

FORUS GROUP

Forus Group provides products and services that benefit society and we grow in partnership with our customers and partners



Introduction

Forus Group is a globally integrated enterprise with the headquarter in HONG KONG (HongKong Forus LTD, 2010) and branches in China (Shanghai Forus Metal Materials LTD.), Australia (Forus Australia PTY LTD) and Russia (LLC FORUS). We are committed to supplying premium steel product, metal coating/printing ink, metal packaging production systems and steel processing equipment worldwide. Strategic partnership with World leading manufacturers and service providers shapes our competitive advantage in supplying best quality product and service to our customers. Flexibility, innovation, collaboration and communication underpin Forus's principal imperative, which is **Providing One-stop, Customized and Comprehensive service for our product to our customers.**

FORUS GROUP provides prepurchase service

- We provide detailed instruction data and standards of the manufacture's steel products.
 - We service our clients with instructions on correct selection of material.
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FORUS GROUP provides on-purchase service

- We provide order tracking information to ensure punctual goods delivery.
 - We perform sample inspection and make sure that the production is conducted in compliance with the contract.
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FORUS GROUP provides after sales service

- We provide clients with online query for certificated quality level.
- We provide clients with advisories for various problems met during the application.

CONTENTS

○ TIN FREE STEEL

List Of Tin Mill Products	01
Features	02
Applications Of Tinsplate And TFS	04
Manufacturing Process	06
Available Specifications And Sizes	08
Usage Precautions	13
Information Required With Orders And Inquiries	14

TIN FREE STEEL

Tin mill products include electrolytic tinplate, electrolytic chromium coated steel (also referred to as tin free steel or TFS), and black plate, the uncoated steel. Tinplate is a thin steel sheet coated by tin, while TFS is an electrolytic chrome plated steel consisting of a thin layer of chromium and a layer of chromium oxide deposited on the steel base. Both of them have a beautiful, metallic luster as well as excellent properties in corrosion resistance and paintability.

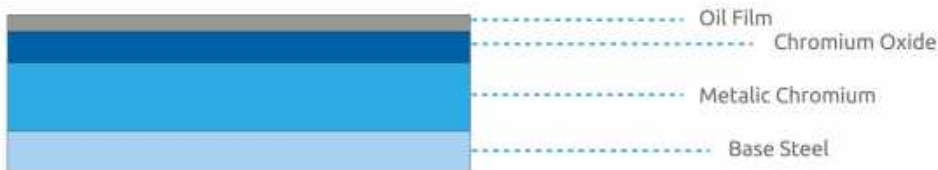
List of Tin Mill Products

Tin Mill Products

TFS	SR
	DR

Note : Tinplate Includes K-Tinplate, DI-Tinplate, Low-Tin Plate, L-Cr Tinplate.

TFS Products



Features

Features of TFS Products

Excellent paint adhesion	T TFS has excellent paint adhesion properties that far surpass those of ETP, allowing its use for making DRD cans and adhesive bonded cans.
Excellent heat resistance	High-temperature baking causes neither discoloration nor deterioration in material properties.
Excellent resistance to Sulphur Blackening	The metallic chromium in TFS has excellent sulphide resistance property when canning protein-rich foodstuff such as fish. TFS compensates for the expensive sulphur resistant lacquer.
Excellent filiform rust resistance	TFS has a excellent under film corrosion resistance.
Excellent alkali resistance	The coating in TFS is not amphoteric. Alkaline products such as detergents and dispersion colours can be packed in TFS with advantage.

Different Features between TFS and ETP

Appearance	Even when the same surface finish as ETP is applied to the substrate steel sheet, it provides the unique surface luster characteristic of metallic chromium.
Corrosion resistance	As it has excellent corrosion resistance after painting, it is generally used with both surfaces painted. It can also be used with the internal surface unpainted, depending on the contents.
Solderability	TFS is not compatible with soldering.
Weldability	Although TFS can be welded when the metallic coating layers are removed, its weldability is inferior to ETP.
Coating weights	Unlike the multiplicity of coating weights with tin, only one standardized chromium-coated product is manufactured.

