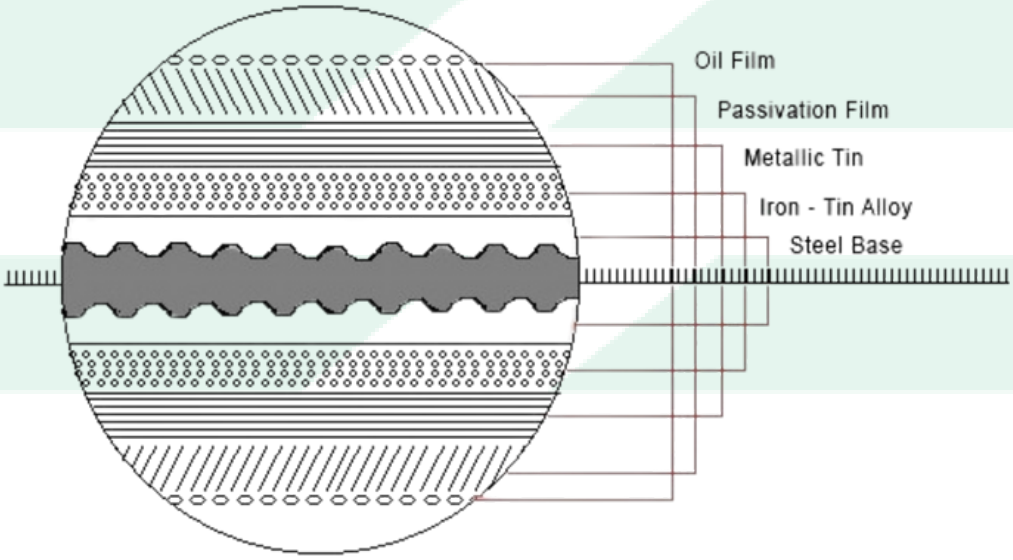
TECHNICAL DATASHEET
Electrolytic Tinplate

1. Tinplate is a heterogeneous material with stratified structure known as Electrolytic Tinplate (ETP), it has a low carbon steel plate as core material, covered on both sides with tin, which could be similar or different on each side. Tinplate is used on container and container parts production, which have to have some properties according to the product to be contained, the production process and the final destiny of the article.

Tinplate consists of five layers each of which performs a different role:



1.1 Steel Base: Provides stiffness to the material due to its thickness and mechanical strength. Its chemical composition imparts special properties to resist corrosion.

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
www.steelforcepackaging.com

1.2. Iron-Tin Alloy: This is made up by the inter-metallic compound Fe-Sn2. Due to its electrochemical characteristics, it acts as a barrier against corrosion. For effective action, its continuity is more important than its quantity.

1.3. Metallic Tin: Tin has many advantages which have turned it into the most important element to protect steel used for cans; in many foods, it acts as a simple barrier against corrosion, improves weldability, it is an excellent base for lithographic printing and for applying lacquers. In tin-robbing foods, it acts as a sacrificial element.

1.4. Passivation Film: According to its nature, it makes it possible to improve the E.T.P.'s resistance to sulphiding, oxidation and rust. It is also a conditioner to improve the adherence of varnishes, inks, lacquers etc.

1.5. Oil Film: Protects the sheet from the humidity in the environment and makes easy to handle. It is applied using an electrostatic oiler on both sides of the sheet.

2.2 USES.

Tinplate can be used for stamped parts, lids and ends, oval and cylindrical two pieces cans, rectangular cans and crown caps for soft drinks and beer.

3.0 TECHNICAL SPECIFICATIONS.

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

3.1 STEEL

TYPES OF STEEL	FEATURE
D	Aluminum killed steel (deoxidized). This is used for deep drawn cans (two-piece cans, aerosol, etc.) or in those processes where wrinkles –de Luders– are likely to appear during machining.
L	Contains small quantities of metalloids and residual elements such as: Cu, Ni, Cr, Mo. Used to improve the internal corrosion resistance of cans for certain food products.
MR	Contains low percentages of residual elements and has a good corrosion resistance. It is the most common in the market and is used for general purposes, including cans.

