

THREE PIECE ROUND STEEL CANS USED FOR CANNING FOOD STUFFS

1. SCOPE AND FIELD OF APPLICATION

This standard is concerned with the single & double reduced three piece round steel cans (tin coated or tin free steel) used for canning food stuffs.

2. COMPLIMENTARY REFERENCE

- 2.1 GSO 1797 “Round Metal Cans Used for Canning Food stuffs Definitions, Construciton, Dimensions and Capacities”.
- 2.2 GSO 1795 “Methods of Test for the Three Piece Round Steel Cans Used for Canning Food stuffs”.
- 2.3. GSO ISO 11949: Cold-reduced tinmill products -Electrolytic tinplate

3. DEFINITIONS

For the purpose of this standard, all definitions mentioned in the Gulf Standard specified in items (2.1 & 2.3) shall apply.

- 3.1 **Food tin cans:** They are cans made of laminated steel and covered with tin, chrome or aluminum and its alloys with magnesium and manganese and may be covered with a layer of paint or without a layer of paint.
- 3.2 **The tinning process:** It is the process of covering the tin with a layer of tin to prevent corrosion resulting from chemical reactions with food components or preservative solutions (salt, acidic or sugary) in packaging operations.
- 3.3 **The chromium process:** It is the process of covering the tin with a layer of chromium and electrically precipitated chromium oxide as an alternative to the tinning process.
- 3.4 **Sealing:** It is the process of double sealing the top cover of metal containers after the filling process to ensure the safety of food inside the package.
- 3.5 **Single cold-reduced :** description of product in which the black plate has been reduced to the desired thickness in a cold reduction mill and subsequently annealed and temper rolled
- 3.6 **Double cold-reduced :** description of product in which the black plate has had a second major reduction after annealing

4. REQUIREMENTS

The hermetically sealed round steel cans used for canning food stuffs shall have the following:

- 4.1 Plate
 - 4.1.1 Tin Plates

- 4.1.1.1 Tin plates used in the manufacturing tin cans shall be made from steel sheets with 0.12 maximum carbon percent and galvanized either by hot tin dipping or electrolytic process with a coating layer. Appendix (1) gives the analysis of some types of steel used in food can manufacture and the class of food according to corrosivity.
- 4.1.1.2 Plate thickness should not be less than 0.10 mm for double reduced and less than 0.15 mm for single reduced.
- 4.1.1.3 The tin layer weight grams per meter square shall be as shown in Appendix (2).
- 4.1.2 Tin Free Steel (Chrome Coated and Oxide Chrome Electrolytically)
 - 4.1.2.1 The chemical analysis of some type of steel in cans manufacture shall be as shown in Appendix (1).
 - 4.1.2.2 Plate thickness shall not be less than 0.10 mm for double reduced and less than 0.15 mm for single reduced.
 - 4.1.2.3 The chrome weight should not be less than 50 milligram per meter square and chrome weight in oxide chrome as 7 milligram per meter square.
- 4.1.3 Plate shall neither alter the taste, odour or properties of the canned food nor form harmful compounds with it.
- 4.2 Lacquer (interior coating)
 - 4.2.1 It shall neither affect the taste , odour of food nor form harmful compounds with it.
 - 4.2.2 The lacquer shall be smooth and uniformly distributed on sheet surfaces, and it shall withstand the thermal treatment degree for sterilization and/or pasteurization for the food material, and also filling and storing condition.
 - 4.2.3 The interior coating shall be one of these specified for use in food industry according to the nature of the food, as shown for example in Appendix 3.
 - 4.2.4 The paint layer should completely cover all the internal parts of the can
- 4.3 Elastic matter
 - 4.3.1 The elastic matter used in the double seaming shall be resistant to chemical changes and free from poisonous compounds, i.e. Sulphur & Antimony.
 - 4.3.2 It shall not cause change in the taste or oder or properties of food, and shall withstand the temperature and pressure during filling, storing and handling.
- 4.4 Double seaming
 - 4.4.1 The can shall be hermetically sealed by double seaming so as to prevent leakage into or from it.
 - 4.4.2 It shall be regular in shape all around the can diameter.
 - 4.4.3 It shall be free from sharp edges.
 - 4.4.4 It shall be uniform in thickness.
 - 4.4.5 It is not allowed to use the gasket for side welding of cans that will be sterilized after filling with food.