Features

Comparison of Properties

		Tinplate		TFS
		2.8	Over 5.6	
Bare Corrosion Resistance (sealed) ⁽¹⁾	Rust Resistance	○	⊙	○
	Acid Resistance	○	○	△
	Alkali Resistance	△	△	⊙
	Black Sulfide Stain Resistance	△	△	⊙
	Stress Cracking Resistance	⊙	⊙	○
Paintability		○	○	⊙
Corrosion Resistance after Painting ⁽²⁾		⊙	⊙	○
Filiform Corrosion Resistance		⊙	⊙	⊙
Paint Adhesion		○	○	⊙
Formability		⊙	⊙	○
Solderability		○	⊙	×
Weldability		○	○	△ ⁽³⁾
Heat Resistance ⁽⁴⁾		○	○	⊙

⊙ excellent ○ good △ fair × poor

Note:

(1) Bare corrosion resistance is evaluated under tightly sealed conditions.

(2) Corrosion resistance after painting is evaluated by crosshatching corrosion tests.

(3) The evaluation is for the case where welding is performed without grinding the surface to remove the metallic coating layer.

(4) High-temperature baking after painting and printing may cause changes in material properties.

▶ Applications of Tinplate and TFS

■ Consumer Packaging and Industrial Packaging

TINPALTE	ETP is primarily used for packaging foodstuffs and beverages, but it is also used in containers for oils, grease, paints, polishes, chemicals and many other products. Aerosol containers and caps and closures are also made from ETP.
TFS	TFS are most frequently used for can tops, screw and lug caps, snap and press-on closures and shallow-drawn food cans.

■ Miscellaneous

in Electronics	Electrodes, Cable tape, Magnetic screen covers, etc.
in Engineering	Automotive oil filters, Automotive air filters, Gaskets, etc.
in Construction	Gas meter internal components, Heat exchangers, cookware, shelving, etc.



Application Examples

DI can

Two-piece steel can represents the highest development level of tinsplate production. Nowadays, Our DI material is used for two-piece can to pack beer and carbonated beverage such as Cocacola and Pepsi-cola.



Three-Piece Can For Beverage

Representative clients: include Wanglaoji, Redbull, Robust, etc.



Food can (3-piece can & 2-piece can)

Our tin mill products are used for the package of all kinds of canned food such as Huangguan, Meilin and Gulong.



Metal closure and ends

Our tinsplate and TFS are used for Budweiser, Harbin and Yanjing beer, etc. Our the major supplier of Ziquan Group, Huapeng closures, Yiwu Easy Open End Industry Group, etc.



Spray can

Clients are Hangzhou Meite, Shenzhen Huate, zhongshan Kaida, etc.



High-grade industrial package

Tinsplate and TFS are used for the package of Nippon, International Paint, Sigma.



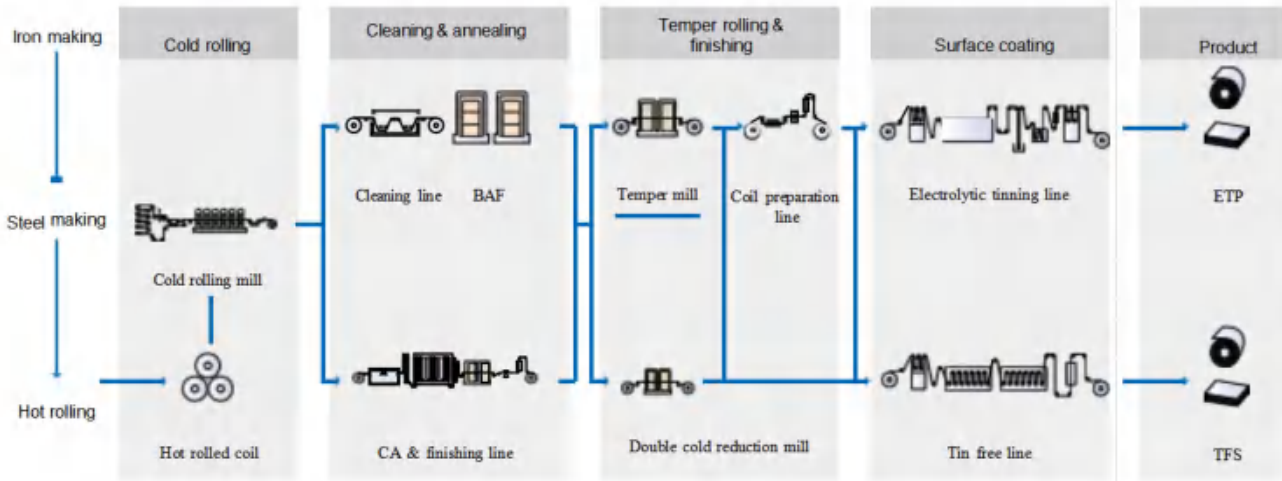
High-grade gift package

Irregular cans are made from Our tinsplate and TFS for high-grade gift package.



