained solutions are below the level of the water in the bath and attach the previously tested reflux condensers. Keep the flasks in the boiling water bath for 30 minutes and then take them out and cool quickly under running water. From the first flask containing the powdered glass sample, decant out the test solution into a third Erlenmeyer flask. Add 4 ml of water to the powdered glass residue in the first flask, shake a little and decant out into the third flask, taking care to see that transference of the powdered glass is avoided as far as possible. Also add 4 ml of water to the second flask containing only the test solution (blank), titrate the solution in the third flask immediately with standard hydrochloric acid (**D.2.1**) to the pink colour of the blank test solution in the second flask.

D.4.1 The bottles shall be taken to have satisfied the test if not more than 3 ml of hydrochloric acid (D.2.1) is required for the titration.

APPENDIX E

TEST FOR RESISTANCE TO IMPACT

E.1 PROCEDURE

Strike the bottles at the following points with a hardened spherical steel ball of mass 400 g falling from a height of 100 mm:

a) four different points at a height of about 50 mm from the base;

b) on both seams; and

c) at the extremities of a diameter, at right angles to the joining seam.

E.1.1 A bottle shall be deemed to have failed the test if there is a complete fracture, that is, a piece of glass falls off from it, or if a crack develops in its body.

APPENDIX F

TEST FOR RESISTANCE TO THERMAL SHOCK

F.1 APPARATUS

The apparatus shall consist essentially of a basket for holding the bottles upright, two water-baths, one containing hot water and the other containing cold water. The temperature of the water baths shall be controlled within ± 2 °C. Each water bath may also be provided with a stirrer to maintain a uniform temperature.

F.2 PROCEDURE

Adjust the cold water bath to a convenient temperature between 27 °C and 35 °C. The water in the hot water bath shall be maintained at a temperature of 42 ± 2 °C above that of the cold water bath. Place the empty bottles in the basket vertically with the mouth upwards. When the baths have attained the prescribed temperatures, immerse immediately the basket containing the bottles in the hot bath in such a manner that the bottles become completely filled with the hot water. Keep the bottles immersed for 15 minutes. Transfer the basket with the bottles filled with hot water to the cold bath so that the bottles are immersed in water. Keep the bottles immersed for 5 minutes. Remove the basket from the cold bath. The process of transfer from the hot bath to the cold bath shall be completed in 15 ± 2 seconds. Take every precaution to protect the apparatus from draughts. Inspect each container for cracks or breaks.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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