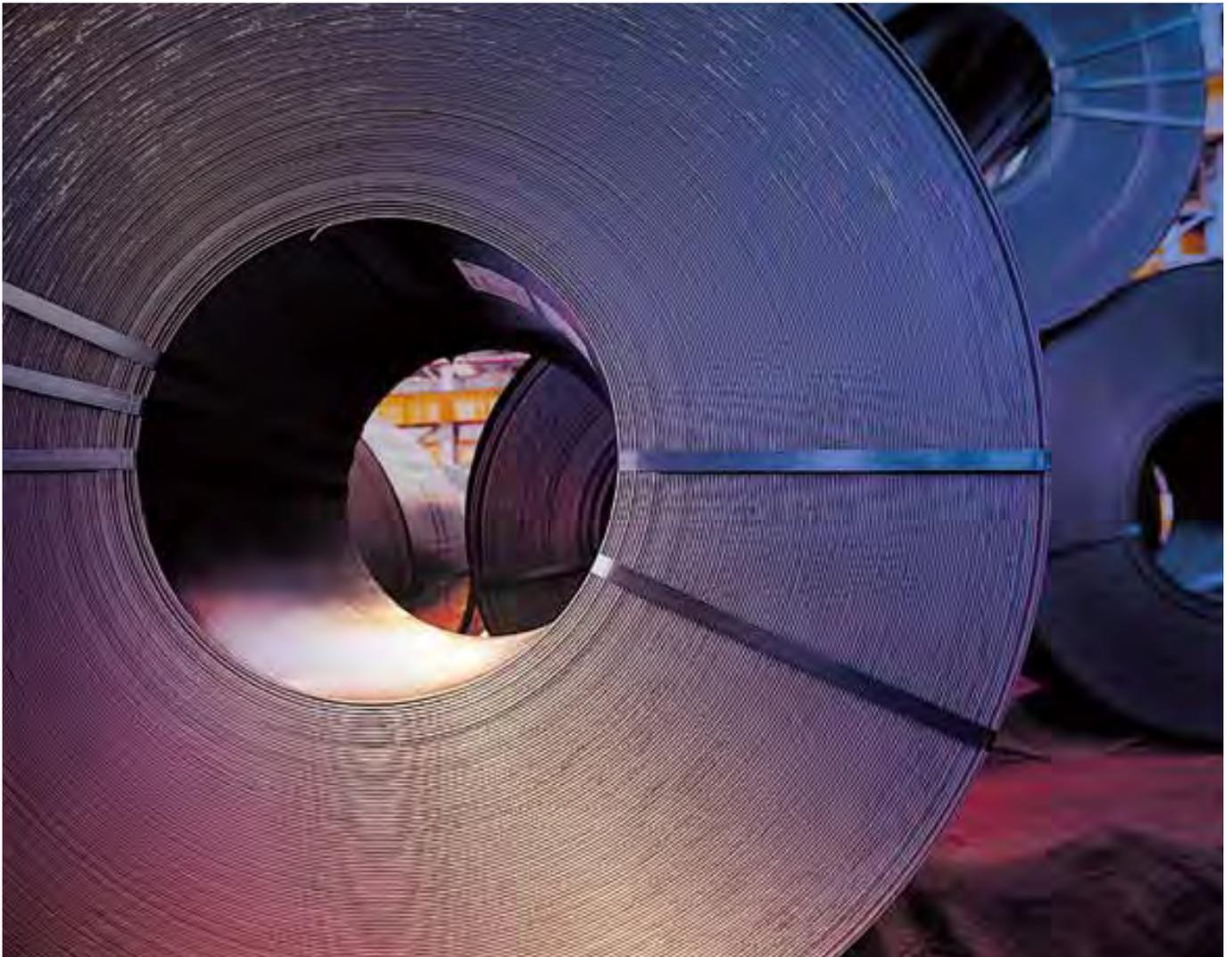


HOT ROLLED STEEL





With six plants producing hot-rolled steel and one high-mill plant in Pohang and Gwangyang, POSCO manufactures 9.8 million tons hot-rolled steel products per year. Some of the hot-rolled coils produced at our hot-rolling plants are sold as finished products while others are used as intermediary materials for cold-rolled or electrical steel production, thus being reprocessed into high added value products.



HOT ROLLED STEEL

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Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

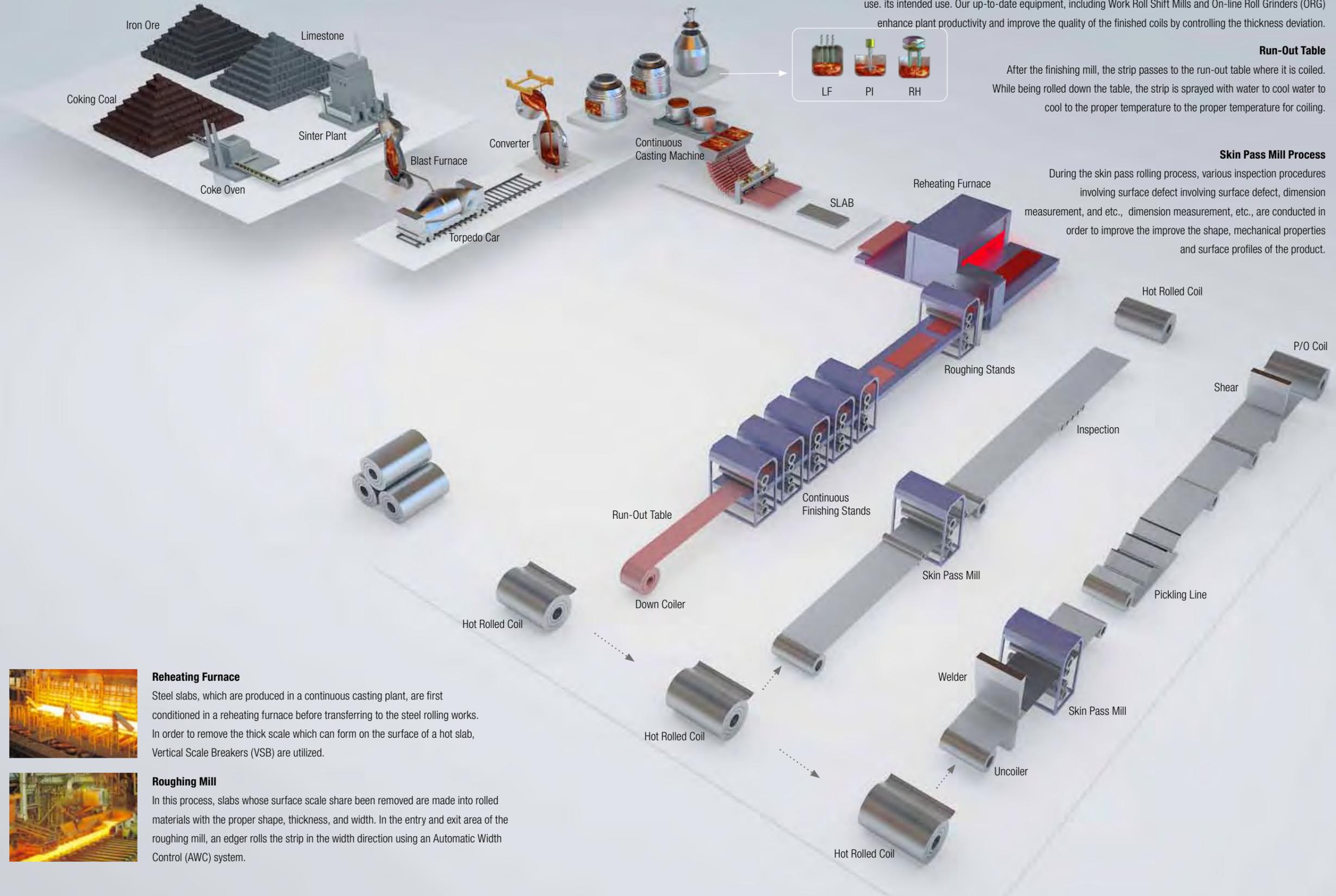
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.



Manufacturing Process & Equipment

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Finishing Mill

The purpose of finishing rolling is to adjust the thickness and width of a coil to the specified dimensions and to produce a smooth surface and shape at a desired finishing temperature appropriate for its intended use. Our up-to-date equipment, including Work Roll Shift Mills and On-line Roll Grinders (ORG) enhance plant productivity and improve the quality of the finished coils by controlling the thickness deviation.



Run-Out Table

After the finishing mill, the strip passes to the run-out table where it is coiled. While being rolled down the table, the strip is sprayed with water to cool water to cool to the proper temperature to the proper temperature for coiling.



Skin Pass Mill Process

During the skin pass rolling process, various inspection procedures involving surface defect involving surface defect, dimension measurement, and etc., dimension measurement, etc., are conducted in order to improve the improve the shape, mechanical properties and surface profiles of the product.



Reheating Furnace

Steel slabs, which are produced in a continuous casting plant, are first conditioned in a reheating furnace before transferring to the steel rolling works. In order to remove the thick scale which can form on the surface of a hot slab, Vertical Scale Breakers (VSB) are utilized.

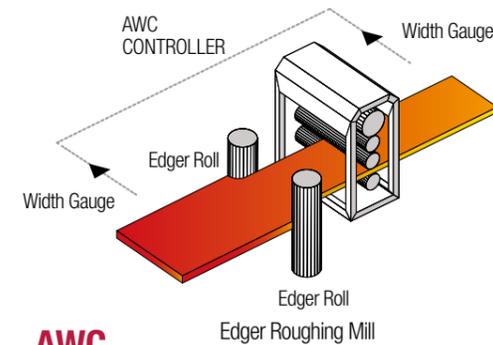


Roughing Mill

In this process, slabs whose surface scale have been removed are made into rolled materials with the proper shape, thickness, and width. In the entry and exit area of the roughing mill, an edger rolls the strip in the width direction using an Automatic Width Control (AWC) system.

Production Facilities

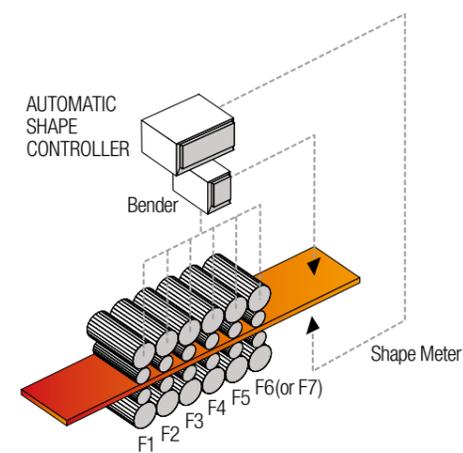
Facility	Pohang Works		Gwangyang Works		
	No.1 Hot Strip Mill	No.2 Hot Strip Mill	No.1 Hot Strip Mill	No.2 Hot Strip Mill	No.3 Hot Strip Mill
Reheating Furnace	200T/H x 2 Walking beam Type	240T/H 250T/H x 4 Walking beam Type	325T/H x 3 Walking beam Type	270T/H x 3 Walking beam Type	270T/H x 3 x 3 Walking beam Type
Scale Breaker	Horizontal	Vertical	Vertical	Vertical	Vertical
Roughing Mill					
Finishing Mill					
Down Coiler	T1.2~12.7mm 18MT x 2	T1.2~22 mm 35MT x 3	T1.2~22 mm 35MT x 3	T1.2~22 mm 35MT x 2	T1.2~22 mm 35MT x 2
Skin Pass Mill	T1.2~6.7mm 18MT 762mm	T1.2~6.7mm 35MT 610,762mm	T1.2~6.7mm 35MT 610,762mm	T1.2~6.7mm 35MT 610,762mm	T1.2~6.7mm 35MT 610,762mm



AWC

AWC(Automatic Width Control) System

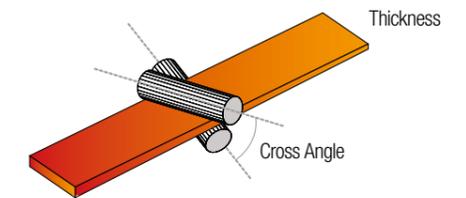
An AWC System, which is attached to the roll of a skin pass rolling mill, automatically adjusts the width of a coil by using the highly-sensitive hydraulic cylinder while monitoring the result width of a coil.



ASC

ASC(Automatic Shape Control) System

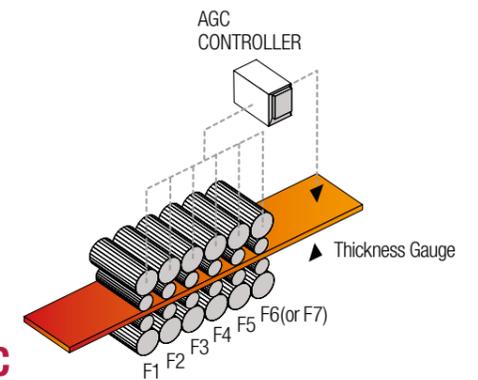
An ASC (Automatic Shape Control) System, which is attached at the end of a finishing mill, adjusts the flatness of a coil. After that, the ASC System automatically adjusts the pressure of the roll bender to control a strip shape.



Pair Cross Mill

Pair Cross Mill

The shape and crown of a coil is adjusted by the paired upper and lower rolls crossing each other.



AGC

AGC(Automatic Gauge Control) System

An AGC System, which is attached to the end of a finishing mill, automatically adjusts the thickness of a coil by using the highly sensitive hydraulic cylinder while monitoring the resultant thickness of a coil.

Main Uses

Hot-rolled steel products are divided into two groups: hot-rolled coils produced by hot strip mill and hot-rolled steel plates, which are made by cutting material from hot-rolled coils. Some of the hot-rolled coils produced at our hot-rolling plants are sold as finished products while others are used as intermediary materials for cold-rolled or electrical steel production, thus being reprocessed into high value added products. Hot-rolled steel products are widely used in many different industries due to their high strength as well as good weldability, machinability and corrosion resistance.

Steel for Structural Uses

Steel for general and welding structures are produced and are used for building iron structures and the structures of bridges, ships and cars, etc.

- **KS** SS330, 400, SM400A, B, C, SM490A, B
- **JIS** SS330, SS400, SS490, SS540, SM400A, B, C, SM490A, B, C, SM490YA, YB, SM520B, C, SM570
- **ASTM** A36, A283, A570
- **BS** BS1449 PART 1 50/35HR, HS, BS4360, 40B, 43A, B, C, 50B, C
- **DIN** DIN17100 ST22, ST33, ST37-2, ST44-2, ST52-3

Weather Resistant Steel

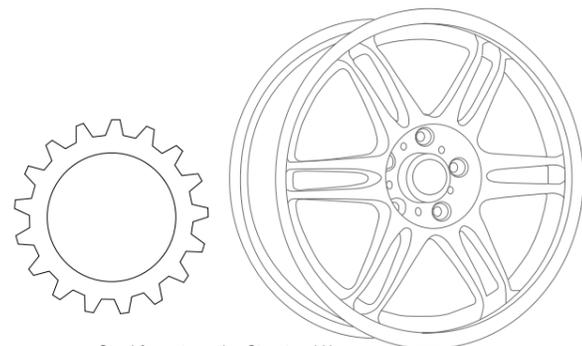
This type of steel with enhanced corrosion and atmospheric corrosion resistant properties through the addition of such special elements as P, Cu, and Cr is used in manufacturing containers, special automobiles and construction structures.

- **POSCO** PAWS50
- **JIS** SPA-H

Steel for automotive Structural Uses

The type of high strength steel which has extremely excellent drawability and weldability is used in automobile frames, members and wheels.

- **POSCO** ATOS55, 60, 80, 100 AUTOBEAM, STAB
- **JIS** SPA-H310, 370, 400, 440, SPFH490, 540, 590
- **ASTM** A715-40, 45, 50, 55, 60, 65, 70, 80



<Steel for automotive Structural Uses>

Carbon Steel for Pipe and Tube

This type of steel, excellent in weldability and formability, is widely used in structural pipes, general pipes, special pipes, and machine-structural carbon steel pipe.

- **POSCO** POSP290A, 340A, 370A, 410A, 440A, 470A, 500A, 540A
- **JIS** SPHT1, 2, 3, 4, STB340, 410, STK290, 400, 490, 500, 540, STKM11A, 12B, 13A, 13B, 14B, 16A, 18A

High Carbon Steel

Under this category are carbon steel for machine structures, alloy steel, and tool steel. After going through cold-rolling and QT heat treatment processes, they are used in making a variety of machine parts.

- **JIS** S10C-S55C, SK60-120, SCM415-440
- **SAE** SAE1010-1055
- **DIN** 50CRV4, 75CR1

Cold Rolled Steel

This cold rolled steel is used in many cold rolled products, such as CR, GI and color plates.

- **SAE** SAE1006-1055

Steel for Oil Well Pipes

This type of steel, characterized by strict high strength qualities, extremely low temperature toughness, excellent weldability and fracture resistance, is used for drilling in severely cold areas and for deep sea oil wells.

- **API** 5G-J55, K55, N80, L80

⚠ The usage presented in this section reflects the general use and shall be used as a reference. Please be sure to consult with our associates when making orders for specific usage.

KS Korean Industrial Standards **JIS** Japanese Industrial Standards **DIN** Deutsches Institut für Normung **BS** British Standards
ASTM American Society for Testing and Materials **SAE** Society of Automotive Engineers **API** American Petroleum Institute

Hot-Rolled Steel for Gas Cylinders

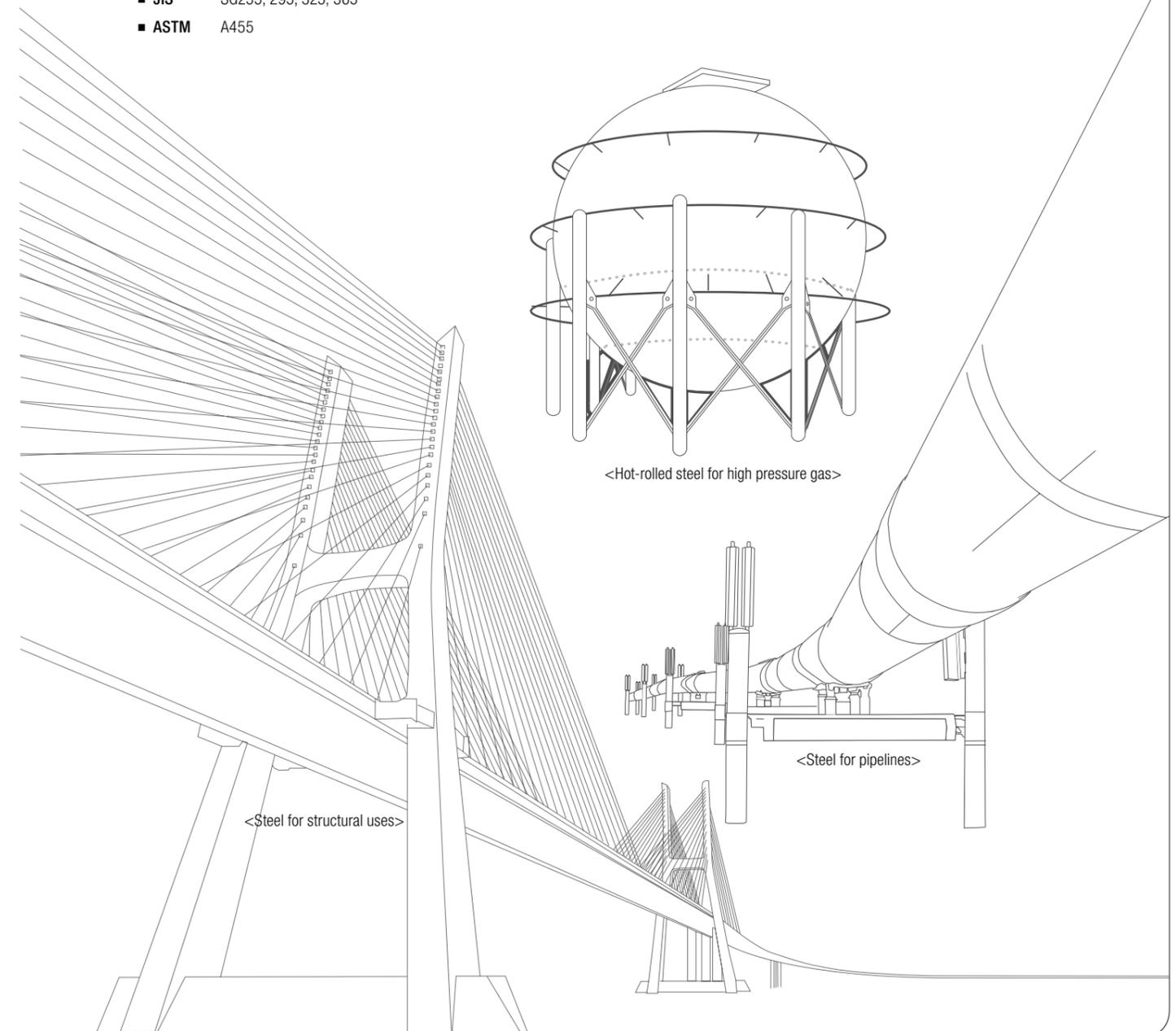
This steel, which has high strength qualities and good formability, is used in high pressure gas containers, with less than a 500l inner capacity, used for holding LPG, acetylene and other high pressure gases.

