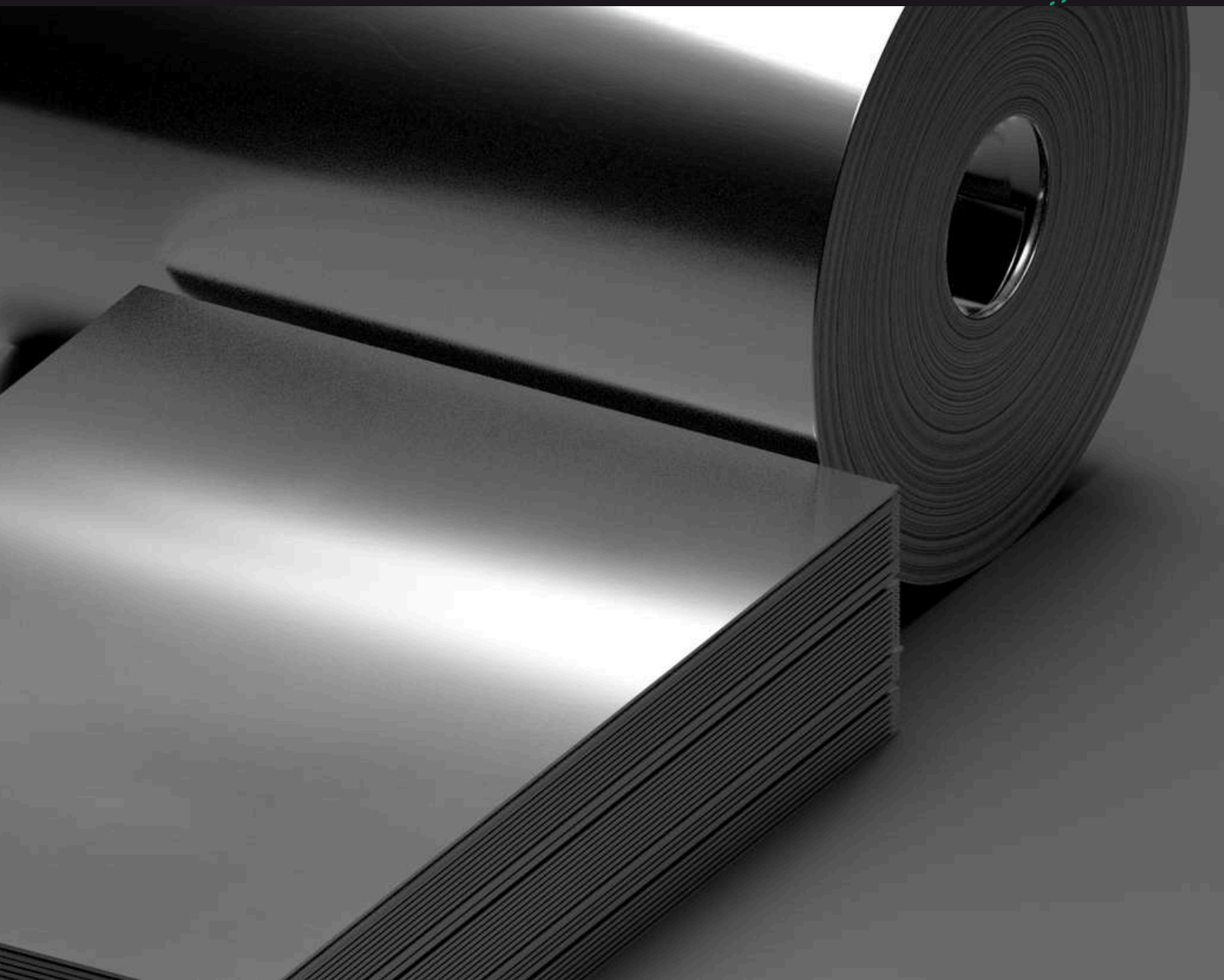
STEELFORCE
PACKAGING

TECHNICAL DATASHEET
Tin Free steel



Tin Free steel (TFS)

Comprehensive Technical Overview

Introduction

Tin-Free Steel (TFS), also known as Electrolytic Chromium Coated Steel (E.C.C.S.), is a high-performance material designed for a wide range of applications in manufacturing and packaging. Its unique composition ensures durability, corrosion resistance, and excellent handling characteristics. Below, you'll find detailed technical specifications and recommendations for optimal use.

