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Full aperture easy open end made of tinplate or ECCS

镀锡或镀铬薄钢板全开式易开盖

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Standardization Administration of the People's Republic of China.

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Full aperture easy open end made of tinplate or ECCS

1 Scope

This Standard specifies the terms and definitions, product classification, codes and main dimensional symbols, requirements, test methods, inspection rules, as well as basic requirements for marking, packaging, transportation and storage of full aperture easy open end made of tinplate or ECCS.

This Standard applies to full aperture easy open end made of tinplate or ECCS for food packaging.

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.

GB/T 191, Packaging - Pictorial marking for handling of goods

GB/T 2520, Cold-reduced electrolytic tinplate

GB/T 2828.1, Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 6682, Water for analytical laboratory use - Specification and test methods

GB/T 24180, Cold-reduced electrolytic chromium/chromium oxide coated steel sheet and strip

QB/T 1877, Tinplate prints for the packing and decoration

QB/T 2763, Coated tinplate (or ECCS)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

full aperture easy open end made of tinplate or ECCS

An end made of tinplate or ECCS as the main material, with a certain depth of notches around the entire circumference of the capping or with full-circumferential and

e – capping depth;

b – hook-edge opening;

D – outer diameter of hook edge (divided into long-side outer diameter D_1 and short-side outer diameter D_2 for special-shaped ends).

Figure 2 – Schematic diagram of main dimensions of the easy open end

5 Requirements

5.1 Raw and auxiliary materials

5.1.1 Tinplate or ECCS

5.1.1.1 Electrolytic tinplate shall comply with the regulations of GB/T 2520, and ECCS shall comply with the regulations of GB/T 24180. That is, electrolytic tinplate or ECCS that has been inspected online and are suitable for printing on the entire sheet under normal storage conditions, and must not have the following defects:

a) pinholes penetrating the thickness of the steel sheet;

b) surface defects such as scars, pits, wrinkles, rust, etc. that may have an impact on use;

c) shape defects that affect use.

5.1.1.2 In addition to the above requirements, there shall be specific requirements for the tin coating weight, chromium plating amount, impact resistance, thickness, temper and the allowable deviation of thickness and temper of electrolytic tinplate or ECCS. Material specifications, parameters and quality requirements shall be agreed upon by both parties.

5.1.2 Coated tinplate or ECCS

The inside and outside of the steel sheet shall be coated. The coating type and the film property shall be agreed between the supplier and the buyer based on QB/T 2763 and the characteristics of the content.

5.1.3 Ring tab material

Galvanized, tin-plated, chromium-plated steel sheets or aluminum-magnesium alloy sheets with appropriate thickness, tensile strength and elongation, which shall also be coated on both sides.

5.1.4 Coating

6 Test methods

The water used in this test method, unless otherwise required, refers to water of grade 3 or above in accordance with GB/T 6682 Water for analytical laboratory use - Specification and test methods.

The reagents used in this test method are analytical reagents (AR) unless the specifications are stated. Special requirements, if any, shall be clearly specified.

The solutions used in this test refer to aqueous solutions unless the solvent used to prepare them is specified.

6.1 Dimensional determination

Use general or special measuring tools with an accuracy not greater than 0.01 mm to measure.

6.2 Appearance quality

Visually inspect with normal vision under normal light.

6.3 Film property

6.3.1 Curability

6.3.1.1 Instruments and apparatuses

a) stainless steel cylinder;

b) steam sterilizer.

6.3.1.2 Test procedure

Immerse the sample cap in a stainless steel cylinder filled with distilled water; place the stainless steel cylinder in a steam sterilizer; heat to 121 °C and maintain a constant temperature for 30 minutes; naturally depressurize and cool; then, remove the sample cap. Visually inspect the coating condition of the sample cap.

6.3.2 Corrosion resistance

6.3.2.1 Reagents and solutions

6.3.2.1.1 Citric acid solution (20 g/L)

Weigh 20 g of citric acid ($C_6H_8O_7 \cdot H_2O$); use water to dissolve and dilute to 1 000 mL.

6.3.2.1.2 Mixed solution A [mixed solution of L-cysteine hydrochloride (0.5 g/L), potassium dihydrogen phosphate (3.6 g/L), and disodium hydrogen phosphate (7.2 g/L)]

Weigh 0.5 g of L-cysteine hydrochloride ($C_3H_8NO_2SCl$) or 0.56 g of 1-hydrate L-cysteine hydrochloride ($C_3H_8NO_2SCl \cdot H_2O$), 3.6 g of potassium dihydrogen phosphate, and 7.2 g of disodium hydrogen phosphate; dissolve them in water respectively; mix and dilute to 1 000 mL. Use the solution within 4 hours after preparation.