- **JIS** SG255, 295, 325, 365
- **ASTM** A455

Steel for Pipelines

Because of its excellent high strength qualities, extremely low temperature toughness, hydrogen induced crack resistance and good weldability, this steel is used in pipelines.

- **API** 5L 5L-A,B, X42, X46, X52, X60, X65, X70, X80



High Carbon Steels

General Characteristics

High carbon steel is used where greater strength is required and this high strength is obtained through final heat treatment. There are two product groups: high carbon steel products with carbon content of more than 0.30wt.% or those with added alloy elements such as Mn, Cr, Mo, B, and Ni with carbon content of more than 0.15wt.%.

The final specified physical properties of high carbon steel are achieved mostly through the process of hot rolling, pickling, cold rolling and annealing. Final heat treatment is performed after the steel is processed and made into parts.

Product Types and Features

High carbon steel can be broadly categorized into high carbon steel for machine structures and high carbon steel for tools. Then, each category can be divided into general high carbon steel and alloy high carbon steel.

Types		JIS	SAE	DN	POSCO	
High carbon steel for machine structures	General high carbon steel	S30C, S35C, S40C, S45C, S50C, S55C	1030, 1035, 1040, 1045, 1050, 1055	C30, C45, C50, C55	POS20FB, POS45FB	
	Alloy high carbon steel	Ni-Cr-Mo	SNCM220	8620, 8622, 8660	20NiCrMo2, 20NiCrMoS2	-
		Cr	SCr415, 420, 430	5046	34Cr4, 34CrS4	POS1062Cr, 1077Cr
		Cr-Mo	SCM415, 430, 435, 440	4120, 4130, 4135, 4140	34CrMo4, 34CrMoS4	-
		Mn	SMn443	1527, 1536, 1541, 1552	34CrMn4, 34CrMnS4	-
		B	-	10B22, 15B27, 15B35	20MnB5, 30MnB5, 27MnCrB5	Autobeam, STAB, POS10B22, POSPM35P
		Others	SUP9	6150	50CrV4, 51CrV4	POS1031MA, 1047MA
High carbon steel for tools	General high carbon steel	S60C, S65C, S70C, S75C, SK65, SK75, SK85, SK95, SK105, SK120	1060, 1065, 1070, 1075, 1080, 1085, 1090, 1095	C80W1	-	
	Alloy high carbon steel	SKS51, SKS81	-	75Cr1	POS10A0Cr, POS10A2Cr	

Chemical Composition(Wt.%)

Spec.	C	Si	Mn	Ni	Cr	Mo
S45C	0.42~0.48	0.15~0.35	0.60~0.90	-	-	-
S50C	0.47~0.53					
S55C	0.52~0.58					
SK65	0.60~0.70	0.10~0.35	0.10~0.50	-	-	-
SK85	0.80~0.90					
SK120	1.15~1.25					
SKS51	0.75~0.85	0.35Max	0.50Max	1.30~2.00	0.20~0.50	-
SNCM220	0.17~0.23	0.15~0.35	0.60~0.90	0.40~0.70	0.40~0.60	0.15~0.25
SCr430	0.33~0.38			0.25Max	0.90~1.20	-
SCM435	0.28~0.33			0.25Max	0.35Max	0.15~0.30
SMn420	0.17~0.23		1.20~1.50	0.25Max	0.35Max	-
SAE1536	0.30~0.38	0.15~0.30	1.20~1.55	-	-	-
SAE1541	0.36~0.45		1.30~1.65			
SAE1080	0.74~0.88		0.60~0.90			
DN-51CrV4	0.47~0.55	0.25~0.50	0.80~1.10	-	0.90~1.20	V:0.1~0.2
DN-75Cr1	0.70~0.80	0.15~0.35	0.60~0.80		0.30~0.40	-

Main Uses

High carbon steel is used to make auto parts such as automatic and manual transmission components, seat belt parts as well as in other diverse products like chainsaw teeth, chains, needles, and farming tools.

					
Clutch Diaphragm	Automission plate	Buckle	Tongue	Seat Recliner	Timing Chain
DN-50CrV4	JIS-S45C	JIS-S50C	JIS-S55C	JIS-SNCM220	SAE1070

					
Impact Beam	Knitting Needle	Shank	Band Saw	Agricultural machine	Hose Clamp
AUTOBEAM	JIS-SK85	JIS-SCM435	POS1047MA	JIS-S55C, SAE1095	JIS-SK85

Weather Resistant Steel

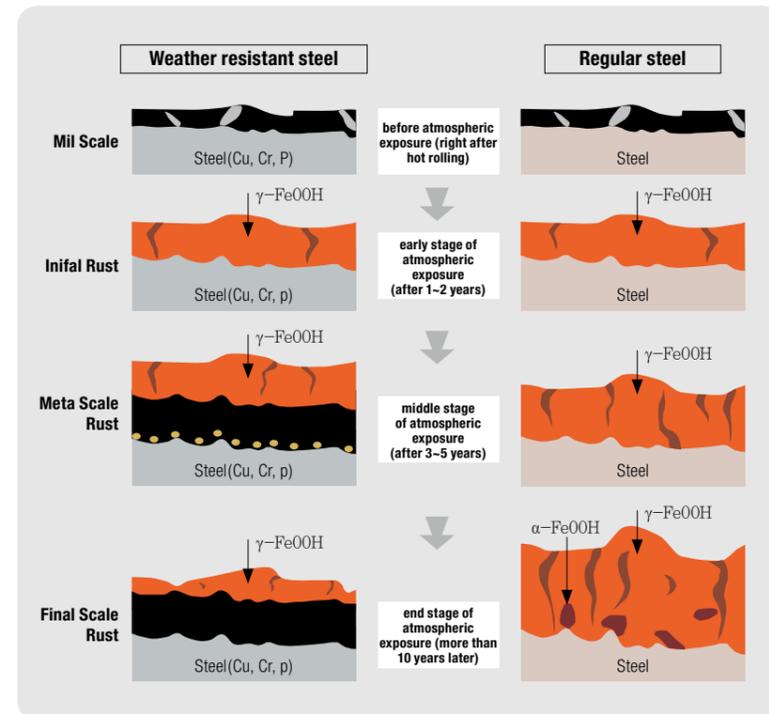
General Characteristics

Weather resistant steel features superior corrosion resistance compared to regular steel and thus suffers less rusting when exposed to the atmosphere. Resistance to moisture and oxygen in the atmosphere is greatly increased. In particular, saltwater resistant steels are excellent for use in marine environments.

Product Types and Features

Corrosion resistant steel contains alloying elements such as Cu, Cr, Ni, and P. at the surface, the steel acquires a stable crystal structure which reduces surface oxidization.

Comparison of rust layer development between weather resistant steel and regular steel



Corrosion Resistant Steel Types

Product name abbreviation	Corrosion resistance	Tensile strength	C	Si	Mn	Cu	Cr	Ni	P	S
JIS-SPA-H	Weather resistance	≥490MPa	≤0.12	0.20~0.75	0.20~0.50	0.25~0.55	0.30~1.25	≤0.65	0.07~0.15	≤0.035
POSEIDON500	Saltwater resistance	≥500MPa	≤0.10	≤0.50	≤1.00	≤0.50	≤1.50	≤0.50	≤0.03	≤0.015
POS1007MA	Saltwater resistance	≥520MPa	≤0.12	≤0.50	≤1.50	0.25~0.55	≤2.00	≤0.50	0.07~0.15	≤0.025

Surface Treatment of Weather Resistant Steel

Weather resistant steel can be used with various surface conditions such as unpainted, general painting, and rust stabilization coating.



Unpainted

Weather resistant steel can be directly exposed to and used in the atmosphere without additional surface treatment. Unpainted weather resistant steel is known for its superb corrosion resistance when exposed to the atmosphere, about fivefold greater than that of regular steel. It should be noted, though, that during the early stages of atmospheric exposure, weather resistant steel forms a coating of rust similar to that of regular steel, with possible contamination occurring when rain washes rust off the steel into the environment. In order to promote even rusting on the surface of unpainted weather resistance steel, a balanced wet and dry cycle must be repeated over a period of time. It is important that unpainted steel not face long term exposure to salt spray in coastal areas or to sulfur oxygen compounds such as sulfur dioxide.



Painted

Paint products meant for regular carbon steel can also be used on weather resistant steel to prevent rust. When regular anticorrosive paint is used on weather resistant steel, its corrosion resistance effect is nearly doubled, thanks to the metal's excellent paint adhesion properties. Weather resistant steel used in ocean shipping containers is mostly finished with regular paint products.



Rust Stabilization Coating

As an alternative to regular paint, this surface treatment coating can be applied in order to form stable oxide film on the surface of weather resistant steel. Various surface treatment methods have been developed and used. As a result, more and more of weather resistant steel used in building exterior and roofing materials are treated with rust stabilization coating. A rust stabilization coating method has been developed in Korea as well. The exterior of the POSCO Museum has been treated with this particular coating.

Long-term Exposure and Corrosion Test for Saltwater Resistant Steel

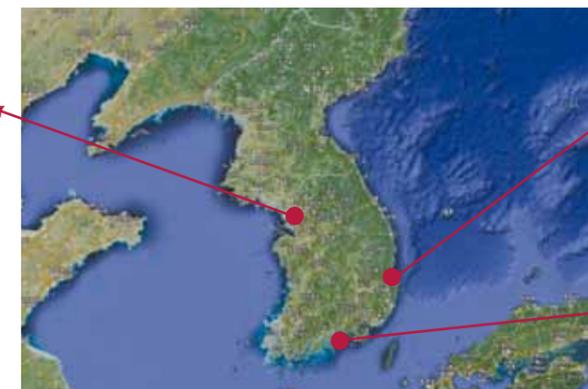
Long-term saltwater exposure testing conducted in Pohang, Gwangyang and Shihwa over a period of two years have confirmed that saltwater resistant steel's anti-corrosion properties are greatly superior to that of regular steel.



Regular carbon steel



POSEIDON 500



Steel for Oil Well Pipes & Pipelines

General Characteristics

API steel pipes refer to oil well pipes and pipelines, which are used in extracting and transporting crude oil, gasoline, and, etc.

Product Types and Features

Steel Pipes for Oil Wells

It is a general term for all casing and tubing used in drilling oil or gas wells, extracting crude oil or natural gas, etc.

- Casing is a steel pipe inserted into an oil or gas well in order to prevent its wall from collapsing and to stop water or soil from infiltrating the well.
- Tubing is a steel pipe inserted through the casing and extending down to the oil deposit after the oil well is established. It is used to pump crude oil up to ground level.

Pipelines

Pipelines are a series of installed pipes to transport crude oil, oil products, or natural gas from source to destination. Either toughness-oriented steel or corrosion-resistant steel is used to make such pipes depending on the environmental characteristics of their installation.

- Steel for toughness is used to make pipe which resists fracture due to external impact or internal pressure, particularly at low temperature.
- Steel for corrosion resistance is used to produce pipe which withstands the harsh conditions and chemicals found in oil and gas wells.



Tubing



Casing



Line pipe

How to Mark API Strength

· The number written on API steel is the minimum of yield strength required by specification. The unit used is ksi.

(1ksi=6.8923, MPa=0.70307kg/mm²)

· API strength is the value required when a pipe is formed. For special purpose API steel pipes, the required strength value is measured after the formed pipe undergoes heat treatment processing.

API Standard system

API - 5 0 - 0 0 0 - 0 0 0 0

① ② ③ ④

① : Usage

L	Steel pipe for pipelines	a pipe used to transport crude oil and natural gas to its destination
CT	Steel pipes for oil wells	a pipe used to pump out crude oil and natural gas from the oil deposit to ground level

② : Grade

A, B	pipe for refining
X	pipe for crude oil/gas
H, J, K, N....	serial number

③ : Minimum yield strength (unit: ksi)

④ : PSL1 or PSL2

Division	PSL1	PSL2
Strength/Impact	YP, TS only minimum regulated/no guarantee	YP, TS up to maximum regulated/0°C
Components	only five primary element (C, Mn, Si, P, S) guaranteed	Cu, Ni, Cr, Mo, Nb, V, and Ti marked in M/S

API Standard types

Usage	Specification
Pipe for pipelines	Regular, HIC, SSCC, Cold climate A25- I , A25-II, A, B X42, X46, X52, X56, X60, X65, X70, X80, X100 *divided into regular material and Level 2 material
Pipe for oil wells	Casing & Tubing Group 1 : H40, J55, K55, N80 Group 2 : C75-1, C75-2, C75-3, C90-1, C90-2, L80, C95 Group 3 : P110 Group 4 : Q125(-1, -2, -3, -4)

■ Specification per use based on TS Min standard

Division	For pipeline	For oil well
Product specification		
Less than 40kgf/mm² class	A25-1, 2, A	H40
Less than 60kgf/mm² class	B, X42~X70	J55
Less than 70kgf/mm² class	X80	K55, N80, C95
70kgf/mm² class	X100	P110, Q125

Automobile Structural Steel

General Characteristics

The name refers to all steel products used for automotive structures. These are steels which have high tensile strength, greater than 500MPa, and yield strength, greater than 300MPa. High strength is obtained by adding alloy elements or cooling to low temperature. Steel products with tensile strength greater than 1,000MPa can be manufactured.

POSCO produces ATOS 60 to 100 grade in compliance with the ATOS (AuTOMobile Structural Steel) specification.

Product Types, Components, Materials, and Material Property

Specifications	Thickness(mm)	Chemical Composition (wt.%)					Nb
		C	Si	Mn	P	S	
ATOS55	2.3~12.7	≤ 0.20	≤ 0.40	≤ 1.50	≤ 0.03	≤ 0.03	Added
ATOS60	2.3~12.7	≤ 0.20	≤ 0.40	≤ 1.50	≤ 0.03	≤ 0.03	
ATOS80	2.3~14.0	≤ 0.20	≤ 0.40	≤ 2.00	≤ 0.03	≤ 0.03	
ATOS100	4.0~8.0	≤ 0.20	≤ 0.40	≤ 2.00	≤ 0.03	≤ 0.03	

Specifications	Yield Point (MPa)	Tensile Strength (MPa)	Tensile Test			Bending Test		
			Elongation(%), Thickness(mm) *Rolling Direction			Bending Angle	Inner Radius	Test Piece (JIS No.3)
			No.5 Test Piece, 2.5~5.0	No.5 Test Piece, 5.0~6.3	No.1 Test Piece, 6.3~12.7			
ATOS55	≥ 540	≥ 340	≥ 20	≥ 21	≥ 14	180°	1.5t	Perpendicular to Rolling Direction
ATOS60	≥ 590	≥ 420	≥ 19	≥ 20	≥ 13	180°	1.5t	Perpendicular to Rolling Direction
ATOS80	≥ 780	≥ 700	≥ 14	≥ 14	≥ 9	180°	1.5t	Perpendicular to Rolling Direction
ATOS100	≥ 980	≥ 880	≥ 8 (No. 5 test piece applied)			90°	3.0t	Perpendicular to Rolling Direction

- Remarks) 1. The number inside parentheses is for reference only.
 2. Appearance, form, dimension, weight and permissible tolerances comply with JIS G 3134.
 3. Number of tensile test pieces and bending test pieces for ATOS 60 & 80: throughout the same type and thickness of steel, one piece per class. If the weight exceeds 50 tons, two pieces per class.
 4. Number of tensile, impact and bending test pieces for ATOS 100: use one sample per slab unit for tensile test; use one piece per class for impact test throughout the same type and thickness of steel; use one piece per class for bending test throughout the same type and thickness of steel, but in excess of 50 tons, use two pieces per class.
 5. A bending test piece is perpendicular to JIS unit 3 rolling direction.

■ ATOS80

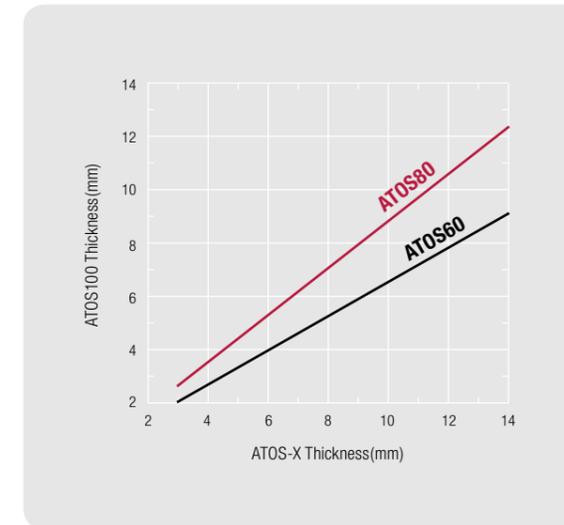
· It has high strength and excellent cold forming ability, used in making boom and arms, truck and trailer frames.

■ ATOS100

- It has hardness equal to that of wear resistant steel of 300HBW class.
- If the steel is heated higher than 300°C, its strength could be reduced.
- It is suitable to make boom and arms in specialty vehicles due to its high strength and excellent impact resistance at low temperature.