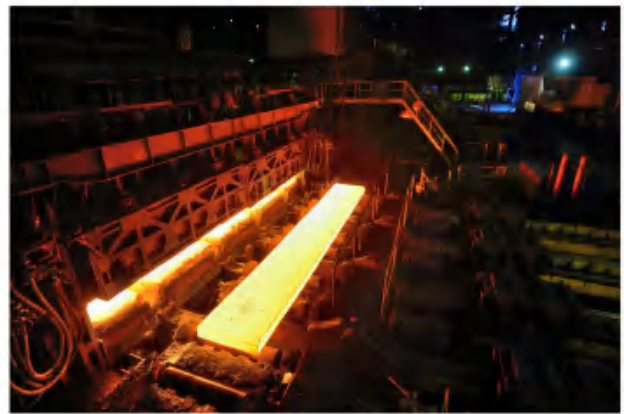
Manufacturing Process

Process Diagram



Note:

Tinplate and TFS products are manufactured under strict quality control all through the manufacturing process to provide the excellent corrosion resistance and uniform material properties required of can-making materials.



Major Control Items in the Manufacturing Process

Steelmaking	Steelmaking: Chemical composition, minimization of inclusions.
Hot Rolling	Finishing temperature, coiling temperature, gage profile.
Cold Rolling	Gage, flatness.
Annealing	Heating temperature, soaking temperature, cooling temperature, atmospheric gas composition.
Temper Rolling	Shape, surface roughness.
Electrolytic Plating	Coating weight, chemical treatment, oiling amount.

ETP and TFS's Parameters Inspected

A	Mechanical Properties	Hardness (temper grade)
B	Dimensional Accuracy	Thickness Width Cut-length
C	Shape Parameters	Bowness Camber Askewness Edge waviness
D	Lubrication	Oil film
E	Corrosion Resistant Property	Tin coating (for Tinfoil) Metallic chromium and chromium in Cr-oxide (for TFS) Passivation film weight Alloy-tin Couple (for required) Iron solution value (for required) Tin grain size (for required) Corrosion resistance SO2 test (for required) Porosity Test (for required) Pickling lag value (for required)

Available Specifications and Sizes

Steel Types

Steel grade	Characteristics	Products
MR	Our low in residual elements that has excellent corrosion resistance, widely used in general applications.	ETP、TFS
L	Base steel extremely low in residual elements such as Cu, Ni, Co, and Mo that has excellent corrosion resistance to certain types of food products.	ETP、TFS
D	Aluminum-killed base steel used in applications involving deep drawing or other types of severe forming that tend to give rise to Lueder's lines.	ETP

Note:

With regard to steel types other than those listed above, please consult us.

Available Sizes

■ TFS

Black Plate	Normal Thickness	Normal Width	Normal Length(sheet)
Single Reduce	0.17 ~ 0.55mm	700 ~ 1050mm	500 ~ 1168mm
Double Reduce	0.12 ~ 0.36mm		

■ Temper Grade

Black Plate	Box Annealing	
Single Reduce	T-1, T-2, T-2.5, T-3	T-1.5, T-2.5, T-3, T-3.5, T-4, T-5
Double Reduce	DR-7M, DR-8, DR-8M, DR-9, DR-9M, DR-10	

Note:

(1) There are two types of annealing: batch annealing (BA) and continuous annealing (CA). When continuous annealing is designated, the symbol of "CA" is added after the temper grade symbol such as "T-4CA".

(2) The DR materials can also be manufactured by box annealing, Normal Width limited from 700~1050mm. Please consult us.