6.3.2.2 Instruments and apparatuses

a) stainless steel cylinder with sealing cover;

b) steam high-pressure sterilizer.

6.3.2.3 Test procedure

6.3.2.3.1 Easy open ends for packaging acidic contents for atmospheric sterilization

Immerse the sample cap in a stainless steel cylinder filled with citric acid solution; seal it; place the stainless steel cylinder in a steam high-pressure sterilizer; heat to 100 °C and keep the temperature constant for 30 minutes; naturally depressurize and cool; then, remove the sample cap. Visually inspect the coating condition of the sample cap.

6.3.2.3.2 Easy open ends for packaging contents containing protein for high pressure sterilization

Immerse the sample cap in the stainless steel cylinder containing mixed solution A; seal it; place the stainless steel cylinder in a steam high-pressure sterilizer; heat to 121 °C and keep the temperature constant for 60 minutes; naturally depressurize and cool; then, remove the sample cap. Visually inspect the coating condition of the sample cap.

6.3.2.3.3 Easy open ends for packaging acidic or other contents for high pressure sterilization

Immerse the sample cap in a stainless steel cylinder filled with citric acid solution; seal it; place the stainless steel cylinder in a steam high-pressure sterilizer; heat to 121 °C and keep the temperature constant for 30 minutes; naturally depressurize and cool; then, remove the sample cap. Visually inspect the coating condition of the sample cap.

6.3.3 Impact resistance

6.3.3.1 Reagents and solutions

Copper sulfate solution (50 g/L): Weigh 50 g of copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$); use water to dissolve and dilute to 1 000 mL.

6.3.3.2 Instruments and apparatuses

a) beaker (1 000 mL);

b) ceramic ware or glassware.

Lift the ring tab to break the engraved line, and push the ring tab to the bottom in the opening direction; then, lift the ring tab and pull it back to open the sample cap; observe the ring tab of the sample cap.

6.4.4 Enamel rate

6.4.4.1 Reagents and solutions

Sodium sulfate solution (20 g/L): Weigh 20 g of sodium sulfate (Na_2SO_4); use water to dissolve and dilute to 1 000 mL.

6.4.4.2 Instruments and apparatuses

Film integrity tester: accuracy not greater than 0.1 mA.

6.4.4.3 Test procedure

Use the film integrity tester for testing; pour the sodium sulfate test solution, and measure the internal film defect current value of the sample cap at the 4^{th} second at a working voltage of 6.3 V.

6.5 Sealant dry film properties

6.5.1 Dry film mass and moisture content

6.5.1.1 Instruments and apparatuses

a) analytical balance: accuracy 0.000 1 g;

b) oven.

6.5.1.2 Test procedures for determining dry film mass

Use an analytical balance to weigh the sample cap without removing the sealant dry film; record the sample cap mass (W_1); after removing the sealant dry film, use the analytical balance to weigh the sample cap mass (W_2) again. Calculate the dry film mass (W) according to Formula (1):

$$W = W_1 - W_2 \qquad \cdots\cdots (1)$$

Where:

W – sealant dry film mass, in milligrams (mg);

W_1 – mass of the sample cap without removing the sealant dry film, in milligrams (mg);

W_2 – mass of the sample cap after removing the sealant dry film, in milligrams (mg).

6.5.1.3 Test procedures for determining moisture content

Use an analytical balance to weigh the sealant dry film peeled off from the sample cap, and record it as W_3; place the sealant dry film in an oven and dry it at 125 °C for 30 minutes to a constant weight, and weigh it again, and record it as W_4. Calculate the moisture content (X%) of the sealant film according to Formula (2):

$$X = 100 \times (W_3 - W_4) / W_3 \qquad \cdots\cdots (2)$$

Where:

X – moisture content of the sealant film, %;

W_3 – mass of the sealant dry film removed from the sample cap, in milligrams (mg);

W_4 – mass of the sealant dry film removed from the sample cap after drying, in milligrams (mg).

6.5.2 Water resistance

6.5.2.1 Test procedure

Immerse the sample cap in water at 100 °C for 20 minutes; take it out; visually observe the condition of the sealant dry film.

6.5.3 Oil resistance

6.5.3.1 Reagents and solutions

Edible grade vegetable oil (salad oil).

6.5.3.2 Test procedure

Immerse the sample cap in a vegetable oil bath at 120 °C ~ 130 °C; keep it for 20 minutes; take it out; visually observe the condition of the sealant film.

7 Inspection rules

7.1 Group or batch

Inspection shall be carried out by batches or groups. Products of the same specifications delivered at one time are considered to be one batch. A batch can be divided into several groups through negotiation between both parties. A group shall be an integral multiple of the packages.

7.2 Inspection classification

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