3.2 CHEMICAL COMPOSITION

CHEMICAL COMPOSITION FOR STEEL USED FOR ETP			
Elemental	**Type D % max**	**Type L (1) % max**	**Type MR (1) % max**
Carbon	0.12	0.13	0.13
Manganese	0.60	0.60	0.60
Phosphorus	0.02	0.015	0.02
Sulfur	0,05	0,05	0,05
Silicon(2)	0.02	0.02	0.02
Copper	0.20	0.06	0.20
Nickel	0.15	0.04	0.15
Chromium	0.10	0.06	0.10
Molybdenum	0.05	0.05	0.05
Others, each	0.02	0.02	0.02

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

According to ASTM A623-2009. (1) Double reduction products are obtained in type L and MR. (2) When it is used steel obtained by continuous casting killed by silicon it is accepted until 0.08%

3.3 FINISHED

ETP FINISHED		
TYPE	**MAIN USES**	**FEATURES**
BRIGHT	General purpose cans	Finishing with melted tin, with a bright shine
MATE	Crown caps	Matte finish, without shine, with electrolytically deposited tin without melting on the matte finishes steel plate
SILVER	Cans for differente applications, crown caps	Finish with melted tin produced using a special treatment on the base metal
STONE	General use cans	Finish with melted tin, produced on the base metal, with a slightly matte appearance. Resist scratching during lithography or cans production.

3.4 HARDNESS, TEMPER AND REDUCTION TYPE

TEMPER	Hardness, HR 30T	Thickness: e,mm	Uses
T1-BA	Max 53	e<=0,21	Necks, nozzles, taps, toys bottoms for 5 gal. cans for oil and other uses that require deep drawing.
	Max 52	0,21<e<=0,28	
	Max 51	e>0,28	
T2-BA	53 ± 4	e<=0,21	Small, square cans, cans for fish (0) salted meat, rings and other uses, with moderate draw.
	52 ± 4	0,21<e<=0,28	
	51 ± 4	e>0,28	

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

T2,5 - BA, CA	56 ± 4	e<=0,21	Crowns, for cans and other applications that require moderate draw and harness.
	55 ± 4	0,21<e<=0,28	
	54 ± 4	e>0,28	
T3 - BA,CA	58 ± 4	e<=0,21	Bodies for 5 gal oil cans, large cans and other applications that require an appropiate level of hardness.
	57 ± 4	0,21<e<=0,28	
	56 ± 4	e>=0,28	
T4 - C4 (1)	62 ± 4	**e<=0,21**	Bodies and bottoms for cans that require relatively high strenght, and crown caps.
	61 ± 4	**0,21<e<=0,28**	
	60 ± 4	**e>=0,28**	
T5 - CA (1)	65 ± 4	e<=0,21	Bodies and bottoms for cans that require a combination of high hardness, strength, and good formability.
	65 ± 4	0,21<e<=0,28	
	64 ± 4	e>=0,28	
DR 7,5	70 ± 4	e<=0,21	Bodies and bottoms of small diameter cans requiring high strength.
	70 ± 4	0,21<e<=0,28	
	70 ± 4	e>=0,28	
DR 8(2) BA - CA	73 ± 4	e<=0,21	
	73 ± 4	0,21<e<=0,28	
	73 ± 4	e>=0,28	
DR 9(2) CA	76 ± 4	e<=0,21	
	76 ± 4	0,21<e<=0,28	
	76 ± 4	e>=0,28	
DR 9 M (2)	77 ± 4	e<=0,21	
	77 ± 4	0,21<e<=0,28	
	77 ± 4	e>=0,28	
DR 10	80 ± 4	e<=0,21	
	80 ± 4	0,21<e<=0,28	
	80 ± 4	e>=0,28	

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

(1) CA means continuous annealing and BA means box annealing. (2) DR: Base metal produced using the double cold reduction process; provides greater stiffness and strength than conventional base material and, therefore, provides the same strength using smaller cross sections. These advantages make it possible to produce more cans per unit weight of electrolytic tinplate. Service characteristic, thickness distribution and chemical characteristics are similar to those of conventional steel.