Weight Savings due to High Strength Steel

- It is calculated as resistance against bending displacement: high strength steel thickness = regular steel thickness X $(YS_{\text{regular steel}} / YS_{\text{high strength steel}})^{0.5}$
- Regarding elastic deflection, reinforcement design is necessary with thickness reduction (proportional to 'elasticity displacement E X thickness³').
- Reinforcement design is also needed for buckling (related to dimension, occurring in elastic region)



(Unit : mm, MPa)

ATOS60		ATOS80	
Thickness of original material	Thickness when ATOS 100 used	Thickness of original material	Thickness when ATOS 100 used
14	9.2	14	12.3
12	7.9	12	10.6
10	6.6	10	8.8
9	5.9	9	7.9
8	5.3	8	7.1
7	4.6	7	6.2
6	3.9	6	5.3
5	3.3	5	4.4
4	2.6	4	3.5
3	2.0	3	2.6
(YS 390)	(YS 880)	(YS 700)	(YS 880)
lightening potential 34%		lightening potential 34%	

Adequate Welding Material Suggestion

Specifications	Yield strength tensile strength (MPa)	Bending ratio (R/t)	Ceq	Heat treatment	Heat input (butt joint)	Welding material	
ATOS60	YS ≥ 390 TS ≥ 590	-	0.35		-	Solid-wire	AWS A5.28-05-ER80SG (Ex. KISWEL ZO-60)
						Flux-cored	AWS A5.29-07-E81T1-Ni1 (Ex. KISWEL K81-T)
ATOS80	YS ≥ 700 TS ≥ 780	-	0.40	Pre-heating, Post-heating usually not required	0.3~1.0 kJ/mm heat input amount test (in progress)	Solid-wire	AWS A5.28-05-ER120SG (Ex. KISWEL ZH-120)
						Flux-cored	AWS A5.29-07-E121T1-G (Ex. KISWEL K120TG)
ATOS100	YS ≥ 880 TS ≥ 980	3.0	0.47			Solid-wire	AWS A5.28-05-ER130SG (Ex. ESAB Spoolarc 140)
						Flux-cored	AWS A5.29-07-E130T1-G (Ex. KISWEL ZO-60)

POSCO Specifications

⚠ The product standards are subject to change. Please be sure to confirm the recent standards when making orders or to consult our associates.

Hot Rolled Steel Sheets & Strips for Deep Drawing

: These specifications are applied to the hot-rolled steel strips for cold-rolled deep drawing that are manufactured by POSCO.

Specifications	Thickness (mm)	Chemical Composition (wt.%)						
		C	Si	Mn	P	S	Sol-Al	Others
POSHRD2	1.8~7.0	≤ 0.03	≤ 0.03	≤ 0.25	≤ 0.02	≤ 0.02	≤ 0.06	-
POSHRD25	2.0~7.0	≤ 0.005	≤ 0.03	≤ 0.20	≤ 0.02	≤ 0.02	≤ 0.06	Ti 0.005~0.05 Nb 0.005~0.04
POSHRD3	2.0~7.0	≤ 0.005	≤ 0.03	≤ 0.20	≤ 0.02	≤ 0.02	≤ 0.06	Ti 0.01~0.06

Notes) 1. External appearance, shape, dimension, weight and thickness tolerance with SAE. 2. This specification guarantees chemical composition without mechanical properties.

Acid Sulfuric Corrosion Resistance and Weather Resistance High Strength Steel Sheets & Strips

: These specifications are applied to the acid sulfuric corrosion resistance and weather resistance hot-rolled high-strength steel sheets and strips that are manufactured by POSCO.

Specifications	Thickness (mm)	Chemical Composition (wt.%)					
		C	Si	Mn	P	S	Others
ANCOR-H (Acid Sulfuric Corrosion Resistant Steel)	1.8~7.0	≤ 0.10	≤ 0.50	≤ 0.80	≤ 0.035	≤ 0.035	Cu ≤ 0.50 Cr ≤ 0.50
HICON700W (Weather Resistant High Strength Steel)	2.3~6.5	≤ 0.12	≤ 0.45	≤ 2.50	≤ 0.035	≤ 0.01	Cu ≤ 0.55 Cr ≤ 1.20

Notes) 1. External appearance, shape, dimension, weight and thickness tolerance with SAE. 2. This specification guarantees chemical composition without mechanical properties.

Hot Rolled Steel Sheets & Strips for Automotive structural

: These specifications are applied to the hot rolled steel sheets and strips for automotive structures that are manufactured by POSCO.

Specifications	Thickness (mm)	Chemical Composition (wt.%)					
		C	Si	Mn	P	S	Nb
ATOS55	2.3~12.7	≤ 0.20	≤ 0.40	≤ 1.50	≤ 0.03	≤ 0.03	Added
ATOS60	2.3~12.7	≤ 0.20	≤ 0.40	≤ 1.50	≤ 0.03	≤ 0.03	
ATOS80	2.3~14	≤ 0.20	≤ 0.40	≤ 2.00	≤ 0.03	≤ 0.03	
ATOS100	4~8.0	≤ 0.20	≤ 0.40	≤ 2.00	≤ 0.03	≤ 0.03	

Notes) 1. External appearance, shape, dimension, weight and thickness tolerance with JIS G 3193(ANCOR-H), JIS G 3134(HICON700W).
2. Number of tension test pieces and bend test pieces: one pieces each of the same charge and same thickness. However, in excess of 50 ton, two pieces of each.
3. Bending test piece JIS No.3, perpendicular to rolling direction.
4. Number of tensile, impact and bending test pieces for ATOS 100: use one sample per slab unit for tensile test; use one piece per class for impact test throughout the same charge. and thickness of steel; use one piece per class for bending test throughout the same charge and thickness of steel, but in excess of 50 tons, use two pieces per class.

Hot Rolled Steel Sheets & Strips for the Impact Beams and Stabilizers of Automobiles

: These specifications are applied to the hot rolled steels strips for the impact beams and stabilizers of automobiles that are manufactured by POSCO.

Specifications	Thickness (mm)	Chemical Composition (wt.%)							
		C	Si	Mn	P	S	Sol-Al	Cr	B
AUTOBEAM	1.6~7.0	≤ 0.30	-	≤ 1.50	-	≤ 0.005	≤ 0.12	0.10~0.30	-
STAB	1.6~7.0	≤ 0.30	≤ 0.25	≤ 1.00	≤ 0.025	≤ 0.015	≤ 0.10	0.20~0.40	0.001~0.005

Notes) 1. External appearance, shape, dimension, weight and thickness tolerance with KS D 3555(AUTOBEAM), JIS G3193 (STAB).
2. Number of tension test pieces and bend test pieces: one pieces each of the same charge and same thickness. However, in excess of 50 ton, two pieces of each.
3. Bending test piece: JIS No.3 rolling direction.

Specifications	Yield Point (MPa)	Tensile Strength (MPa)	Elongation		Bending Test		
			Test Piece	%	Bending Angle	Inner Dia.	Test Piece/Direction
ANCOR-H	≥ 245	≥ 400	No.5 Rolling Direction	≥ 25	180°	1.5t	JIS No1. Transverse to Rolling Direction
HICON700W	≥ 700	750~950	No.5 Rolling Direction	≥ 12	90°	1.0t	JIS No5. Transverse to Rolling Direction

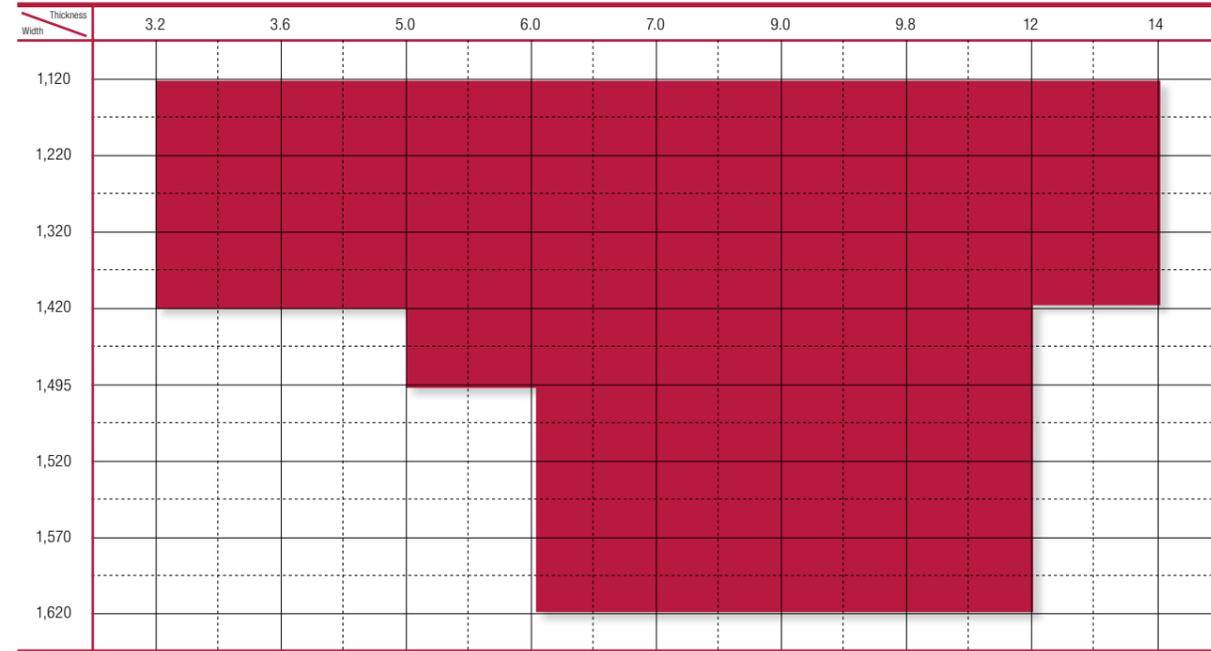
Specifications	Yield Point (MPa)	Tensile Strength (MPa)	Tensile Test			Bending Test		
			Elongation(%), Thickness(mm) *Rolling Direction			Bending Angle	Inner Dia.	Test Piece (JIS No.3)
			No.5 Test Piece, 2.5~5.0	No.5 Test Piece, 5.0~6.3	No.1 Test Piece, 6.3~12.7			
ATOS55	≥ 540	≥ 340	≥ 20	≥ 21	≥ 14	180°	1.5t	Transverse to Rolling Direction
ATOS60	≥ 590	≥ 420	≥ 19	≥ 20	≥ 13	180°	1.5t	Transverse to Rolling Direction
ATOS80	≥ 780	≥ 700	≥ 14	≥ 14	≥ 9	180°	1.5t	Transverse to Rolling Direction
ATOS100	≥ 980	≥ 880	≥ 8 (No. 5 test piece applied)			90°	3.0t	Transverse to Rolling Direction

Specifications	Yield Point(MPa)	Bending Test		Remark
		Bending Angle	Inner Dia.	
AUTOBEAM	490~784	180°	1.5t	Steel pass through proper heat treatment to come out as finished products
STAB	-	180°	1.5t	

Available Dimensions

Hot Rolled Steel Coil TS 800MPa Class

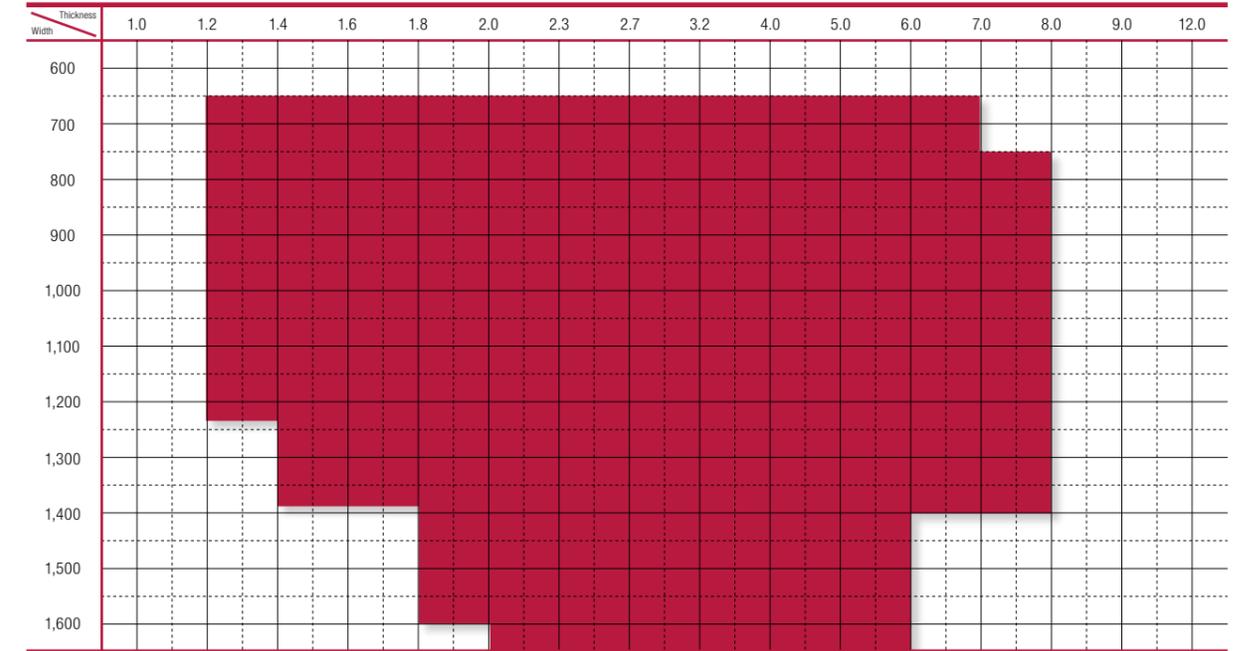
(Unit : mm)



⚠ The available sizes are subject to change. Please consult with the POSCO contact person before ordering.

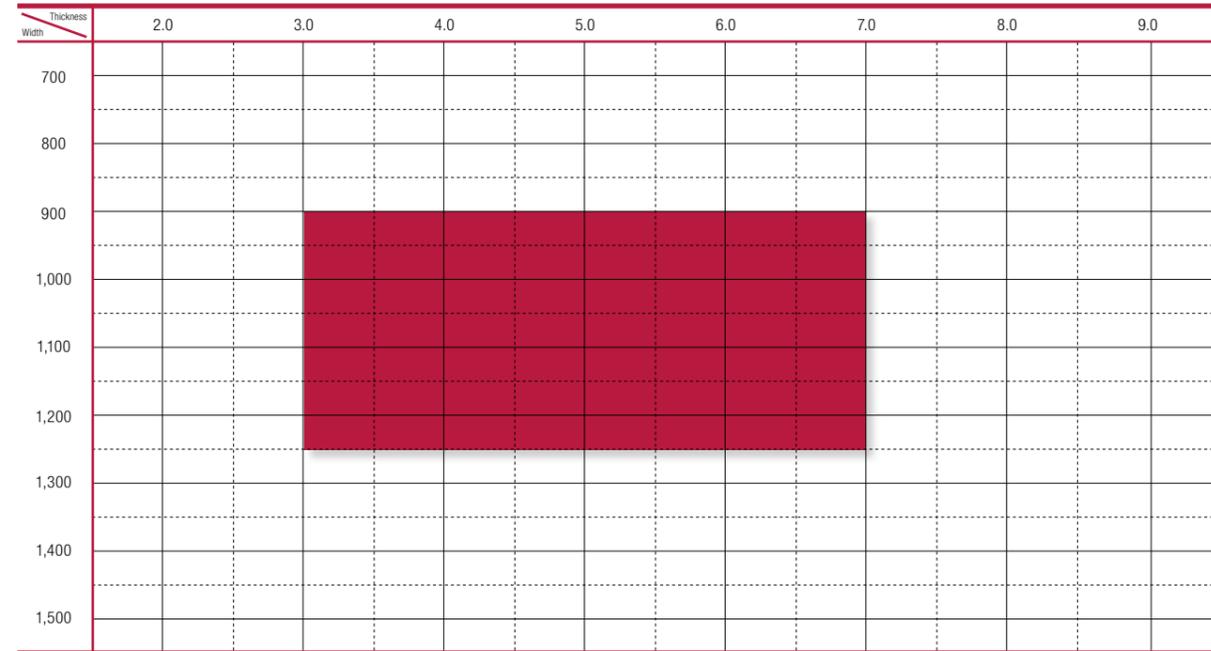
P/O Coil

(Unit : mm)

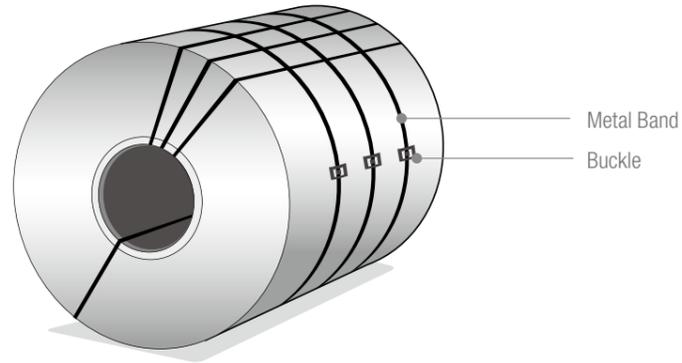


Checkered Coil TS 300MPa Class

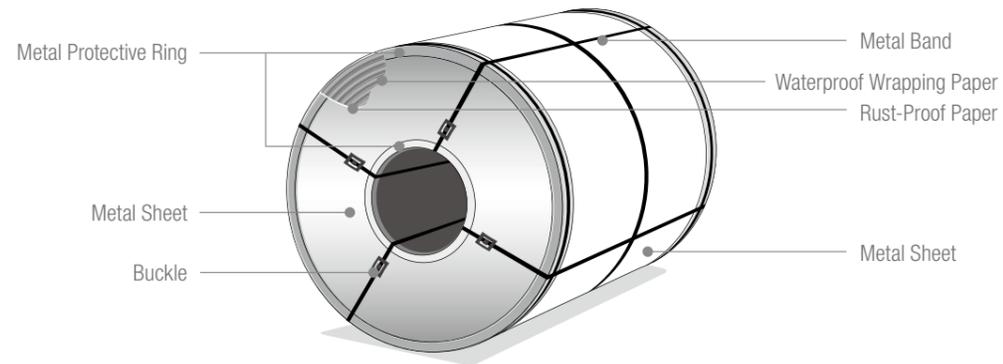
(Unit : mm)



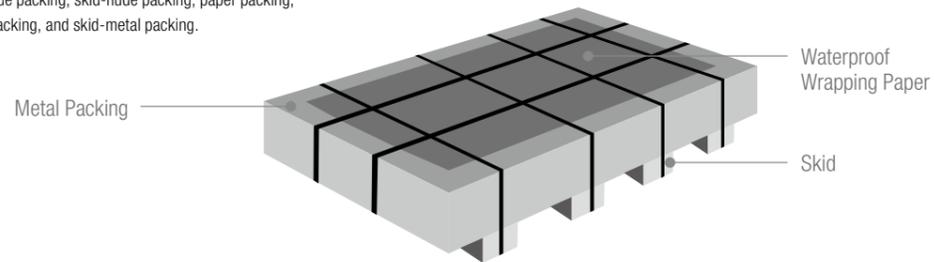
HR COIL | **Nude Packing**
Choose either nude or paper packing.



P/O COIL | **Metal Packing**
Choose either paper packing or metal packing.



HR SHEET | Choose from nude packing, skid-nude packing, paper packing, skid-papering packing, and skid-metal packing.

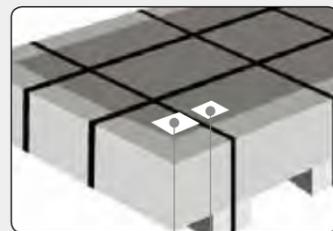


■ **Coil**



Marking Label
Product label

■ **Sheet**



Product label
Marking Label

■ **Product label**



※ Marking labels are attached when requested by customers.