- 4.5 The side seam for three pieces cans be formed by electric welding or any other regular method shall be free from defects causing leakage into or from it and side stripe varnish applied Permitted to be used in contact with food.
- 4.6 Covers
 - 4.6.1 Covers used for bottom and top of three piece cans. It shall be suitable for double seaming with sealing compound on cover.
 - 4.6.2 Common covers standards or easy open ends can be made of tin plates or tin free steel or aluminium. It shall be lacquered depending on the canned food stuffs and shall be resistant to internal pressure or vacuum and shall not impair food nor affect odour, taste, colour.
- 4.7 The can shall be internally and externally clean and free from swells or deformation (can bulged at both ends) or other defects.
- 4.8 Permitted wrinkle number in the cover hook shall be from 1 to 2.
- 4.9 The can shall be easily opened by any of the widely used can openers.
- 4.10 Dimensions and capacities
 - 4.10.1 The preferred nominal internal diameters of cans and their tolerance in mm according to Gulf Standard mentioned in item 2.1
 - 4.10.2 The preferred nominal capacities and their tolerance according to Gulf standard mentioned in item 2.1.
- 4.11 Performance Requirements
 - 4.11.1 Pressure Test
 - 4.11.1.1 It shall be capable of withstanding air pressure as below :

Common Food Can with Common Lid	0.1 N/mm ² (Mega Pascal)
Common Food Can with Easy Open End	0.05 N/mm ² (Mega Pascal)
Carbonated Drink Can	0.655 N/mm ² (Mega Pascal)

- 4.11.2 The average enamel rater level shall be less than 5 mA and not more than 15 mA.

5. LABELLING

- 5.1 The following information shall be declared on each pallet containing cans:
 - 5.1.1 Manufacture’s name and/or his trade mark.
 - 5.1.2 Country of origin
 - 5.1.3 Can nominal capacity in ml
 - 5.1.4 Production date
 - 5.1.5 Number of cans
 - 5.1.6 Storage and handling conditions when needed.
- 5.2 Each can shall be marked with the following:
 - 5.2.1 Trade mark of the manufacturer.

5.2.2 Code number (this code shall trace the information needed about the can such as year, month and day of manufacture from the records of manufacturer) or the date of manufacture (year, month and day).

6. TESTING

All necessary tests shall be carried out on samples taken according to item (7) to ensure their conformity to the requirements of this standard.

7. SAMPLING

7.1 Samples necessary for visual inspection and air pressure tests shall be taken at random as shown in Table 1.

Table 1

No of cans in the consignment	Sample number	Sample size	Visual inspection		Air pressure test	
			Acceptance No.	Rejection No.	Acceptance No.	Rejection No.
Up to 3000	First	50	3	7	0	3
	Second	50	8	9	3	4
From 3001 up to 10000	First	80	5	9	1	4
	Second	80	12	13	4	5
From 10001 up to 35000	First	125	7	11	2	5
	Second	125	18	19	6	7
Over 35000	First	200	11	16	3	7
	Second	200	26	27	8	9

7.2 The dimensions measurement test shall be carried out on 20 of the samples which have passed both the visual inspection and air pressure tests.

7.3 The capacity test shall be carried out on 10 of the samples which have passed the dimensions measurement test.

7.4 The lacquer test shall be carried out on 5 cans which passed the dimensions and capacity test.

7.5 The wrinkling number test shall be carried out on 5 of the samples which have passed the capacity test.

7.6 To carry out the chemical analysis test, a number of samples shall be taken at random according to the equation.

$$n = \sqrt{\frac{N}{2}}$$

Where:

n = number of cans in sample

N = number of cans in consignment

An area 1250 mm² shall be taken from cans at a distance from edges and side seaming. Pieces of the same area shall be taken from covers and bottoms in case of large size cans. An area of 625 mm² taken from covers and bottoms in case of

small size cans, and a suitable quantity of elastic matter shall be taken from double seam.