3.5 ELECTROLYTIC TINPLATE AVAILABILITY

DIMENSIONS AND COATING AVAILABILITY			
Variable	**Units**	**Minimum**	**Maximum**
3.4.1. MECHANICAL PROPERTIES AND COATINGS			
Thickness	mm	0,15	0,6
Temper	N/A	T1	DR10
Metallic tin	g/m2	1,1	13,4
Iron - tin - alloy	g/m2	0,4	1,2
Chromium oxide (passivation)	µg/dm2	40	70
Oil	mg/m2	0	25
Differential marking	N.A	Just for upper side. Parallel lines2	
3.4.2. PACKAGES PRESENTATION			
Rectangular cutting sheets			
Cutting length	mm	457,2	1250
Width	mm	600	965,2
Package weight	Kg	N/A	2500
Package height	mm	N/A	450

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

Pre-scroll cutting sheets			
Thickness	mm	0,13(1)	0,50
Cutting length	mm	610	1016
Width	mm	610	1118
Package weight	Kg	N/A	2500
Package height	mm	N/A	457,2
Rectangular re-squared cutting sheets			
Thickness	mm	0,13(1)	0,40
Width	mm	600	1000
Cutting length	mm	500	1000
Package weight	Kg	N/A	2500
Package height	mm	N/A	450
Lithographed sheets (Press)			
Width	mm	710	1130
Lenght	mm	510	960
Maximum printing area	mm	1130 (Width)	945 (Length)
Package weight	Kg	N/A	2500
Package height	mm	N/A	450
Varnished sheets			
Width	mm	710	1130
Lenght	mm	510	960
Maximum printing area	mm	1130 (Width)	970 (Length)
Package weight	Kg	N/A	2500
Package weight	mm	N/A	450

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

3.4.3 COILS PRESENTATION			
3.1 Coils			
Coil weight	Kg	1000	9000
Internal diameter	mm	419	505
External diameter	mm	610	1626
Strips			
Thickness	mm	0,17	0,6
Coil width	mm	600	984
Strip width	mm	20	614
Strips by step	Units	2	15
Coil weight	Kg	1000	9000
Internal diameter	mm	505	-------
External diameter	mm	610	1624

Sheets with thickness less than 0.15 mm are provided by the customer
Marking conventions: Marking designations are differential coating.

- Differential Electrolytic Tinplate (ETP) shows parallel lines as indicated in the drawings.

- The distance between the lines indicates the tinning that has been applied to the Electrolytic Tinplate (ETP). For example, a distance of 12.5 mm between lines indicates a 5.6/2.8 g/m2 differential tinning.

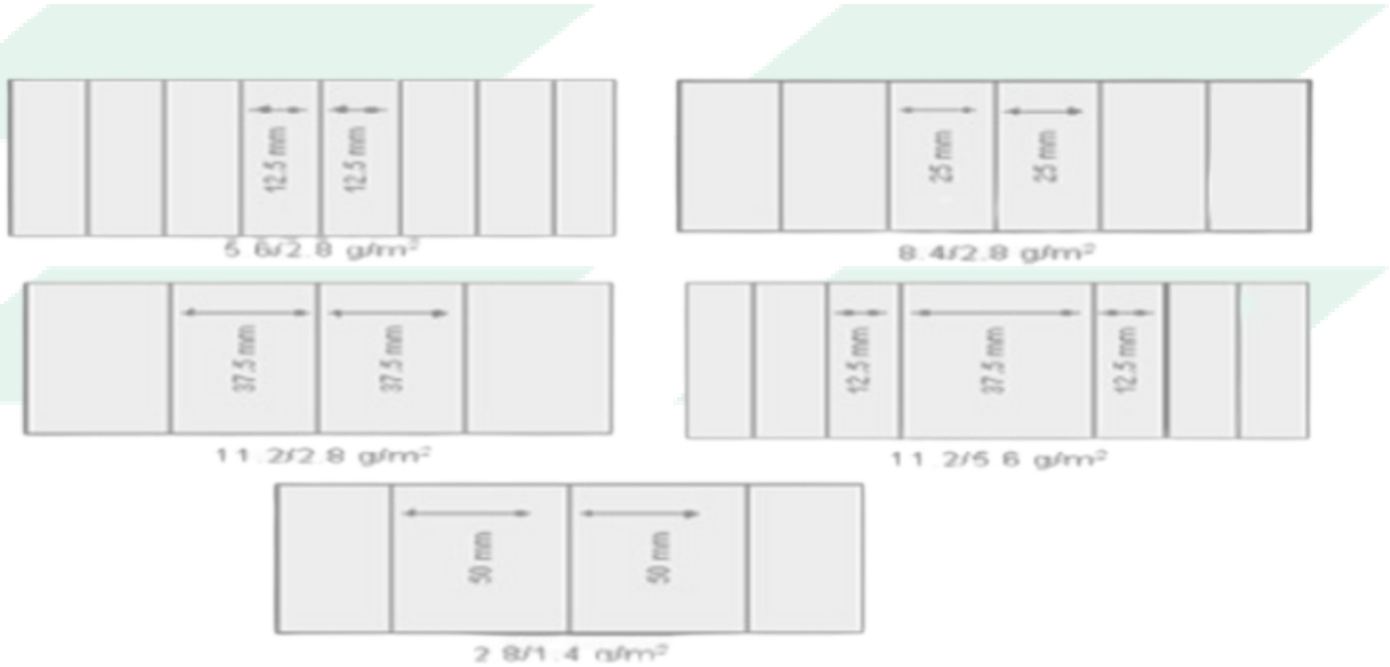
STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