Conversion Factors

■ **Weight**

Classification	kilogram	Ounce	Pound	Short Ton (2,000lbs)	Long Ton (2,240lbs)	Metric Ton (1,000kg)
	kg	oz	lb	st	lt	t
kilogram(kg)	2	35.2740	2.20462	1.001102	0.09842	0.001
Ounce(oz)	0.02835	1	0.06250	0.03125	0.02790	0.00002835
Pound(lb)	0.45359	16	1	0.00050	0.04464	0.00045
Short Ton(st)	907.185	32,000	2,000	1	0.89286	0.90719
Long Ton(lt)	1,106.05	35,840	2,240	1.12	1	1.01605
Metric Ton(t)	1,000	35,274	2,204.62	1.10231	0.98421	1

■ **Leaner Measure**

Classification	Millimeter mm	Centimeter cm	Meter m	Inch in.	Foot ft	Yard yd	Mile ml
Millimeter(mm)	1	0.1	0.001	0.03937	0.0032808	0.0010936	0.0006214
Centimeter(cm)	10	1	0.01	0.3937	0.032808	0.010936	0.006214
Meter(m)	1,000	100	1	39.37	3.28083	1.0936	0.006214
Inch(in.)	25.40	2.540	0.0254	1	0.0833	0.02778	0.0006214
Foot(ft)	304.8	30.48	0.3048	12	1	0.3333	0.0006214
Yard(yd)	914.4	91.44	0.9144	36	3	1	0.0006214
Mile(ml)	1,609,347.0	160,934.70	1,609.35	63,360	5,280	1,760	1

■ **Force**

Classification	kgf	lbf	N
kgf	1	2.205	9.807
lbf	4.536×10 ⁻⁴	1	4.448
N	1.020×10 ⁻¹	2.248×10 ⁻¹	1

■ **Force Per Unit Area**

Classification	kgf	lbf	N
kgf/mm²	1	1.422×10 ³	9.807
lbf/in²(psi)	7.031×10 ⁻⁴	1	6.895×10 ⁻³
N/mm², Mpa	1.020×10 ⁻¹	1.450×10 ²	1

■ **Energy**

Classification	kgf-m	lbf-lb	J, N-m	cal
kgf-m	1	7.233	9.807	2.343
lbf-lb	1.383×10 ⁻¹	1	1.356	3.239×10 ⁻¹
J, N-m	1.020×10 ⁻¹	7.376×10 ⁻¹	1	2.389×10 ⁻¹
cal	6.268×10 ⁻¹	3.087	4.186	1

Appendix

Vickers Hardness No.	Brinell Diameter of Ball 10mm Load 3,000kg HB	Rockwell		Shore HS	Tensile Strength Approximate value kgf/mm ²
		B Scale Load 100kg HRB	C Scale Load 100kg HRC		
940	-	-	68.0	97	-
920	-	-	67.5	96	-
900	-	-	67.0	95	-
880	-	-	66.4	93	-
860	-	-	65.9	92	-
840	-	-	65.3	91	-
820	-	-	64.7	90	-
800	-	-	64.0	88	-
780	-	-	63.3	87	-
760	-	-	62.5	86	-
740	-	-	61.8	84	-
720	-	-	61.0	83	-
700	-	-	60.1	81	-
690	-	-	59.7	-	-
680	-	-	59.2	80	-
670	-	-	58.8	-	-
660	-	-	58.3	79	-
650	-	-	57.8	-	-
640	-	-	57.3	77	-
630	-	-	56.8	-	-
620	-	-	56.3	75	-
610	-	-	55.7	-	-
600	-	-	55.2	74	-
590	-	-	54.7	-	210
580	-	-	54.1	72	206
570	-	-	53.6	-	202
560	-	-	53.0	71	199
550	505	-	52.3	-	195
540	496	-	51.7	69	190
530	488	-	51.1	-	186
520	480	-	50.5	67	183
510	473	-	49.8	-	179
500	465	-	49.1	66	174
490	456	-	48.4	-	169
480	448	-	47.7	64	165
470	441	-	46.9	-	160
460	433	-	46.1	62	156
450	425	-	45.3	-	153
440	415	-	44.5	59	149
430	405	-	43.6	-	144

Vickers Hardness No.	Brinell Diameter of Ball 10mm Load 3,000kg HB	Rockwell		Shore HS	Tensile Strength Approximate value kgf/mm ²
		B Scale Load 100kg HRB	C Scale Load 100kg HRC		
420	397	-	42.7	57	140
410	388	-	41.8	-	136
400	379	-	40.8	55	131
390	369	-	39.8	-	127
380	360	(110.0)	38.8	52	123
370	350	-	37.7	-	120
360	341	(109.0)	36.6	50	115
350	331	-	35.5	-	112
340	322	(108.0)	34.4	47	109
330	313	-	33.3	-	105
320	303	(107.0)	32.2	45	103
310	294	-	31.0	-	100
300	284	(105.5)	29.8	42	97
295	280	-	29.2	-	96
290	275	(104.5)	28.5	41	94
285	270	-	27.8	-	92
280	265	(103.5)	27.1	40	91
275	261	-	26.4	-	89
270	256	(102.0)	25.6	38	87
265	252	-	24.8	-	86
260	247	(101.0)	24.0	37	84
255	243	-	23.1	-	82
250	238	99.5	22.2	36	81
245	233	-	21.3	-	79
240	228	98.1	20.3	34	78
230	219	96.7	(18.0)	33	75
220	209	95.0	(15.7)	32	71
210	200	93.1	(13.4)	30	68
200	190	91.5	(11.0)	29	65
190	181	89.5	(8.5)	28	62
180	171	87.1	(6.0)	26	59
170	162	85.0	(3.0)	25	56
160	152	81.7	(0.0)	24	53
150	143	78.7	-	22	50
140	133	75.0	-	21	46
130	124	71.2	-	20	44
120	114	66.7	-	-	40
110	105	62.3	-	-	-
100	95	56.2	-	-	-
95	90	52.0	-	-	-
90	86	48.0	-	-	-
85	81	41.0	-	-	-

Conversion Factors

Weight

The weight tables on the following pages show calculated weights of steel products, which thickness, width and length are specified by inch and feet. Calculation is done on the basis of the basic weights show below. Calculation methods for area, weight per unit area are in accordance with KS D3500.

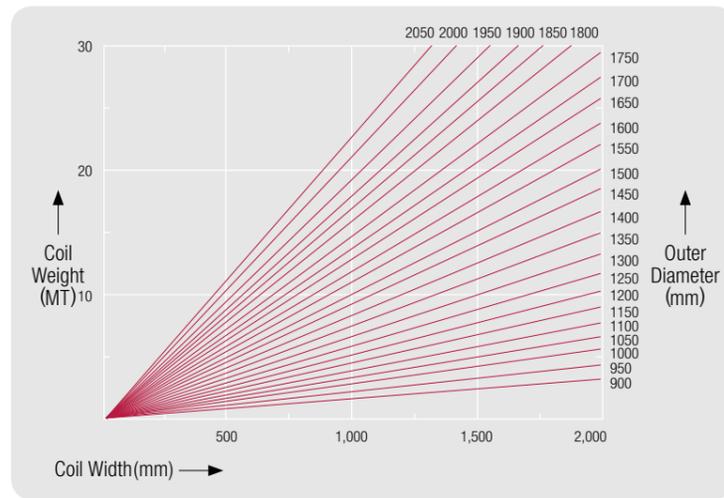
Classification	kgf/mm ²	lbf/in ² (psi)	N/mm ² , MPa
Basic weight as specified by standards specification kg/in, ft ²	7.85kg/mm, m ² 18.524	0.2833 lbs/in, m ² 18.505	40.8 lbs/in, ft ² 18.507

Weight Table

Thickness	Width	Length	1,000	762					914					1,219				
			1,000	1,524	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	3,658	1,829	2,134	2,438
1.2	9.24	10.9	13.1	15.3	17.5	19.7	21.9	15.7	18.4	21.0	23.6	26.2	31.5	21.0	24.5	28.0	31.5	35.0
1.4	10.99	12.8	15.3	17.9	20.4	23.0	25.5	18.4	21.4	24.5	27.6	30.6	36.7	24.5	28.6	32.7	36.7	40.6
1.6	12.56	14.6	17.5	20.4	23.3	26.3	29.6	21.0	24.5	28.0	31.5	35.0	42.0	28.0	32.7	37.3	42.0	46.7
1.8	14.13	16.4	19.7	23.0	26.3	29.6	32.8	23.6	27.6	31.5	35.4	39.4	47.2	31.5	36.8	42.0	27.2	52.5
2.0	15.70	18.2	21.9	25.5	29.2	32.9	36.5	26.2	30.6	35.0	39.4	43.7	52.5	35.0	40.8	46.7	52.5	58.3
2.3	18.06	21.0	25.2	29.4	33.6	37.8	41.9	30.2	35.2	40.2	45.3	50.3	60.4	40.3	47.0	53.7	60.4	67.1
2.6	20.41	23.7	28.4	33.2	37.9	42.7	47.4	34.1	39.8	45.5	51.2	56.9	68.2	45.5	53.1	60.7	68.2	75.8
2.9	22.76	26.4	31.7	37.0	42.3	47.7	52.9	38.0	44.4	50.7	57.1	63.4	76.1	50.7	59.2	67.6	76.1	84.6
3.0	23.55	27.3	32.8	38.3	43.8	49.3	54.7	39.4	45.9	52.5	59.0	65.6	78.7	52.5	61.3	70.0	78.7	87.5
3.2	25.12	29.2	35.0	40.8	46.7	52.7	58.3	41.8	49.0	56.0	63.0	70.0	84.0	56.0	65.3	74.7	84.0	93.3
4.5	35.32	41.0	49.2	57.4	65.6	74.0	82.0	59.0	68.9	78.7	88.3	98.1	118	78.7	91.9	105	118	131
5.0	39.25	45.6	54.7	63.8	72.9	82.2	91.2	65.6	76.7	87.5	98.4	109	131	87.5	102	117	131	146
6.0	47.10	54.7	65.6	76.6	87.5	98.6	109	78.7	91.9	105	118	131	157	105	123	140	157	175
7.0	54.95	63.8	76.6	89.4	102	115	128	91.9	107	122	138	153	184	123	143	163	184	204
8.0	62.80	73.0	87.5	102	117	132	146	105	122	140	157	174	210	140	163	187	210	233
9.0	70.65	82.0	98.5	115	131	148	165	118	138	157	177	197	236	158	184	210	236	263
10.0	78.50	91.2	109	128	146	164	182	131	153	175	197	219	262	175	204	233	262	292
11.0	86.35	100	120	140	160	181	201	144	168	192	216	241	289	193	225	257	289	321
12.0	94.20	109	131	153	175	197	219	157	184	210	236	262	315	210	245	280	315	350

Appendix

Width-Weight Curves for Coils (Coil ID=30Inch)



(Unit: mm)

1,219		1,524										1,829							
3,658	4,877	1,829	2,134	2,438	2,743	3,048	3,658	6,096	9,144	12,192	1,829	2,134	2,438	2,743	3,048	3,658	6,096	9,114	12,192
42.0	56.0	26.3	30.6	35.0	39.4	43.8	52.5	87.5	131	175	31.5	36.8	42.0	47.3	52.5	63.0	105	158	210
49.0	65.3	30.6	35.7	40.8	45.9	51.1	61.3	102	153	204	36.8	42.9	49.0	55.1	61.3	73.5	123	184	245
56.0	74.7	35.0	40.8	46.7	52.5	59.3	70.0	117	175	233	42.0	49.0	56.0	63.0	70.0	84.0	140	210	280
63.0	84.0	39.4	46.0	52.5	59.1	65.6	78.8	131	197	263	47.3	55.2	63.0	70.9	78.8	94.5	158	236	315
70.0	93.3	43.8	51.1	58.3	65.6	72.9	87.5	146	219	292	52.5	61.3	70.0	78.8	87.5	105	175	263	350
80.5	107	50.3	58.7	67.1	75.5	80.0	101	168	252	336	60.4	70.5	80.5	90.6	101	121	201	302	403
91.0	121	56.9	66.4	75.8	85.3	94.8	114	190	284	379	68.3	79.7	91.0	102	114	137	228	341	455
101	135	63.4	74.0	84.7	95.1	106	127	211	317	423	76.1	88.8	101	114	127	152	254	381	508
105	140	65.6	76.6	87.5	98.4	109	131	219	328	438	78.8	91.9	105	118	131	158	263	394	525
112	149	70.0	81.7	93.3	105	117	140	233	350	467	84.0	98.0	112	126	140	168	280	420	560
157	210	98.5	115	131	148	164	197	328	492	656	118	138	157	177	197	236	394	591	788
175	233	109	128	146	164	182	219	365	547	729	131	153	175	197	219	263	438	656	875
210	280	131	153	175	197	219	263	438	656	875	141	184	210	236	263	315	525	788	1,050
245	327	153	179	204	230	255	306	511	766	1,021	184	214	245	276	306	368	613	919	1,225
280	373	175	204	233	263	292	350	583	875	1,167	210	245	280	315	350	420	700	1,050	1,400
315	420	197	230	263	295	328	394	656	985	1,313	236	276	315	354	394	473	788	1,182	1,575
350	467	219	255	292	328	365	438	729	1,094	1,459	263	306	350	394	438	525	875	1,313	1,750
385	513	241	281	321	361	401	481	802	1,203	1,604	289	337	385	433	481	578	963	1,444	1,926
420	560	263	306	350	394	438	525	875	1,313	1,750	315	368	420	473	525	630	1,050	1,575	2,101

HOT ROLLED STEEL

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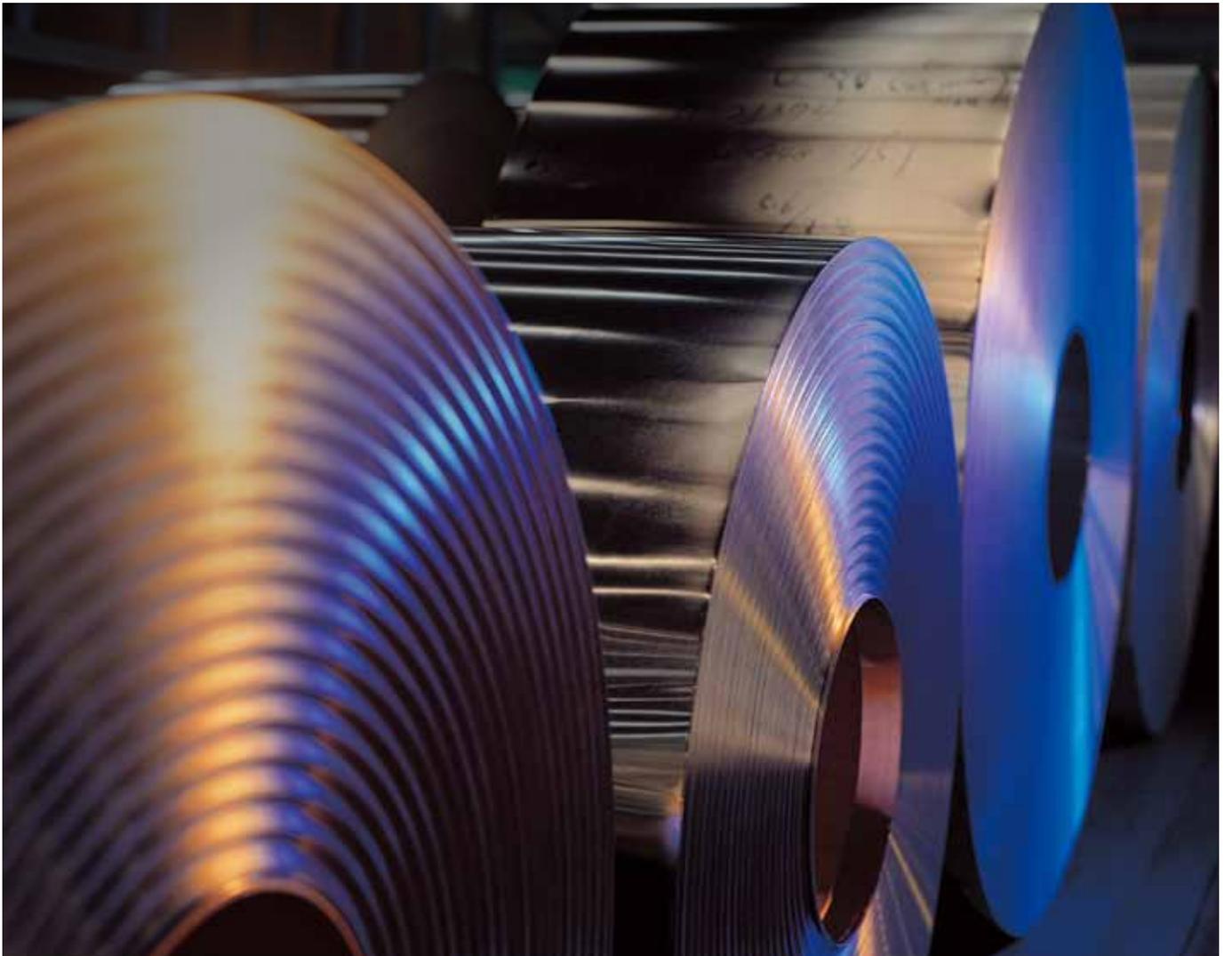
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COLD ROLLED STEEL





Cold rolled steel is a high quality steel product with a smooth, beautiful surface and excellent machinability. POSCO operates two cold rolling mills in Pohang and four cold rolling mills in Gwangyang. With the ever-growing demand in cold rolled products, we are expanding our development in the manufacturing activities of high quality products.

COLD ROLLED STEEL

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Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

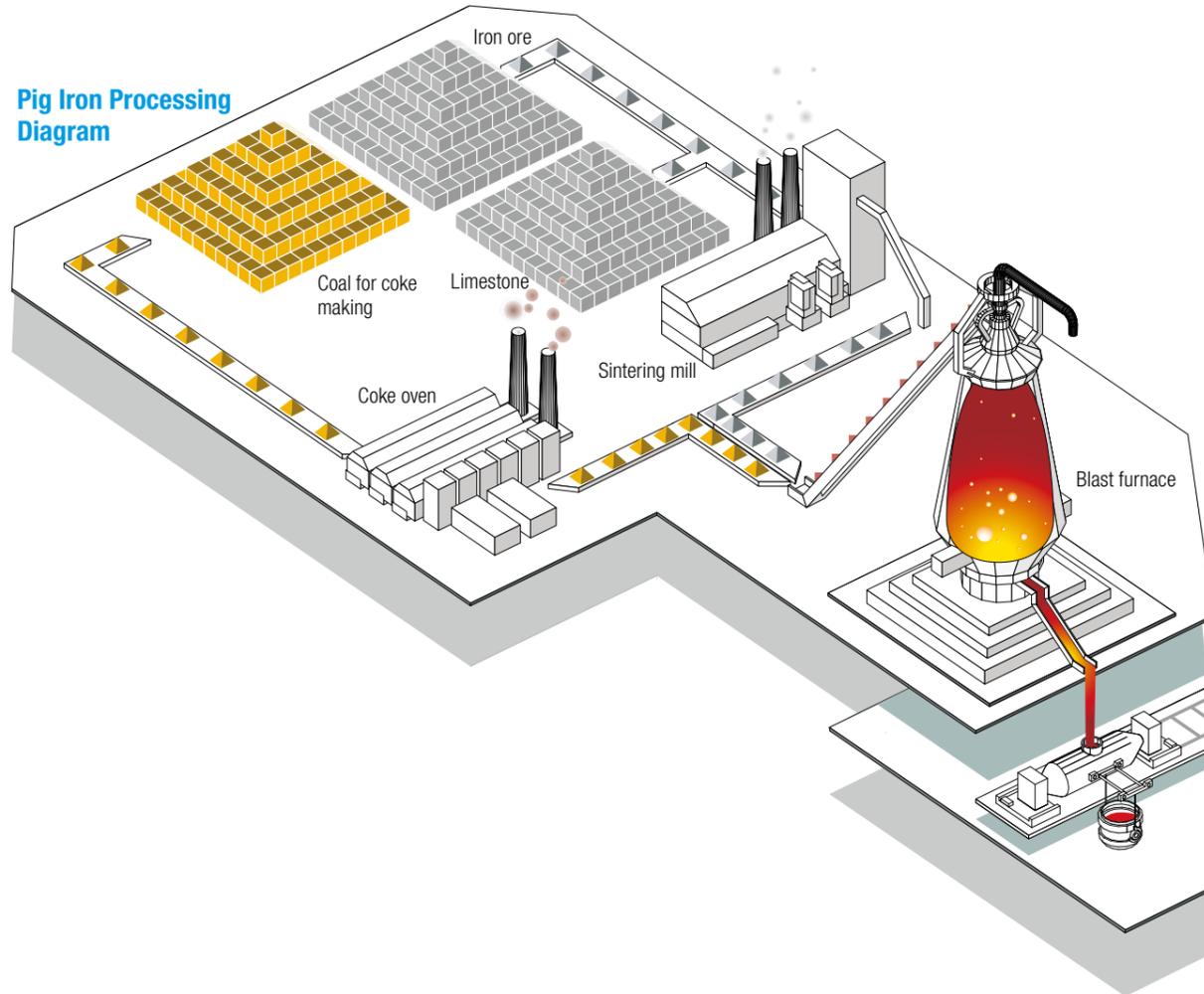
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.