Coating Weight

- TFS

Metallic Chromium Layer (one side)		Chromium Oxide Layer (one side)	
Minimum Average Coating Weight	Maximum Average Coating Weigh	Minimum Average Coating Weight	Maximum Average Coating Weigh
50 mg/m ²	150 mg/m ²	5 mg/m ²	35 mg/m ²

Surface Finishes

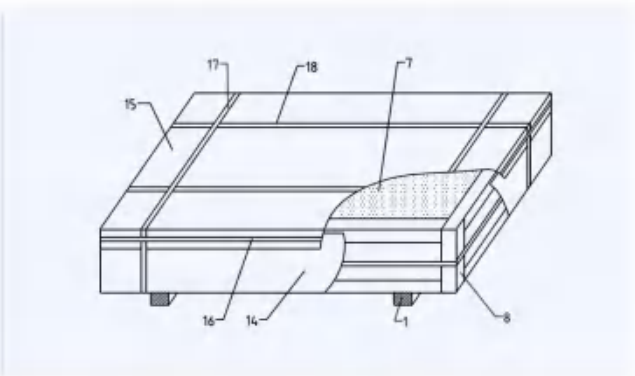
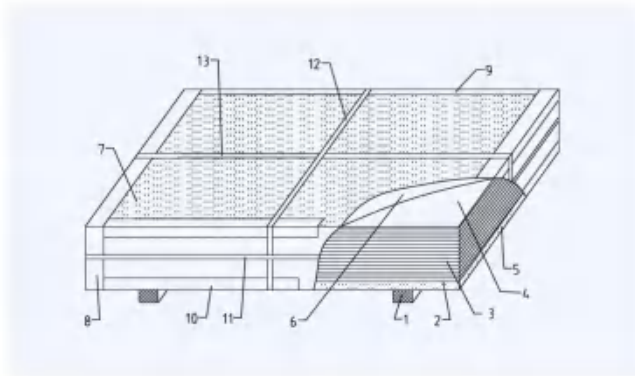
- TFS

Black Plate	Code	Surface Finish	Characteristics
Single Reduce	B	Bright surface	Glazed surface obtained by a thin layer of chromium and chromium oxide deposited on the smooth steel base with extremely fine stone figures by processing.
	R	Stone surface	Glazed surface obtained after a thin layer of chromium and chromium oxidedeposited on the smooth steel base featuring certain oriented stone figures.
	R2	Stone rough surface	Glazed surface obtained after a thin layer of chromium and chromium oxidedeposited on the smooth steel base featuring certain oriented stone figures, roughness higher than "R".
	M	Matte surface	Matt surface.
Double Reduce	R	Stone surface	Glazed surface obtained after a thin layer of chromium and chromium oxidedeposited on the smooth steel base featuring certain oriented stone figures.

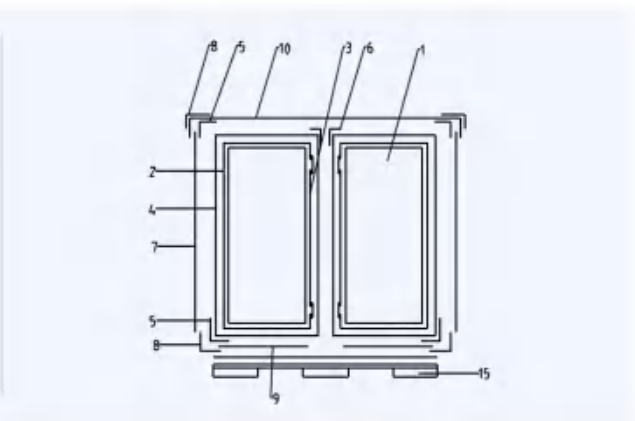
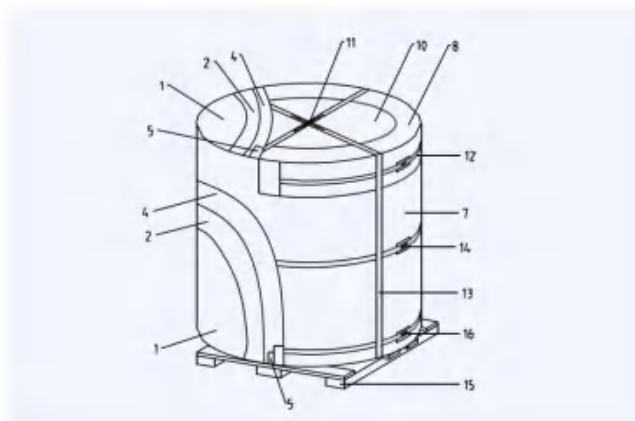
Oiling

- If no engagement, tinplate and TFS are electro statically oiled with DOS.