8. METHODS OF TESTS

The tests shall be carried out in accordance with Gulf standard mentioned in item 2.2.

9. RULES OF ACCEPTANCE AND REJECTION

9.1 Samples shall be examined in accordance with the test methods specified in Clause 8.

9.2 The consignment is deemed to be complying with the visual test, if the defectives are equal to or less than the acceptance number as shown in Table 1. If the defectives are more than or equal to rejection number as shown in Table 1, the consignment is deemed to be non-complying. If defectives are more than the acceptance number and less than the rejection number, a second sample shall be taken and retested. If the combined number of defectives of the first and the second samples is less than or equal to the corresponding acceptance number, the consignment shall be considered complying as regards to visual test, otherwise it shall be considered non-complying.

9.3 The consignment is deemed to be acceptable as regards other test (dimension –air pressure –.....etc.) if the sample passes the tests mentioned in the standard mentioned in item 2.2. If the sample does not pass any of the tests a second sample double the number of the first sample shall be taken. The consignment shall be considered complying if the second sample passes the repeated tests, otherwise it shall be considered non complying.

Appendix 1

Chemical analysis of some types of steel used in cans manufacture
and class of food according to corrosivity.

Class of food according to corrosivity	Type of steel	Food characteristics	Chemical analysis of steel elements in percent (maximum)									
			C	P	Cu	Si	Mn	S	Ni	Cr	Mo	As
Most strongly corrosive	L	High acidic fruit products. Acidic, salty foods & dark coloured fruits	0.12	0.015	0.06	0.01	0.25 to 0.60	0.05	0.04	0.06	0.05	0.02
Moderately corrosive	MR	Acidic vegetables and mildly acidic fruits	0.12	0.015	0.1	0.01	0.25 to 0.60	0.05	0.04	0.06	0.05	0.02
			0.12	0.02	0.2	0.01	0.25 to 0.60	0.05	–	–	–	–
Mildly or non - corrosive	D	Low acidity products, dry and non processed products	0.12	0.07	0.2	0.01	0.25 to 0.60	0.05	–	–	–	–

Appendix 2
Tin layer weight

Class of food according to corrosively	Food characteristics	Tin layer weight internal g/m ²	Tin layer weight external g/m ²
Most strongly corrosive	High acidic fruit products. Acidic, salty foods & dark coloured fruits	+ 0 8.4 - 0.65	2.8 + 0 - 0.35
Moderately corrosive	Acidic vegetables and mildly acidic fruits	5.6 + 0 - 0.50	2.8 + 0 - 0.35
Mildly or non-corrosive	Low acidity products, dry and non processed products	2.8 + 0 - 0.35	2.8 + 0 - 0.35

Appendix 3

Examples of interior coating types used in cans

Type	Product resistance	Fabricability
Epoxy amino	Excellent	Good
Epoxy phenolics	Good	Good
Epoxy acrylates	Excellent	Good
Epoxy acrylates/phenolics	Excellent	Good
Solution vinyls	Good to excellent	Excellent
Dispersion vinyls	Excellent	Excellent
Polyesters	Excellent	Excellent

المصطلحات الفنية

Wrinkling	تجعيد
Acceptance number	عدد القبول
Rejection number	عدد الرفض
Can	علبة
Capacity	سعة
Strongly Corrosive	شديد التآكل
Tin Plate	صفيح مقصدر
Tin free steel	صفيح غير مقصدر
Side seam	وصل جانبي
Elastic matter	مادة مرنة
Hermetically sealed	محكمة القفل آلياً
Thermal treatment	معاملة حرارية
Rubber	مطاط