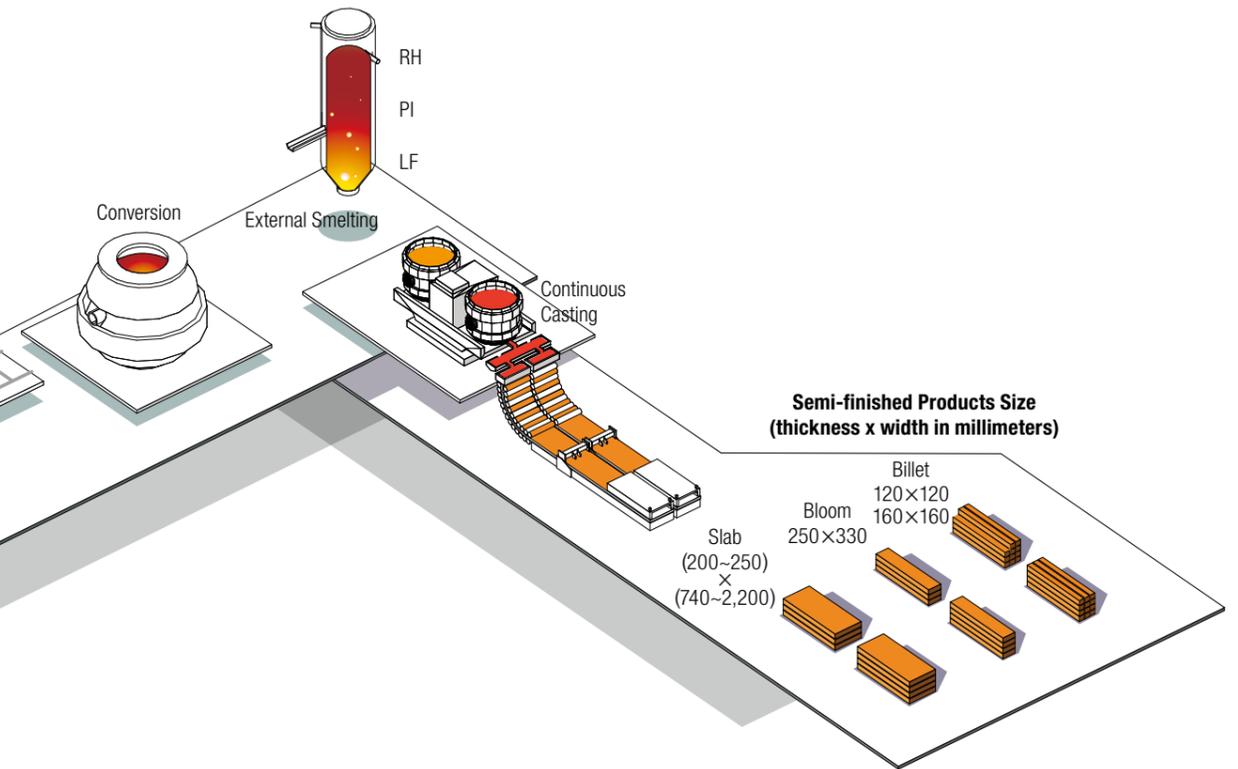


Manufacturing Processes

Pig Iron Processing Diagram



Steelmaking/Continuous Casting Processes



Stages of Pig Iron Processing in Detail

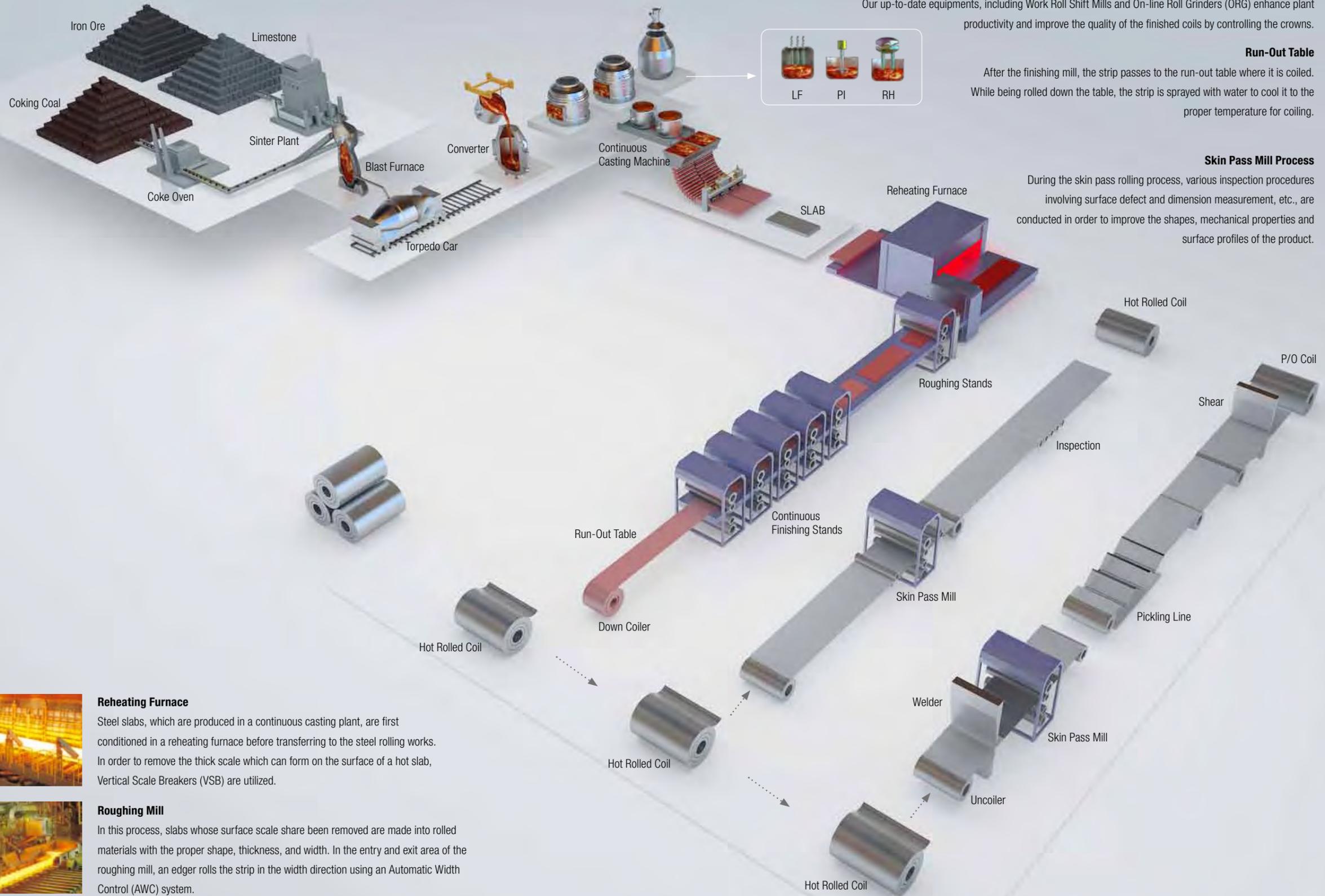
Process	Description
Sintering	Iron ore, the main ingredient in steelmaking, is sorted by size into subgroups such as pelletized ore (10~25mm), lump ore (larger than 25mm), and fine ore (less than 10mm). After being crushed and sorted at the raw material factory, lump ore is sent to post-processing facilities in the form of pelletized or fine ore.
Fuel treatment	Limestone and powdered coke are mixed with fine ore, which is produced from crushing lump ore. The mixture is first heated at about 1,200°C, cooled, and then crushed into sintered ore of 10~50mm granule dimensions. - Operating facilities: five in Pohang and four in Gwangyang
Coke treatment	Coke is produced by heating various coals over 1,000°C to remove water and ash. The suitable grain size of coke to be used in blast furnaces is 25~75mm considering air permeability and chemical reactivity. - Operating facilities: five in Pohang and four in Gwangyang
Blast Furnace	Sintered ore, lump coke and other powdered raw materials are introduced at the top of the furnace in multiple stages. Then, the bottom of the furnace is brought up to a temperature of about 1,100°C to heat the coke/iron ore mixture, inducing a reduction reaction to produce molten iron. - Operating facilities: six in Pohang (including the first COREX furnace) and five in Gwangyang

Steelmaking/Continuous Casting Processes

Process	Description
Converter	- Molten iron in the furnace is converted to molten steel by adding oxygen, and Impurities are removed during this process. - Pohang: 3 converters of 100-ton capacity each at the 1st steelmaking plant, 3 converters of 300-ton capacity each at the 2nd steelmaking plant - Gwangyang: 3 converters of 250-ton capacity each at the 1st steelmaking plant, 3 converters of 250-ton capacity each at the 2nd steelmaking plant
Additional Refining Facilities	These processes remove impurities and make subtle adjustments to the chemical composition of the molten steel product of the converter.
	RH - Acronym for Reinstahl Hutenerwerke & Heraus - Ar or N ₂ is blown into the molten steel ladle to remove an impurity in this process, hydrogen gas, and to separate and raise non-metallic inclusions to the surface. - Decarbonizing can be accomplished by adding an oxygen injection process.
	PI - Powder injection - Through a lance, powders such as Ca-Si are injected to remove sulfuric elements. Non-metallic inclusions are separated and then raised to the surface by stirring the bottom of the molten steel volume.
LF	- Ladle Furnace - During this process, a high current electric arc is used to increase the temperature of the molten steel.
Continuous Caster	- Molten steel, which has undergone external refining processes (RH, PI and LF), is poured into molds to produce specific desired shapes. Intermediate products such as slabs, blooms, and billets are produced.

Manufacturing Processes & Equipment for Hot Rolling

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Finishing Mill

The purpose of finishing rolling is to adjust the thickness and width of a coil to the specified dimensions and to produce a smooth surface and shape at a desired finishing temperature appropriate to its intended use. Our up-to-date equipments, including Work Roll Shift Mills and On-line Roll Grinders (ORG) enhance plant productivity and improve the quality of the finished coils by controlling the crowns.



Run-Out Table

After the finishing mill, the strip passes to the run-out table where it is coiled. While being rolled down the table, the strip is sprayed with water to cool it to the proper temperature for coiling.



Skin Pass Mill Process

During the skin pass rolling process, various inspection procedures involving surface defect and dimension measurement, etc., are conducted in order to improve the shapes, mechanical properties and surface profiles of the product.



Reheating Furnace

Steel slabs, which are produced in a continuous casting plant, are first conditioned in a reheating furnace before transferring to the steel rolling works. In order to remove the thick scale which can form on the surface of a hot slab, Vertical Scale Breakers (VSB) are utilized.



Roughing Mill

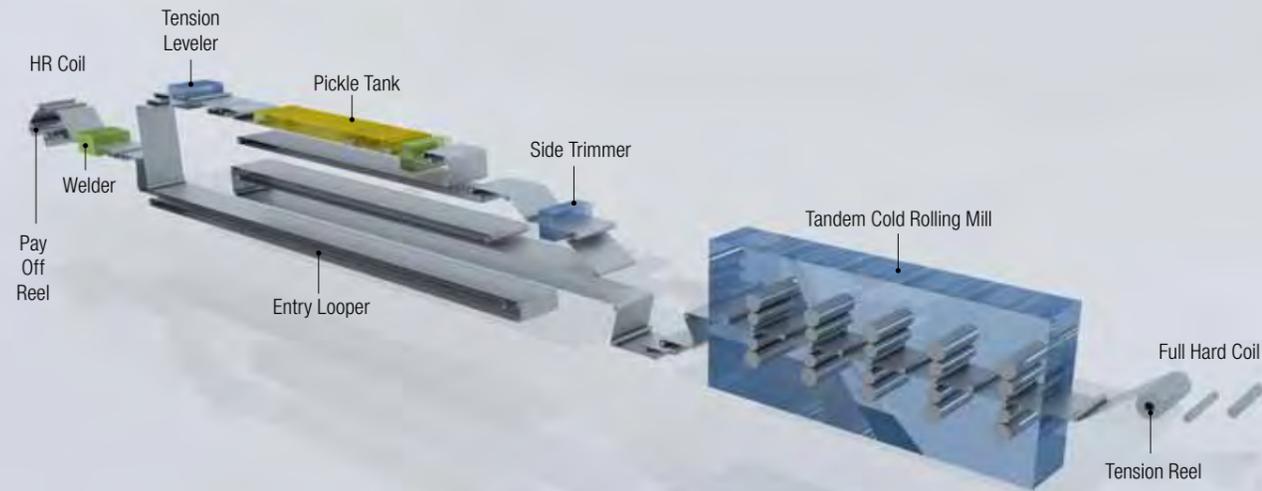
In this process, slabs whose surface scale have been removed are made into rolled materials with the proper shape, thickness, and width. In the entry and exit area of the roughing mill, an edger rolls the strip in the width direction using an Automatic Width Control (AWC) system.



Manufacturing Processes & Equipment for Cold Rolling

In order to deliver quality products meeting customer requirements, POSCO is equipped with the latest fully-automated, computer-controlled, cutting-edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.

PL/TCM (Pickling Line and Tandem Cold Mill)



Pickling

The hot-rolled coil passes through a pickling line, where scale breaker machines and hydrochloric acid solutions are used to remove surface scale and oxide film, which cause surface flaws during the final stage of cold rolled steel processing.



Cold Rolling

Pickled coils are cold rolled in tandem mills to a specified thickness, typically 40–90%, of original material dimensions. Fully automated thickness and shape adjustment is ensured through state of the art process machinery.



Electrolytic Cleaning

The purpose of electrolytic cleaning is to remove lubricant oil and contaminants on the cold rolled steel prior to the annealing process. All traces of surface oil are removed through mechanical and chemical action as the cold rolled coil passes through an alkaline solution bath.



Annealing

After cold-rolling, the steel is hard and brittle, and its grains are elongated in the rolling direction. To obtain the desired grain structure and improve the mechanical properties, the material is reheated in a furnace and subjected to cycles of rapid heating and cooling. Steel products with extra deep drawing qualities and high tensile strength can be produced via this high productivity manufacturing method. Two annealing methods are commonly used: batch annealing and continuous annealing.



Skin Pass

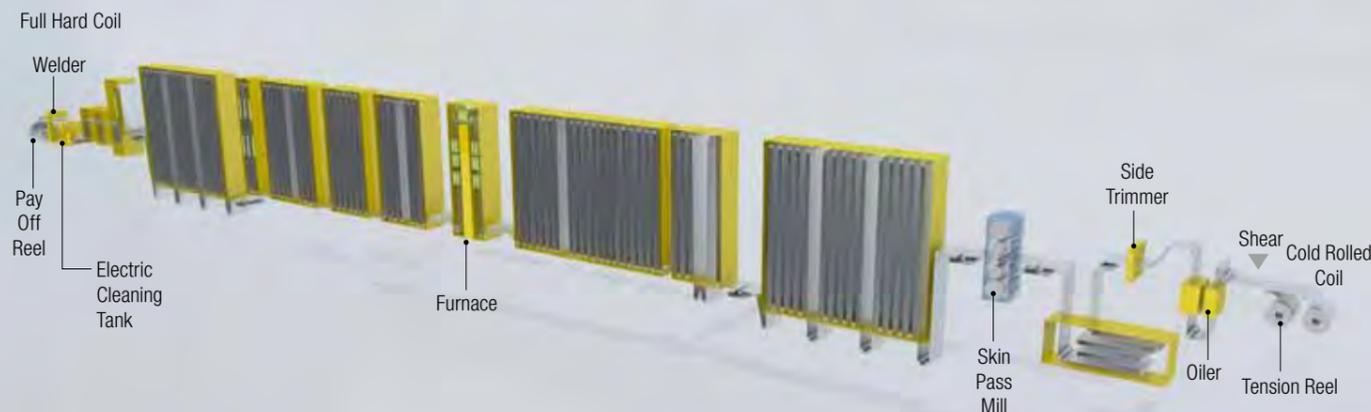
A final rolling process is performed in order to remove minor surface defects such as stretch marks and to produce a smooth, lustrous surface. Skin Pass results in a further thickness reduction of about 1%.



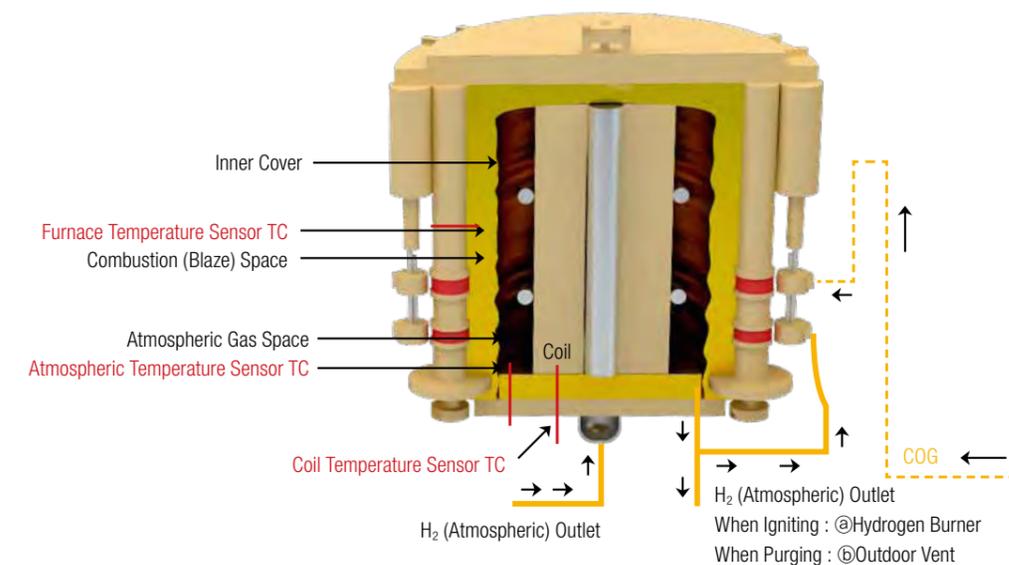
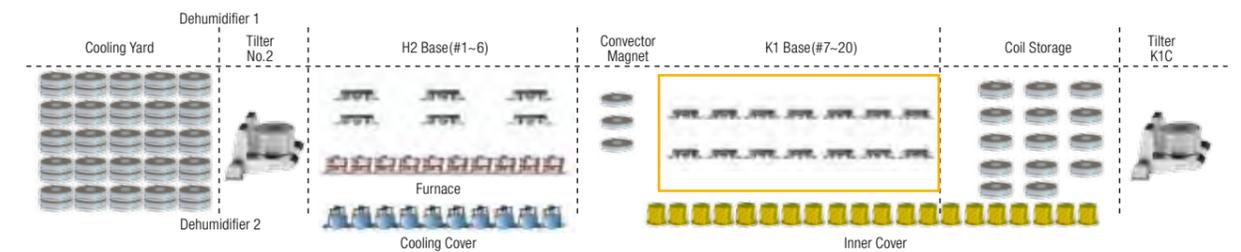
Finishing and Inspection

During this final stage of manufacturing, cold rolled strips are trimmed to customer specified size. The finished product is subject to final inspection, where thickness, width and surface quality are verified. Samples are sent for laboratory testing of mechanical properties as appropriate for specific end use.