▶ Packaging and Marking



- | | | | |
|--------------------------------------------|------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| 01 Wood bracket | 02 Bottom cover | 03 Steel sheet | 04 Top cover |
| 05 Bottom corrugated paper | 06 Rust-proof paper | 07 Top corrugated paper | 08 Side corner guard |
| 09 Top corner guard | 10 Bottom corner guard | 11 Circumferential banding strip (inner) | 12 Horizontal banding strip (inner) |
| 13 Vertical banding strip (inner) | 14 Guard plate | 15 Steel package box | 16 Circumferential banding strip (outer) |
| 17 Horizontal banding strip (outer) | 18 Vertical banding strip (outer) | | |



- | | | | |
|----------------------------------------------|------------------------------------------------|-----------------------------------------|--------------------------------------|
| 01 Steel coil | 02 External peripheral rest-proof paper | 03 Inner core rest-proof paper | 04 Paper inner corner guard |
| 05 Paper external corner guard | 06 Iron round cover | 07 Iron inner corner guard | 08 Iron external corner guard |
| 09 External peripheral wrapping plate | 10 Inner peripheral guard plate | 11 Circumferential banding strip | 12 Radial banding strip |
| 13 Shim for lock | 14 Lock | | |

Offers coils and sheets, coil packed in a vertical form or a horizontal.
 A label that indicates the manufacturing history is affixed to the outside of the packaging.
 In addition, a service card is contained inside.
 With regard to types of packing and markings, please consult us.

Products Standard

TFS

- TFS orders are placed in accordance with Q/BQB 455-2009 standard which uses in a non-equivalent to JIS G 3315:2008, DIN EN 10202:2001, EN 10203 standards.

List of Usual Specification

	Temper	Nominal Thickness (mm)	Nominal Width (mm)
SR-CA	T-1.5CA	0.22-0.25	700-840
		0.26-0.35	700-915
		0.36-0.49	790-960
	T-2.5CA	0.22	700-880
		0.23-0.26	700-1050
		0.27-0.45	700-1150
		0.46-0.55	900-1150
	T-3CA	0.18-0.19	700-840
		0.20-0.21	700-880
		0.22	700-940
		0.23-0.26	700-1050
		0.27-0.35	700-1150
		0.36-0.45	800-1150
		0.46-0.55	900-1150
	T-3.5CA	0.20-0.22	700-900
		0.23-0.32	700-1050
		0.33-0.50	800-1050
	T-4CA	0.18-0.22	700-1050
		0.23-0.26	700-1150
		0.27-0.36	700-1080
	T-5CA	0.18-0.22	700-1050
		0.23-0.26	700-1150
		0.27-0.29	700-960
0.30-0.50		800-1000	
T-2.5CA,T-3CA (IF)	0.26-0.5	800-1000	

Note:

Specific specifications are available on-site subject to the actual production.