1.What is Tin-Free Steel?

Tin-Free Steel is a steel sheet coated on both sides with a dual-layer film comprising metallic chromium, chromium oxide, and oil. Each component contributes to the exceptional properties of TFS:

- Steel Base: Provides stiffness and mechanical strength, with a composition tailored for corrosion resistance.
- Metallic Chromium: Offers robust corrosion resistance, comparable to 2.8 g/m² tinplate.
- Chromium Oxide: Enhances sulfur and iron oxide resistance and ensures superior adhesion for inks and varnishes.
- Oil Film: Prevents humidity-induced corrosion and facilitates handling.

2. Applications

TFS is versatile and used in:

- Stamped parts, lids, and ends
- Oval and cylindrical two-piece cans
- Rectangular cans
- Crown caps for soft drinks and beer.
- Technical Specifications

Steel Types

Type	Features	Applications
D	Deoxidized for deep-drawn cans to prevent wrinkles during machining.	Two-piece cans, aerosols
L	Contains small quantities of metalloids and residual elements such as: Cu, Ni, Cr, Mo. Improved corrosion resistance for specific food products.	Food cans
MR	Contains low percentages of residual elements. General-purpose steel with excellent corrosion resistance.	Various can types

3. Handling Recommendations

- Lubrication: Always apply a moderate quantity of lubricant during fabrication.
- Storage: Avoid outdoor storage and use within 10 days of unwrapping.
- Tools: Use high-quality cutting and stamping tools for optimal results.
- Coating: Ensure both sides are lacquered before cutting or forming.

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

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%

FINISHES		
Type	**Main uses**	**Features**
Bright	General purpose cans	Finishing with melted tin, with a bright shine
Mate	Crown caps	Matte finishes, without shine, with electrolytically deposited tin without melting on the matte finishes steel plate
Silver	Cans for different 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.

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	
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	

(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 like those of conventional steel

DIMENSIONS 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
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
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
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.

5. Recommendations and product handling

General recommendations

Apply a moderate quantity of lubricants in the fabrication process. Oil is an important constitutive layer of the tin free steel and should never be specified without oil.
Before any cutting or forming process, apply lacquer or varnish on both sides of the tin free steel to avoid friction problems associated with the chromium coating.
Use cutting and stamping tools with special steel, like carbon steel with tungsten, to avoid it fast wear.

If it is necessary to have the same tone of the lithography applied over tin free steel than the lithography applied over tinplate, it is necessary, in some cases, to change inks formulation or increase film thickness, among others. If these conditions are necessary, the standards should be modified, and the optimum formulation must be found before industrial processing.

Tin free steel could be used on products with less than 1% organic acids (acetic acid and lactic acid), provided that the tin free steel is coated with the appropriate lacquer.

When tin free steel will be used on bodies and bottoms for food cans, specific tests must be done to assure that coating materials and conditions are appropriate, because content and thermal treatment used are not uniform.

Do not use tin free steel for cans type DI – deep drawing.

Handling recommendations

Tin free steel is designed and processed to be corrosion resistant, applying lithography coatings on both sides, however for best results, it is recommended to have into account the following points:

Store tin free steel with exceptional care with the humidity.

Never store tin free steel outdoor
Use tin free steel for a maximum of ten (10) days after having been unpaged.

Handle tin free steel with gloves. Fingerprints and sweat can be easily removed rubbing with an alcohol-impregnated cloth.

Do not store tin free steel in process, with lacquer or lithography on one side, for a period longer than one week.

Material storage should be as follows:

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

Contact Us for Technical Inquiries
For more detailed technical information or to discuss your specific requirements, reach out to our expert team. Let us help you select the optimal specifications for your project.

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