CAL (Continuous Annealing Line)



BAF (Batch Annealing Furnace)



Main Uses

Cold rolled steel sheet (CR) features a fine surface and excellent workability. It is used for a variety of products ranging from home appliances such as refrigerators and washing machines to industrial machinery, architectural components and automobiles. Cold rolled steel is an indispensable material in our modern society.

Commercial Cold Rolled Steel

This type of steel is appropriate for manufacturing ordinary objects like refrigerator doors, drum containers and furniture as well as automobile parts such as oil filters.

HSS (High Strength Cold Rolled Steel) (up to 60kg class)

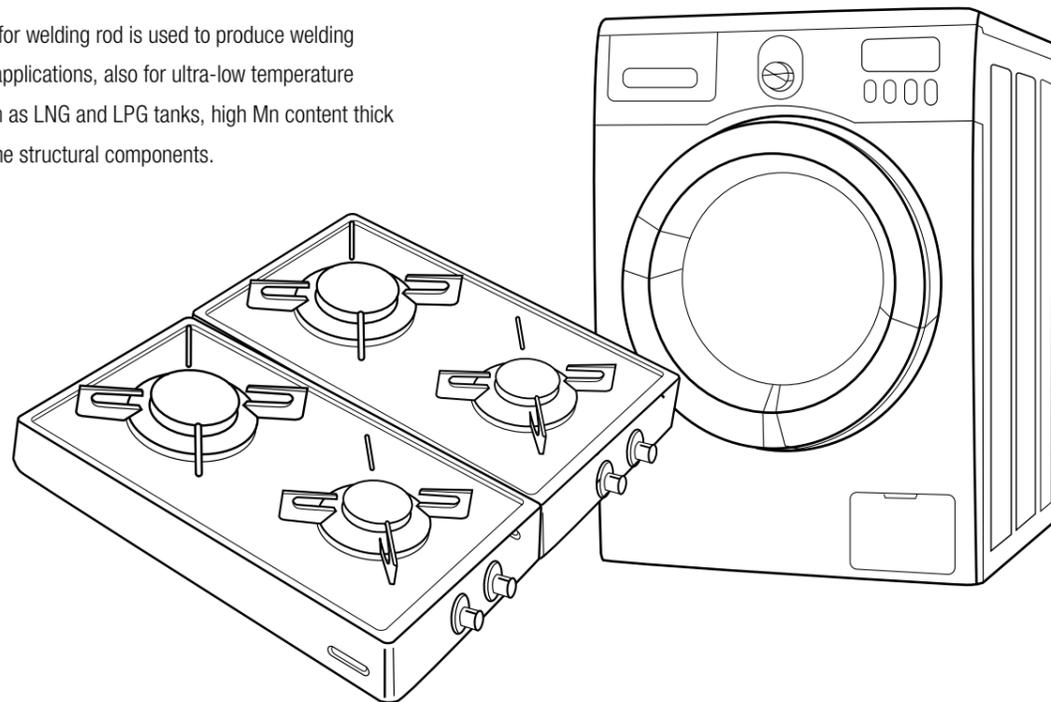
High strength steel is used in products requiring a material with higher strength than traditional cold rolled steel can provide. If machinability is also required along with strength, HSS is the right choice.

Structural Cold Rolled Steel

This material is particularly suitable for steel components that do not require further processing, such as drawing, but require high strength. Structural CR steel is widely used as a structural building material.

Cold Rolled Steel for Welding Rod

Cold rolled steel for welding rod is used to produce welding rod for ordinary applications, also for ultra-low temperature applications such as LNG and LPG tanks, high Mn content thick plates, and marine structural components.



Cold Rolled Steel for Porcelain Enameling

This product features desirable properties for enameled porcelain manufacturing such as heat resistance, corrosion resistance, and gloss surface, as well as traditional steel virtues (impact resistance, high ductility and formability). It is used for components of home appliances, construction materials, kitchen appliances and bathtubs, etc.

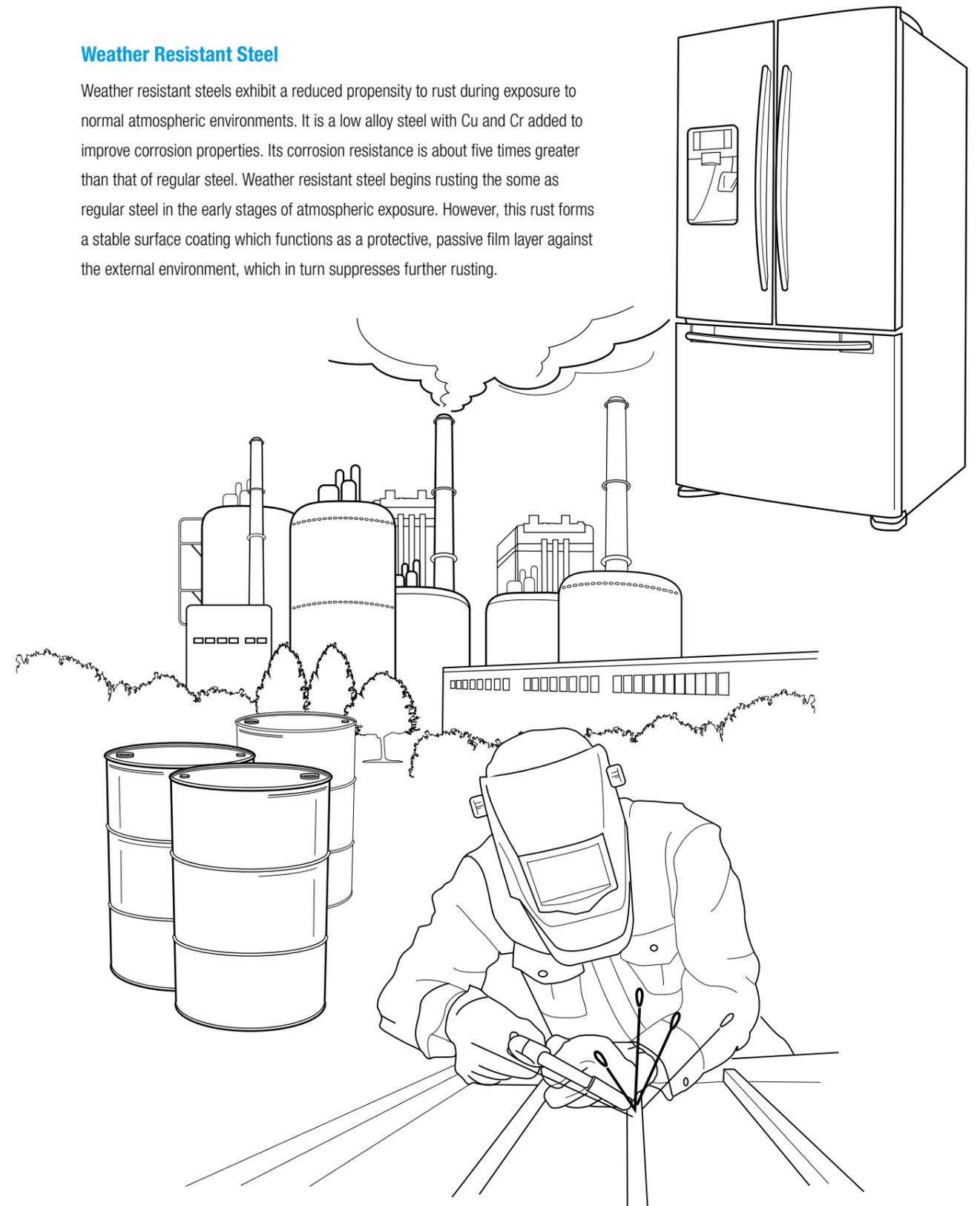
Sulfate Resistant Cold Rolled Steel

Gases emitted by thermal power plants and boilers, where fossil fuels such as heavy oil and bituminous coal are used, contain Sulfur Oxides (SOx). Sulfur oxides encounter condensed moisture during recovery of waste heat from exhaust gases, creating a highly corrosive environment. Sulfate resistant steel is an excellent choice for desulfurization and smoke elimination facilities where sulfate corrosion is a real concern. Through the use of this steel, maintenance and repair costs can be controlled making compliance with environmental regulations.

⚠ The applications described in this section reflect typical uses and are offered as examples. Please be sure to discuss your end use with our associates when selecting steel products.

Weather Resistant Steel

Weather resistant steels exhibit a reduced propensity to rust during exposure to normal atmospheric environments. It is a low alloy steel with Cu and Cr added to improve corrosion properties. Its corrosion resistance is about five times greater than that of regular steel. Weather resistant steel begins rusting the same as regular steel in the early stages of atmospheric exposure. However, this rust forms a stable surface coating which functions as a protective, passive film layer against the external environment, which in turn suppresses further rusting.



Regular Cold Rolled Steel

General Characteristics

A general purpose steel, it is used to make products such as home appliances, drum containers, furniture, etc.

Product Types and Features

Division	Characteristics	Uses
for General Use	For goods that require bending, forming, light processing, and welding.	Drums, furniture, etc.
for Machining	For goods that require machinability.	Outer plates for home appliances, etc.
for Deep Machining	For goods that require deep-machinability.	Frames for furniture, home appliances, etc.

Remarks) Rigid steel for general purposes can be ordered in both KS and JIS Standards.

Chemical Composition

Specifications	C(%)	Mn(%)	P(%)	S(%)
CSP1	~0.15	~0.60	~0.100	~0.035
CSP2	~0.10	~0.50	~0.040	~0.035
CSP3	~0.08	~0.45	~0.030	~0.030

Mechanical Properties

Specifications	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)						
			Thickness(mm)						
			0.25~0.3	0.3~0.4	0.4~0.6	0.6~1.0	1.0~1.6	1.6~2.5	2.5~3.3
CSP1	~392	270~	28~	31~	34~	36~	37~	38~	39~
CSP1D	~343	270~	33~	33~	35~	37~	38~	38~	40~
CSP2	~345	270~	30~	33~	36~	38~	39~	40~	41~
CSP3	~294	270~	32~	35~	38~	40~	41~	42~	43~
CSP3N	~294	270~	32~	35~	38~	40~	41~	42~	43~
CSP3E	~294	265~	32~	35~	38~	40~	41~	42~	43~
CSP3X	~294	260~	-	-	47~	47~	49~	50~	-
CSP3Z	~250	255~	-	-	52~	52~	52~	-	-

Remarks) 1. Markings such as '-S', '-E', and '-Z' are added at the end of size symbols indicating tempering level and surface quality. (example: CSP1D-E)
S: standard tempering, E: strict surface treatment, Z: non-strict surface treatment
2. Products with markings CSP3N, E, X, and Z are guaranteed for six months without limitation after shipment.

Comparison Chart of Different National Standards

Grade	POSCO	National Standards			
		KS	JIS	ASTM	EN
Commercial Quality	CSP1	KS-SPCC	JS-SPCC	A1008 CS	EN-DC01, EN-DC03
	CSP1D				
Drawing Quality	CSP2	KS-SPCD	JS-SPCD	A1008 DS	EN-DC04
Deep Drawing Quality	CSP3(N)	KS-SPCE	JS-SPCE	A1008 DDS	EN-DC05
Extra Deep Drawing Quality	CSP3E, CSP3X, CSP3Z	KS-SPCF, KS-SPCG	JS-SPCF, JS-SPCG	A1008 EDDS	EN-DC06, EN-DC07
Test piece	Rolling direction KS 5	Rolling direction KS 5	Rolling direction JIS 5	Rolling direction ASTM	Perpendicular to Rolling direction EN

Remarks) 1. Components and materials of each national standard are listed in detail in the Appendix (page 31).
2. The specification comparison chart above is analogous to that of POSCO. Chemical composition and mechanical properties may vary depending on the test methods of each specification.
3. For details, please contact our technical representative.

Rigid Steel

Difference in Tempering	Specifications	Hardness	
		HRB	HV
Rigidity	SPCC-1	No testing	No testing
1/2 Rigidity	SPCC-2	74~89	135~185
1/4 Rigidity	SPCC-4	65~80	115~150
1/8 Rigidity	SPCC-8	50~71	95~130

High Strength Cold Rolled Steel

General Characteristics

High strength steel is used in products requiring higher strength than which traditional cold rolled steel can provide. If machinability is also required along with strength, HSS is the right choice.

Product Types and Features

Classification	Name	Strengthening Method	Characteristics
E Class	Interstitial Free High Strength Steel High Strength Low Alloy Steel	Using ultra-low carbon steel as the base, the carbonitride-forming element Ti is added to acquire deep machinability. For high strength, permutable solid elements P and Mn are both added.	Proper strength is maintained and deep machinability acquired.
R Class	Rephosphorized Steel	Permutable alloying elements P and Mn are added to low carbon steel. Permutable elements cause lattice mutation and increase internal stress, disrupting electron migration which results in higher strength.	Compared to precipitation-strengthened steel (C class), the degree of the strengthening effect is smaller, but this type of steel still has high strength and good machinability.
C Class	Interstitial Free High Strength Steel	Using low carbon steel as the base, precipitation-enhancing elements Ti and Nb are added to spread carbonitride extracts very finely inside the steel. Precipitation inhibits electron migration, increasing yield strength and impact resistance.	In comparison to regular steel, high strength is maintained with a high yield point.

Chemical Composition

Classification	C(%)	Mn(%)	P(%)	S(%)	Si(%)
E Class	~0.005	~1.0	~0.11	~0.02	~0.40
R Class	~0.09	~1.4	~0.03	~0.015	~0.14
C Class	~0.09	~1.4	~0.025	~0.01	~0.34

Mechanical Properties

Classification	Specifications	Yield Strength(N/mm ²)	Tensile Strength(N/mm ²)	Ductility(%)
E Class	CHSP35E	185~	340~	34~
	CHSP40E	215~	390~	30~
	CHSP45E	235~	440~	26~
R Class	CHSP35R	185~	340~	35~
	CHSP40R	215~	390~	29~
	CHSP45R	245~	440~	26~
C Class	CHSP45C	275~	440~	22~
	CHSP60C	350~	588~	17~
	CHSP260C	260~340	340~450	28~
	CHSP340C	340~440	410~530	20~
	CHSP420Y	420~530	490~600	16~

- Remarks)
- High Strength Cold Rolled Steel test sample is perpendicular to the rolling direction per KS 13A.
 - If thickness is less than 0.6mm, tensile test is not performed.
 - Chemical composition is subject to agreement between POSCO and ordering parties.

Structural Cold Rolled Steel

General Characteristics

This steel is not subject to post processing, and used for steel structures which require high strength.

Product Types and Features

It is widely used for architectural components, Minimum tensile strength is guaranteed.

Chemical Composition

C(%)	Mn(%)	P(%)	S(%)
~0.2	~0.6	~0.04	~0.04

Mechanical Properties

Specification	Tensile Strength(N/mm ²)
CSP30	294~
CSP32	314~
CSP34	334~

Cold Rolled Steel for Welding Rod

General Characteristics

Flux Cored Wire Welding Rod :

The wire product, is made by slitting cold rolled steel in small widths, roll-forming to increase flux volume and passing the material through a die.



Product Types and Features

Division	Specification	Uses	Product characteristics	Welded parts characteristics
General use	CSP2-WB	• General purpose steel	• Excellent Productivity • Low Spatter	Impact resistance(-20℃) ≥ 27J
Ultra-low temperature	CSP2-WC	• Ultra-low temperature steel (LNG, LPG TANK types)	• Excellent ultra-low temperature impact resistance • Excellent Productivity	Impact resistance(-60℃) ≥ 47J
As an adhesive for special applications	CSP2-WE	• High Mn steel plate • Marine structural steel	• High temperature fracture resistance of Mn steel • Excellent ultra-low temperature impact resistance	Impact resistance(-60℃) ≥ 47J
for Low fume uses	CSP3-LW	• Eco-friendly steel	• Decreased fumes during welding • excellent tube forming properties	Impact resistance(-20℃) ≥ 27J

Chemical Composition

Specifications	C(%)	Mn(%)	P(%)	S(%)	Si(%)
CSP2-WB	~0.04	0.1~0.5	~0.02	~0.02	~0.03
CSP2-WC	~0.05	0.1~0.5	~0.015	~0.015	~0.03
CSP2-WE	~0.04	0.1~0.5	~0.01	~0.01	~0.03
CSP3-LW	~0.007	0.5~1.0	~0.015	~0.015	~0.03

Mechanical Properties

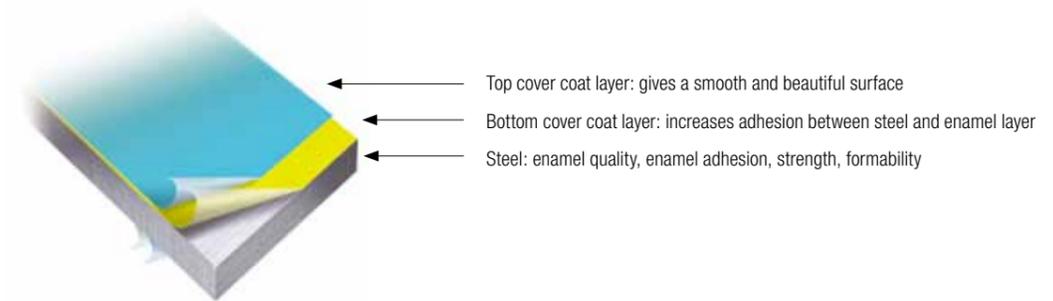
Specifications	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)				Hardness (HrB)
			0.4~0.6T	0.6~1.0T	1.0~1.6T	1.6~2.0T	
CSP2-WB	~260	270~	36~	38~	39~	40~	~55
CSP2-WC	~264	275~	36~	38~	39~	40~	~60
CSP2-WE	~260	270~	36~	38~	39~	40~	~55
CSP3-LW	~240	270~	38~	40~	41~	42~	~45

Remarks) 1. Test samples oriented in the rolling direction per KS 5.
2. If thickness is less than 0.6mm, tensile test is not performed.
3. Chemical composition is subject to agreement between POSCO and ordering parties.

Cold Rolled Steel for Enameling

General Characteristics

The material is baked at high temperature after being coated with inorganic hyaline enamel. Material compositions combines the characteristics of both metal and porcelain enamel such as strength, heat resistance, corrosion resistance, and surface luster.



Main Uses

Division	Uses
Industrial	Chemical reaction furnace, heat exchanger, food processor, hot water tank, holding tank, etc.
Residential	Gas oven, washing machine, microwave oven, gas heater, boiler, dishwasher, kitchen appliances, etc.
Architectural	Shell plates for building, roofs, wall tiles, tunnel panels, blackboard, desks, road signs, exterior materials, etc.