- Bearing in mind the international standards, the parallel markings indicate the side with the greater coating. For example, in differential Electrolytic Tinplate (ETP) with 5.6/2.8 g/m2 tinning; the marking will be on the side tinned with 5.6 g/m2.

- In electrolytic tinplate, the markings will always be on the upper side of the ETP.

- Notwithstanding the international standard, if the customer would rather have the markings on the lower tinned side, it is in a position to provide this service, but keeping in mind that the markings will always be on the upper side.

- In differential Electrolytic Tinplate (ETP) with differential coatings, the distance between parallel lines will be agreed with the customer.



STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

5.0 RECOMMENDATIONS AND PRODUCT HANDLING.

- For maximum usage of the raw material, the following recommendations should be followed:

- ·The Electrolytic Tinplate (ETP) should be stored in a humidity-free environment to prevent and risk of oxidation.

- ·Oxidation is the result of the interaction among the iron, exposed through imperfections in the coating, water (humidity) and oxygen in the air.

- ·To prevent oxidation it is necessary to take care when transporting, storing and handling the Electrolytic Tinplate (ETP) by following these precautions:
- Inspect one hundred percent of each production order to check the general status of the packaging

- Never leave the Electrolytic Tinplate (ETP) outdoors

- Store the Electrolytic Tinplate (ETP) in closed warehouses with low relative humidity. In coastal areas or lots of rainfall, it is advisable to use equipment to reduce relative humidity to acceptable levels. Otherwise, the electrolytic tinplate can change color in what is known as yellow stain.

- Do not store Electrolytic Tinplate (ETP) without appropriate packaging

- Do not make piles higher than 2.50 m.

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos

- Never handle Electrolytic Tinplate (ETP) without gloves. The humidity and salts in perspiration attack tinplate very quickly

- If the Electrolytic Tinplate (ETP) bales have to be inspected, they should be covered again for storage. If humidity is seen during inspection, it is advisable to use that electrolytic tinplate immediately to prevent the oxidation process.

- Use Electrolytic Tinplate (ETP) immediately after opening it
- In fabrication processes that use electrolytic tinplate and require cuts, the resulting parts should not be stored for a long time because the edges do not contain tin and become quickly oxidized
-
- Special care should be taken in handling and fabrication of cans and caps to avoid scratching the Electrolytic Tinplate (ETP) Do not store the electrolytic tinplate for very long because the oil applied to protect it evaporates and breaks down until it disappears

- Whenever it becomes necessary to wet objects made out of electrolytic tinplate, dry them properly: use compressed air or an appropriate oven.

- Do not rub the Electrolytic Tinplate (ETP) with abrasive material or use inorganic liquids to clean it. Use cotton and a solvent compatible with the lacquer or ink that is going to be used.

- Material storage should be as follows:
  - In general the lots with greater area or quantity should be located in the stack's lower side
  - Stack height should be necessary enough to keep visual control to avoid injuries. Moreover, the stability due the base/height and floor capacity resistant should be considered.

STEELFORCE PACKAGING
infocol@steelforcepackaging.com
Bélgica - Amberes - Países bajos