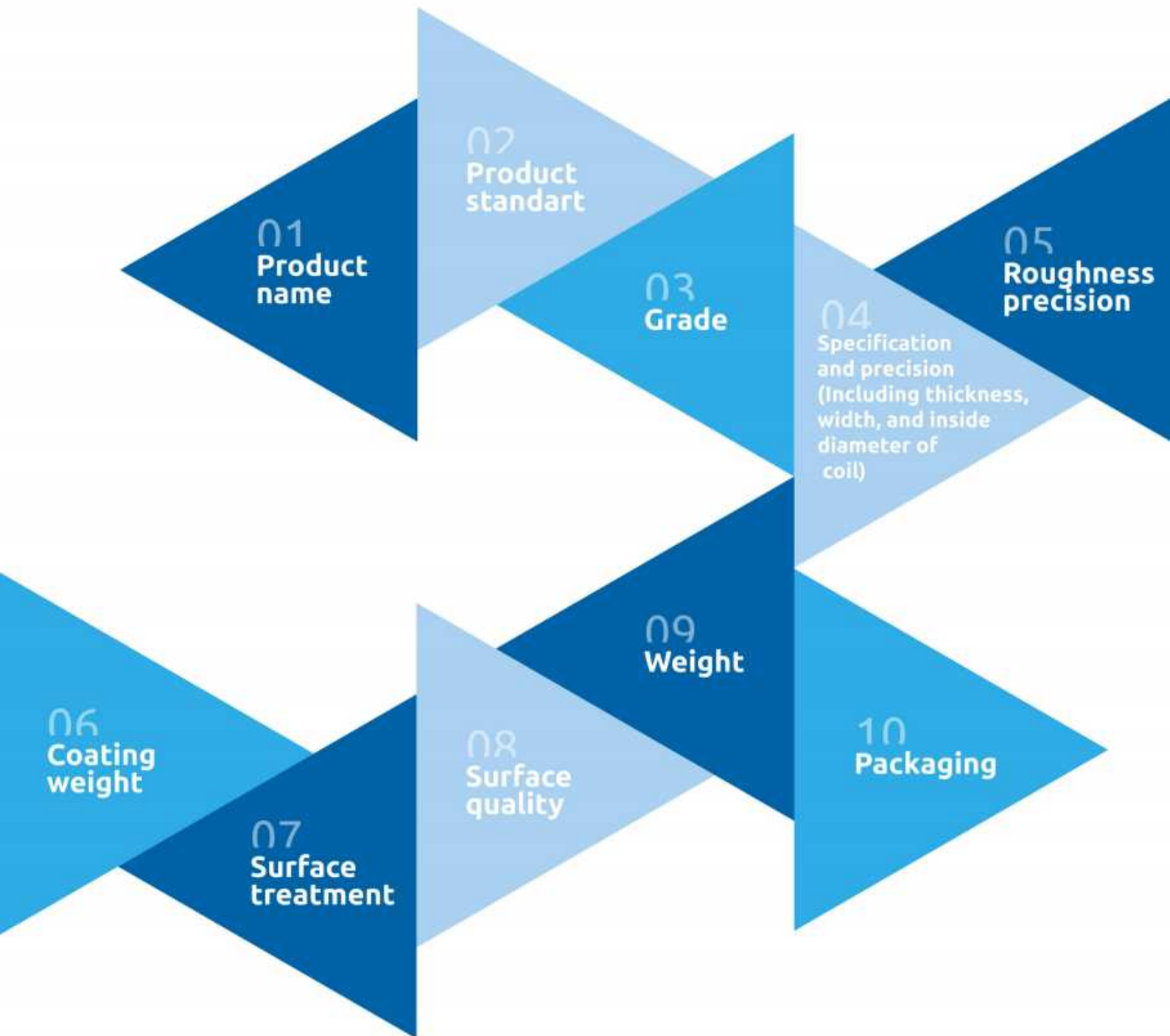
	Temper	Nominal Thickness (mm)	Nominal Width (mm)	
SR-BA	T-2BA	0.22-0.50	700-960	
	T-2.5BA,T-3BA	0.19	700-860	
		0.20	700-900	
		0.21	700-920	
		0.22-0.23	700-940	
		0.24-0.50	700-960	
DR-CA	DR520 DR7M	0.15	700-880	
		0.16	700-920	
		0.17	700-940	
		0.18-0.28	700-970	
		0.29-0.40	800-970	
	DR550 DR8	0.14	700-880	
		0.15-0.16	700-920	
		0.17-0.26	700-970	
		0.27-0.38	800-970	
	DR580 DR8M	0.14	700-920	
		0.15	700-950	
		0.16-0.25	700-970	
		0.26-0.36	800-1000	
	DR620 DR9	0.14	700-940	
		0.15-0.23	700-970	
		0.24-0.34	800-1000	
	DR-BA	DR520 DR7M	0.15	700-880
			0.16-0.17	700-900
0.18-0.40			700-960	
DR550 DR8		0.14	700-820	
		0.15	700-900	
		0.16	700-920	
		0.17-0.37	700-960	

Usage Precautions

Usage Precautions for TFS

- 01 TFS is not compatible with soldering and DI forming. However, once painted, it can be used in almost all applications where TIN PLATE is used.
- 02 The metallic coating layer of TFS has a high electrical resistance. When welding it, the metallic coating layers in the welded areas should be removed in advance.
- 03 TFS tends to rust in a humid atmosphere. Use as soon as possible after unpacking.
- 04 The external surfaces of cans should be painted to prevent corrosion. The internal surfaces should also be painted to prevent corrosion except when the content is motor oil or cooking oil.
- 05 TFS does not provide sacrificial protection like TIN PLATE. Due precautions should be taken not to cause scratches on the surface of TFS after it is formed into cans and painted.

Information Required with Orders and Inquiries





Please contact us to get more information

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