Product Types and Features

Specification	Formability (Drawability)	Enamel characteristic	Enameling
CESP-C	for deep processing	Good	Plasticizing once or twice
POSCENA-C	for regular processing	Very good	

Remarks) Enamel characteristic is mainly due to the enamel processing, which is related to the typical defects such as 'Fish scale' and 'Blister'.

Chemical Composition

Specification	C(%)	Mn(%)	P(%)	S(%)	Notes
CESP-C	~0.008	~0.5	~0.04	~0.06	Ti added
POSCENA-C	~0.008	~0.5	~0.04	~0.04	Ti not added

Mechanical Properties

Specification	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)				R-bar
			0.4~0.6T	0.6~1.0T	1.0~1.6T	1.6~2.0T	
CESP-C	~240	270~	38~	40~	41~	42~	1.2~
POSCENA-C			34~	36~	37~	38~	1.4~

Sulfate Corrosion Resistant Steel

General Characteristics

Gases emitted by thermal power plants and boilers, where fossil fuels such as heavy oil and bituminous coal are used, contain oxides of sulfur (SOx). Sulfur oxide encounters condensed moisture during recovery of waste heat from exhaust gases, creating a highly corrosive environment. Sulfate resistant steel is an excellent choice for desulfurization and smoke elimination facilities where sulfate corrosion is a big concern. Through the use of this steel, maintenance and repair costs can be controlled making compliance with environmental regulations.

*Sulfate resistance degree by steel type: regular steel < stainless steel < weather resistant steel < sulfate resistant steel

[Air Pre-Heater at thermal power plant]



Regular steel used (serious corrosion shown)

Sulfate resistant steel used (excellent corrosion resistance shown)

Product Types and Features

Specifications	Corrosion resistant environment	Sulfate corrosion reduction	Hydrochloric acid and sulfuric acid compound corrosion reduction
ANCOR-C	Sulfate condensation at low-temperatures	45mg/cm ² /hr and under	-
ANCOR-CS	Hydrochloric acid and sulfuric acid compound corrosion	30mg/cm ² /hr and under	5mg/cm/hr and under

* Advanced environmentally-friendly steel with sulphuric acid COrrOSion Resistance

■ Evaluation conditions for corrosion reduction

- Sulfuric acid: 50% sulfuric acid at 70°C
- Hydrochloric acid and sulfuric acid compound corrosion: 31% sulfuric acid and 0.4% hydrochloric acid at 80°C

Chemical Composition

Specifications	C(%)	Mn(%)	Si(%)	Cu(%)	Other
ANCOR-C	~0.1	~0.8	0.1~0.035	0.2~0.5	Other Elements Added
ANCOR-CS	~0.1	~1.7	0.1~0.035	0.2~0.5	Other Elements Added

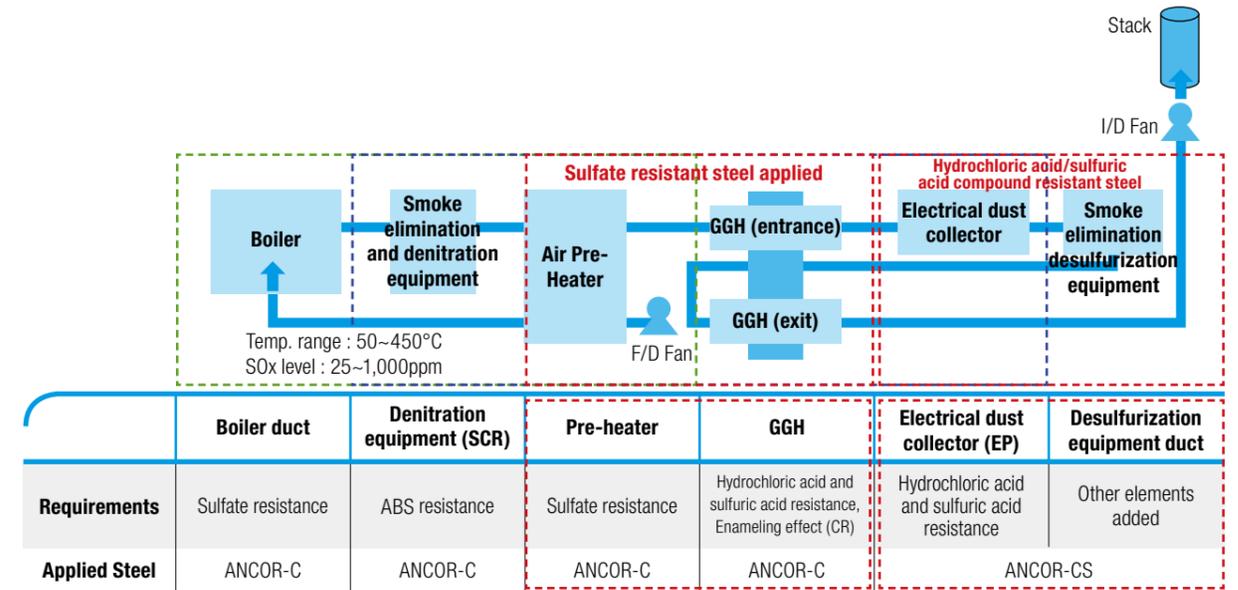
Mechanical Properties

Specifications	Yield Strength(N/mm ²)	Tensile Strength(N/mm ²)	Ductility(%)	Hardness(HrB)
ANCOR-C	245~	340~	22~	50~
ANCOR-CS	245~	340~	22~	50~

Main Uses

This steel is used in power plant's burning fossil fuel, boiler heat exchangers, and parts for desulfurization equipment.

→ Heat element and dust collecting panel usage

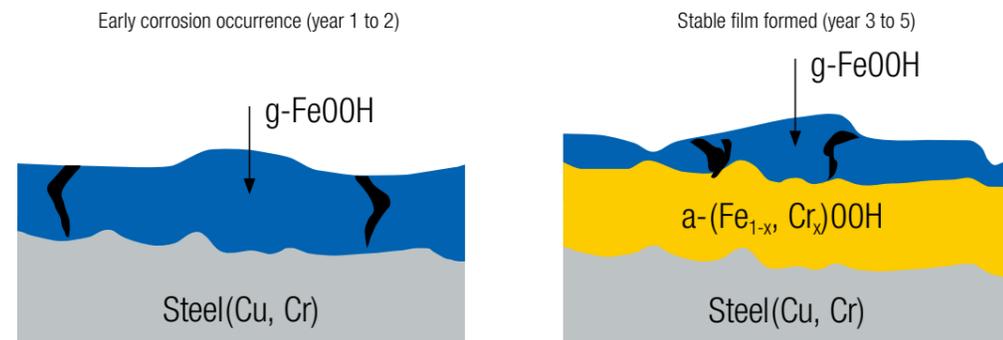


Weather-resistant Cold Rolled Steel

General Characteristics

Weather resistant steels exhibit a reduced propensity to rust during exposure to normal atmospheric environments. It is a low alloy steel that small quantities of Cu and Cr added to improve corrosion properties. Its corrosion resistance is about five times greater than regular steel. Weather resistant steel begins rusting like regular steel in the early stages of atmospheric exposure. However, this rust forms a stable surface coating which functions as a protective, passive film layer against the external environment, which in turn suppresses further rusting.

Surface Corrosion Development of Weather Resistant Steel



Surface g-FeOOH rust formed

Dissolution and precipitation easily occur, resulting low resistance corrosion. At this stage, both regular steel and weather resistant steel are similar.

Stable g-FeOOH rust formed

For weather resistant steel, a stable layer of rust with fine grain size is formed underneath the bottom of corrosion, through interaction with Cu, P, and Cr, making the oxidization harder. In regular steel, the corrosion occurs at the same rate as it does during the early stage.

Specification: KS D 3542(2013) KS-SPA-C, High Weather Resistant Rolled Steel

Chemical Composition

Specifications	C(%)	Si(%)	Mn(%)	P(%)	S(%)	Cu(%)	Cr(%)	Ni(%)
SPA-C	~0.12	0.25~0.75	~0.60	0.070~0.150	~0.035	0.25~0.55	0.30~1.25	~0.065

Mechanical Properties

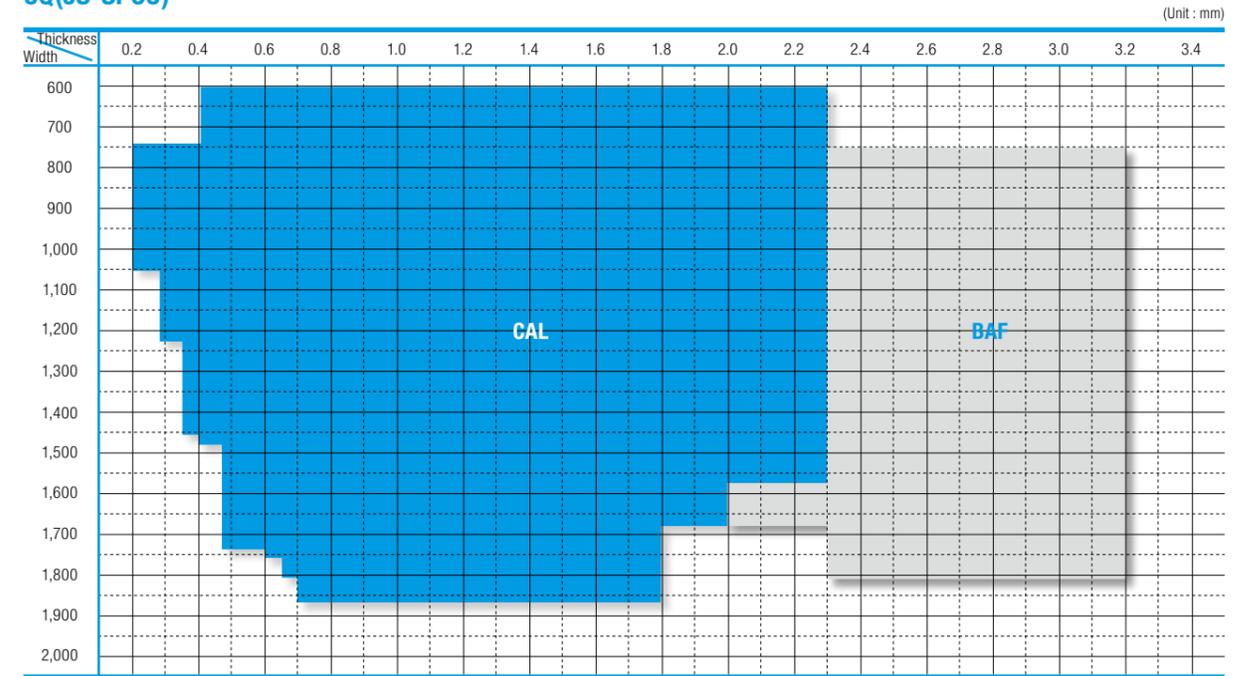
Specifications	Yield Strength(N/mm ²)	Tensile Strength(N/mm ²)	Ductility(%)
SPA-C	315~	450~	26~

Main Uses

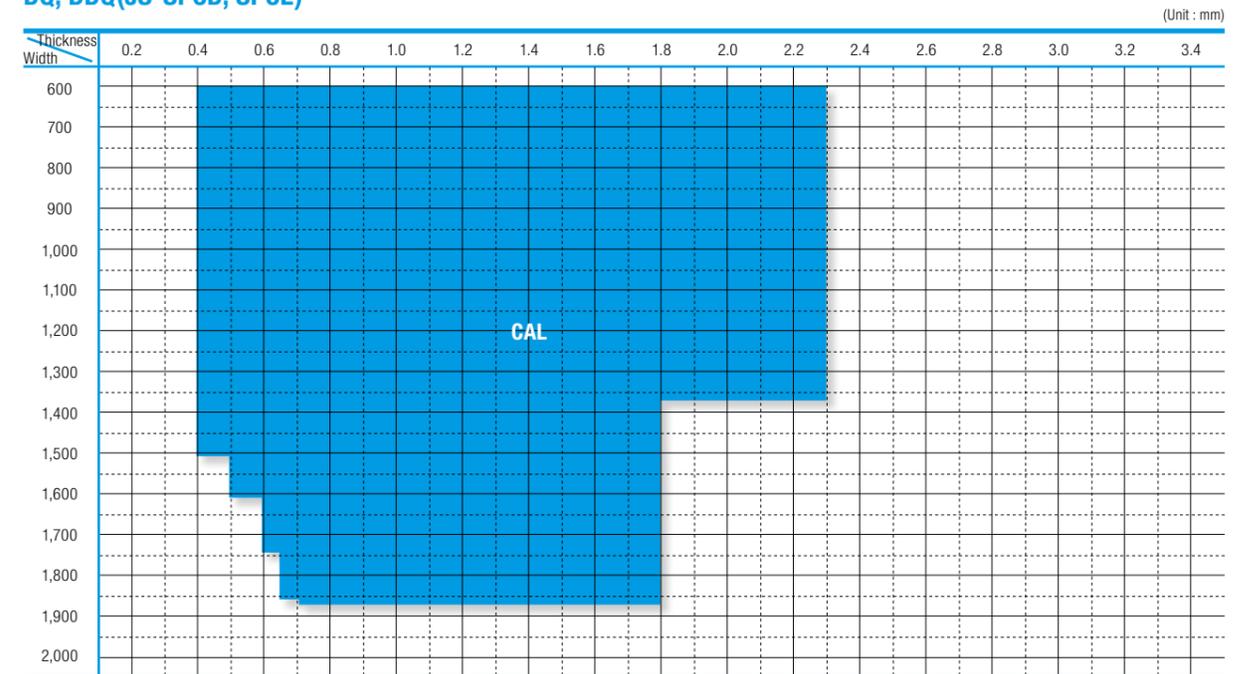
This type of steel is used for bridges, steel tubing utility poles, containers, transmission towers, steel structures, building materials, boiler pre-heaters, heat exchangers, dust collectors, and etc.

Available Dimensions

CQ(JS-SPCC)



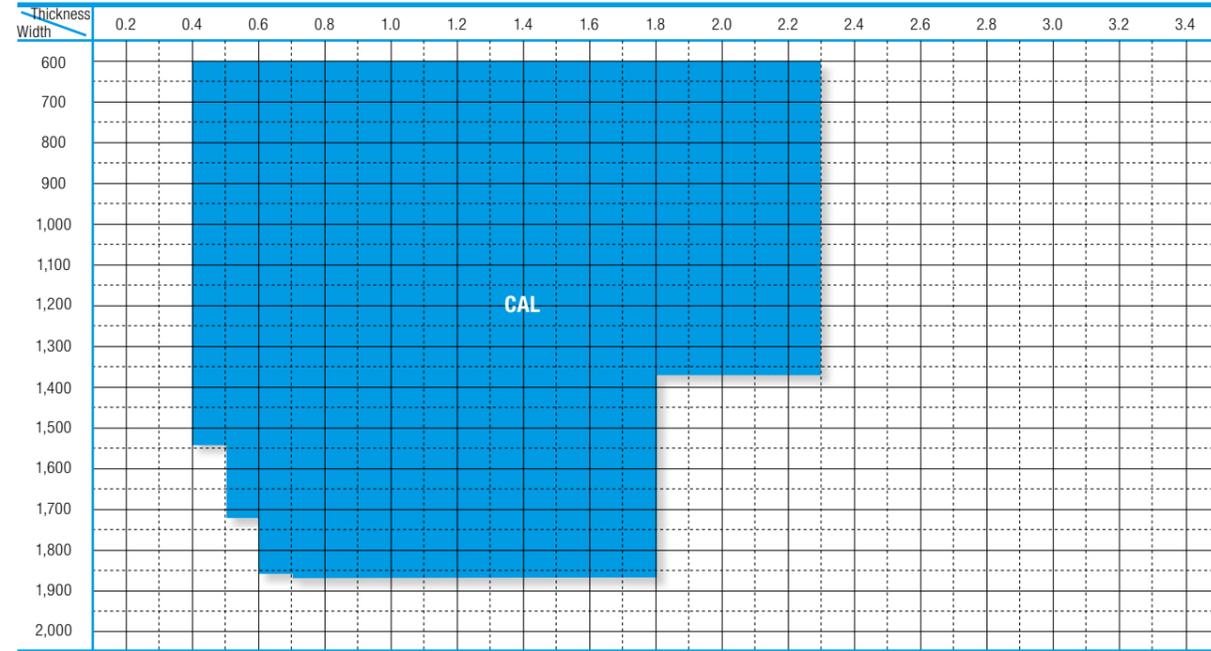
DQ, DDQ(JS-SPCD, SPCE)



Available Dimensions

EDDQ(JS-SPCG)

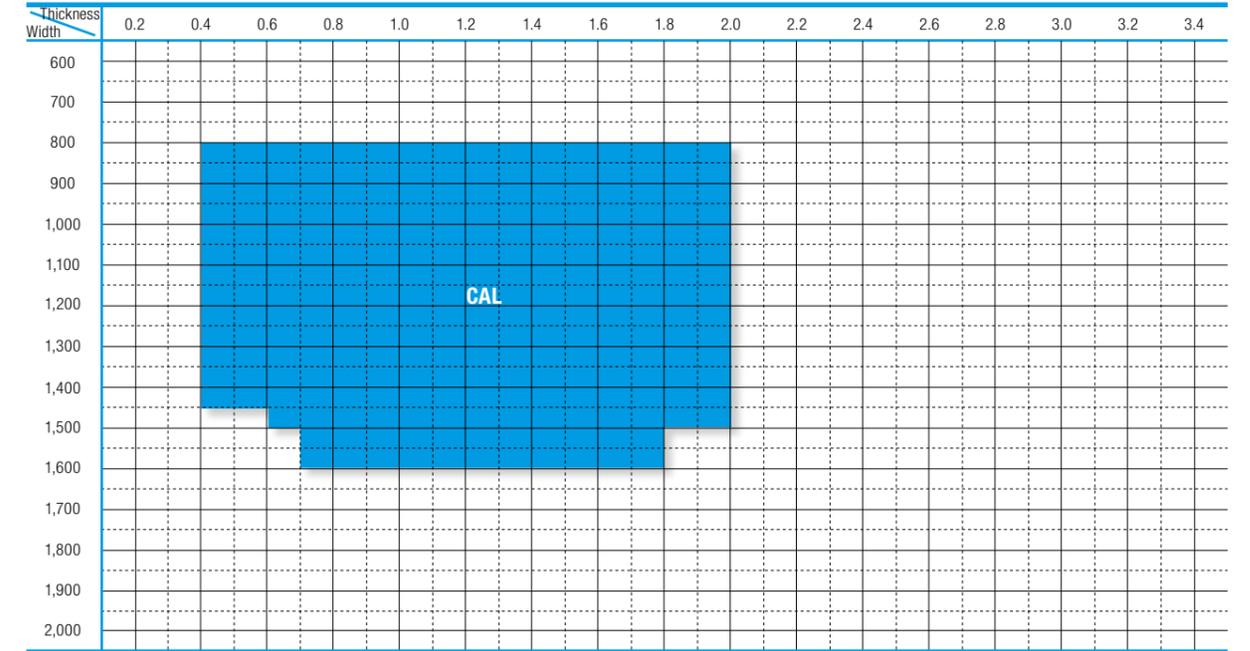
(Unit : mm)



⚠ Available sizes are subject to change. Please consult with your POSCO contact person before ordering.

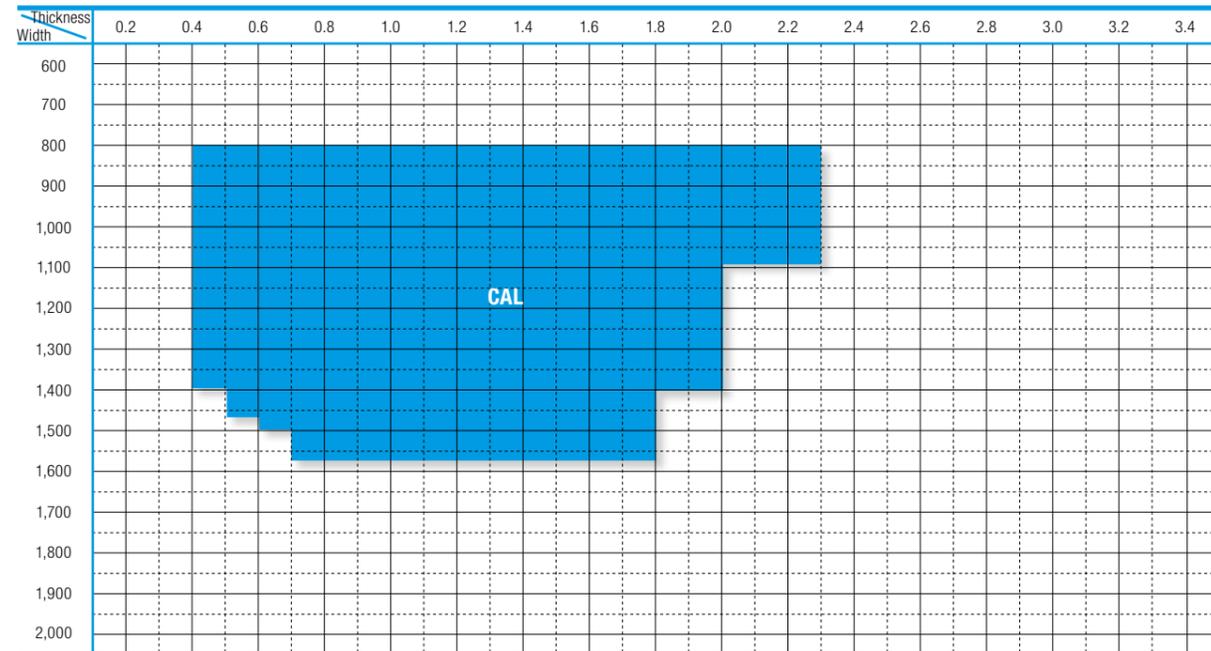
Welding Rod(CSP2-WB, CSP2-WC, CSP2-WE), Sulfate Resistant Steel(ANCOR-C,ANCOR-CS), Weather Resistant Steel(JS-SPA-C)

(Unit : mm)



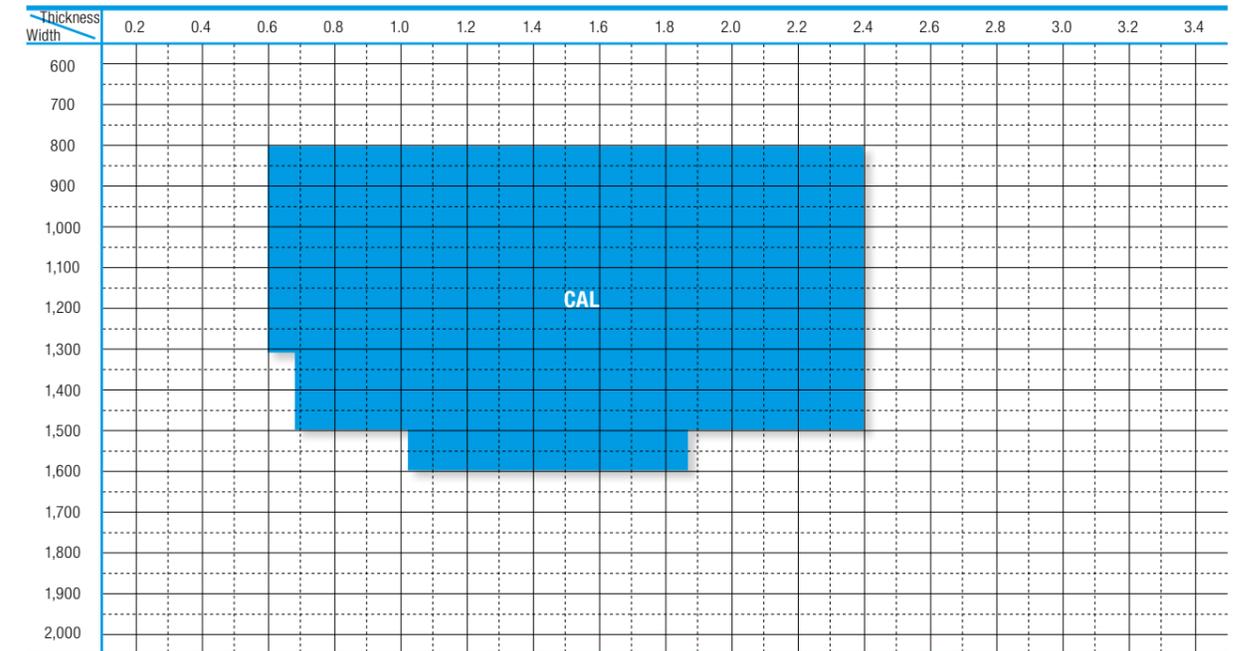
Enamel(CESP-C, POSCENA-C)

(Unit : mm)



High Strength Cold Rolled Steel

(Unit : mm)



Size Tolerance

Thickness Allowance

POSCO Standards

width(mm) thickness(mm)	250~400	400~630	630~1,000	1,000~1,250	1,250~1,600	1,600~
~0.25	±0.030	±0.030	±0.030	±0.030	-	-
0.25~0.40	±0.035	±0.035	±0.040	±0.040	-	-
0.40~0.60	±0.040	±0.040	±0.050	±0.050	±0.060	-
0.60~0.80	±0.045	±0.045	±0.060	±0.060	±0.060	±0.070
0.80~1.00	±0.050	±0.050	±0.060	±0.070	±0.080	±0.090
1.00~1.25	±0.060	±0.060	±0.070	±0.080	±0.090	±0.110
1.25~1.60	±0.080	±0.080	±0.090	±0.100	±0.110	±0.130
1.60~2.00	±0.080	±0.080	±0.110	±0.120	±0.130	±0.150
2.00~2.50	±0.080	±0.090	±0.130	±0.140	±0.150	±0.170
2.50~3.21	±0.090	±0.100	±0.150	±0.160	±0.170	±0.170

KS, JIS Standards

width(mm) thickness(mm)	~630	630~1,000	1,000~1,250	1,250~1,600	1,600~
~0.25	±0.03	±0.03	±0.03	-	-
0.25~0.40	±0.04	±0.04	±0.04	-	-
0.40~0.60	±0.05	±0.05	±0.05	±0.06	-
0.60~0.80	±0.06	±0.06	±0.06	±0.06	±0.07
0.80~1.00	±0.06	±0.06	±0.07	±0.08	±0.09
1.00~1.25	±0.07	±0.07	±0.08	±0.09	±0.11
1.25~1.60	±0.08	±0.09	±0.10	±0.11	±0.13
1.60~2.00	±0.10	±0.11	±0.12	±0.13	±0.15
2.00~2.50	±0.12	±0.13	±0.14	±0.15	±0.17
2.50~3.15	±0.14	±0.15	±0.16	±0.17	±0.20
3.15~	±0.16	±0.17	±0.19	±0.20	-

Width Allowance

POSCO, KS, JIS Standards

Cutting Method	Width(mm)	POSCO	KS, JIS Allowance(mm)
Standard Cutting	~1250	0~+5	0~+7
	1250~		0~+10
Precision Cutting	~1250	0~+2	0~+3
	1250~		0~+4

Length Allowance

POSCO, KS, JIS Standards

Length(mm) Cutting Method	~1,000	1,000~2,000	2,000~3,000	3,000~4,000	4,000~6,000
Standard Cutting	0~+10		0~+15		0~+20
Re-cutting & Precision Cutting	0~+3	0~+4	0~+6	0~+8	-

Planarization

POSCO, KS, JIS Standards

Width(mm) Types	Curvature	Edge deformation	Center deformation
~1000	12(2)	8(2)	6(2)
1000~1250	15(3)	9(2)	8(2)
1250~1600	15(4)	11(3)	8(2)
1600~	20(5)	13(4)	9(2)

- In general, numbers inside parentheses are applied to stretcher leveler processed steel.
- Curvature: bending of the entire plate. There are two axes of bending: in the rolling direction and perpendicular to the rolling direction.
- Edge deformation: Bending occurs at the edges in the width axes and the center remains flat.
- Center deformation: Bending occurs in the center and the edges remain flat.

Horizontal Bending

POSCO, KS, JIS Standards

Width(mm) Division	Steel Plates(mm)		Steel Rods
	Length ~2000	Length 2000~	
~630	4	4 per random length of 2,000	
630~	2	2 per random length of 2,000	

Surface Finishes and Oiling

Surface Finishes

Dull Finish, also called Pear-Skin Finish or Egg-Shell Texture, is a steel surface finish in which designated roughness is produced in its surface. To create these fine roughness, roll surface is grinded and treated with special abrasive blasting method. This surface finish allows lubricant to adhere to the surface more evenly, thus reducing friction during subsequent machining. Also, paint adheres better and lasts longer. Bright Finish, created by passing the steel through highly polished rollers, produces exquisite surface smoothness and a mirror-like luster. Its highly luminous surface makes such treated steel well suited for decorative use.

* Please consult with our sales representative when ordering steel products with Bright Finish.

Dull Finish, Ra (μm)				Bright Finish, Ra (μm)	
D3	D5	D7	D9	B2	B4
1.50~2.50	1.00~1.80	0.70~1.30	0.40~0.80	0.30~0.50	0.15~0.30

Oiling

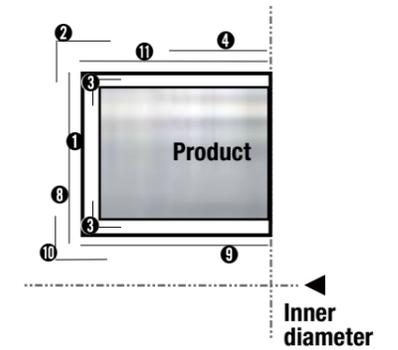
POSCO protects finished products by spraying rust-preventative oil on the steel surface to stop rust from occurring during shipment and warehousing. Upon ordering, our customers can specify the type and amount of oil applied in accordance with their machining needs. Of course, no-oiled steels are very rust-prone and require extreme care to avoid it. Also, rusting remains a likely occurrence with DOS oiled steels.

Specification	Code	Amount of oil used on surfaces(mg/m ²)	
Regular Oiling	Heavy	AH	3,000~4,500
	General	AG	1,800~3,000
	Light	AL	800~1,800
	Thin	AT	200~800
Dos	Deep	BD	50~100
	Slight	BS	25~50
	Ultra light	BU	10~25
No Oiling	XX	-	

Packaging & Marking



Name of outer pack



Name of cross-sectional pack

NO	Name	Material
①	PP VCI WRAP	VINYL
②	OUTER RING	STEEL
③	CORNER WRAP	ANTI-RUST BOARD
④	OUTER PROTECT BOARD	STEEL
⑤	HORIZONTAL BAND	STEEL
⑥	CENTER BAND	PET
⑦	VERTICAL BAND	STEEL
⑧	SIDE BOARD	PLASTIC
⑨	INNER PROTECT BOARD	PLASTIC
⑩	INNER RING	STEEL
⑪	OUTER PROTECT BOARD	ANTI-RUST BOARD

* Packing Type and materials are changeable.

Appendix

KS Standards

■ Chemical Composition

Specification	C(%)	Mn(%)	P(%)	S(%)
KS-SPCC	~0.15	~0.60	~0.050	~0.050
KS-SPCD	~0.12	~0.50	~0.040	~0.040
KS-SPCE	~0.10	~0.45	~0.030	~0.030
KS-SPCF	~0.08	~0.45	~0.030	~0.030
KS-SPCG	~0.02	~0.25	~0.020	~0.020

■ Mechanical Properties

Specification	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)							Hardness		
			0.25t~	0.25t~	0.25~0.3t	0.3~0.4t	0.4~0.6t	0.6~1.0t	1.0~1.6t	1.6~2.5t	2.5t~	HRB
KS-SPCC	-	-	-	-	-	-	-	-	-	-	-	-
KS-SPCCT	-	270~	28~	31~	34~	36~	37~	38~	39~	-	-	-
KS-SPCD	*(~240)	270~	30~	33~	36~	38~	39~	40~	41~	-	-	-
KS-SPCE	*(~220)	270~	32~	35~	38~	40~	41~	42~	43~	-	-	-
KS-SPCF	*(~210)	270~	-	-	40~	42~	43~	44~	45~	-	-	-
KS-SPCG	*(~190)	270~	-	-	42~	44~	45~	46~	-	-	-	-
KS-SPCC-1	-	-	-	-	-	-	-	-	-	85~	170~	-
KS-SPCC-2	-	-	-	-	-	-	-	-	-	74~89	135~185	-
KS-SPCC-4	-	-	-	-	-	-	-	-	-	65~80	115~150	-
KS-SPCC-8	-	-	-	-	-	-	-	-	-	50~71	95~130	-

Remarks) 1. Target Temper Grade: (S) Standard, (A) As-annealed. *Rigid steel products (8, 4, 2, and 1) are excluded.
 2. SPCF: Non-aging deep drawing quality, SPCG: Non-aging extra deep drawing quality. We guarantee deep drawing qualities for six months from date of purchase.
 3. *The yield strength value in parentheses is for reference only. The delivered yield performance will be subject to agreement between the customer and manufacturer.

JIS Standards

■ Chemical Composition

Specification	C(%)	Mn(%)	P(%)	S(%)
JS-SPCC	~0.15	~0.60	~0.100	~0.035
JS-SPCD	~0.10	~0.50	~0.040	~0.035
JS-SPCE	~0.08	~0.45	~0.030	~0.030
JS-SPCF	~0.06	~0.45	~0.030	~0.030
JS-SPCG	~0.02	~0.25	~0.020	~0.020

■ Mechanical Properties

Specification	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)							Hardness		
			0.25t~	0.25t~	0.25~0.3t	0.3~0.4t	0.4~0.6t	0.6~1.0t	1.0~1.6t	1.6~2.5t	2.5t~	HRB
JS-SPCC	-	-	-	-	-	-	-	-	-	-	-	-
JS-SPCCT	-	270~	28~	31~	34~	36~	37~	38~	39~	-	-	-
JS-SPCD	*(~240)	270~	30~	33~	36~	38~	39~	40~	41~	-	-	-
JS-SPCE	*(~220)	270~	32~	35~	38~	40~	41~	42~	43~	-	-	-
JS-SPCF	*(~210)	270~	-	-	40~	42~	43~	44~	45~	-	-	-
JS-SPCG	*(~190)	270~	-	-	42~	44~	45~	46~	-	-	-	-
JS-SPCC-1	-	(550~)	-	-	-	-	-	-	-	85~	170~	-
JS-SPCC-2	-	(440~590)	-	-	-	-	-	-	-	74~89	135~185	-
JS-SPCC-4	-	(370~490)	(10~)							65~80	115~150	-
JS-SPCC-8	-	(290~410)	(25~)							50~71	95~130	-

Remarks) The numbers marked with an asterisk in the Yield Strength, Tensile Strength, and Ductility sections are for reference only. The actual delivered performance will be subject to agreement between the customer and manufacturer.

Appendix

ASTM Standards

■ Chemical Composition

Specification	C(%)	Mn(%)	SI(%)	P(%)	S(%)	AL(%)	CU(%)	NI(%)	CR(%)	MO(%)	V(%)	NB(%)	TI(%)	N(%)	B(%)
A1008 CSA	~0.10	~0.60	-	~0.030	~0.035	-	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 CSB	0.02~0.15	~0.60	-	~0.030	~0.035	-	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 CSC	~0.08	~0.60	-	~0.100	~0.035	-	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 DSA	~0.08	~0.50	-	~0.020	~0.030	0.01~	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 DSB	0.02~0.08	~0.50	-	~0.020	~0.030	0.02~	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 DDS	~0.06	~0.50	-	~0.020	~0.025	0.01~	~0.20	~0.20	~0.15	~0.06	~0.008	~0.008	~0.025	-	-
A1008 EDDS	~0.02	~0.40	-	~0.020	~0.020	0.01~	~0.10	~0.10	~0.15	~0.03	~0.10	~0.10	~0.15	-	-

■ Mechanical Properties

Specification	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Ductility(%)	Hardness(HRB)	r _m value	n value
A1008 CSA	140~275	-	30~	~70	-	-
A1008 CSB	140~275	-	30~	~70	-	-
A1008 CSC	140~275	-	30~	~70	-	-
A1008 DSA	150~240	-	30~	~60	1.3~1.7	0.17~0.22
A1008 DSB	150~240	-	30~	~60	1.3~1.7	0.17~0.22
A1008 DDS	115~200	-	30~	~55	1.4~1.8	0.20~0.25
A1008 EDDS	105~170	-	30~	~45	1.7~2.1	0.23~0.27

EN Standards

■ Chemical Composition

Specification	C(%)	Mn(%)	SI(%)	P(%)	S(%)	CU(%)	NI(%)	CR(%)	MO(%)	V(%)	NB(%)	TI(%)
DC01	~0.12	~0.60	-	~0.045	~0.045	-	-	-	-	-	-	-
DC03	~0.10	~0.45	-	~0.035	~0.035	-	-	-	-	-	-	-
DC04	~0.08	~0.40	-	~0.030	~0.030	-	-	-	-	-	-	-
DC05	~0.06	~0.35	-	~0.025	~0.025	-	-	-	-	-	-	-
DC06	~0.02	~0.25	-	~0.020	~0.020	-	-	-	-	-	-	~0.3
DC07	~0.01	~0.20	-	~0.020	~0.020	-	-	-	-	-	-	~0.2

■ Mechanical Properties

Specification	Yield Strength(N/mm ²)			Tensile Strength (N/mm ²)	Ductility(%)			Anisotropy		R90	N
	0.23~0.501	0.501~0.701	0.701~3.01		0.23~0.501	0.501~0.701	0.701~3.01	Sampling Lot/Length/Width/Orientation of Test Sample	Number of Test Samples		
DC01	140~320	140~300	140~280	270~410	24~	26~	28~	-	-	-	-
	0.500~0.501	0.501~0.701	0.701~3.01	-	0.500~0.501	0.501~0.701	0.701~3.01	05~2.01		2.01~3.21	
DC03	140~280	140~260	140~240	270~370	30~	32~	34~	51/T/C/C	05	1.3~	1.1~
DC04	140~250	140~230	140~210	270~350	34~	36~	38~	51/T/C/C	05	1.6~	1.4~
DC05	140~220	140~200	140~180	270~330	36~	38~	40~	51/T/C/C	05	1.9~	1.7~
DC06	120~210	120~190	120~170	270~330	37~	39~	41~	51/T/C/C	05	2.1~	1.9~
DC07	100~190	100~170	100~150	250~310	40~	42~	44~	51/T/C/C	05	2.5~	2.3~

COLD ROLLED STEEL

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GALVANIZED STEEL





Hot-dip galvanized steel products are now being used in a wide range of automobiles, electrical equipments and other industrial machinery as well as in civil engineering and construction. Since hot-dip galvanized steel products are characterized in excellent formability, weldability, paintability as well as anticorrosion, they can meet the high quality requirements of the customers.

GALVANIZED STEEL

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Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

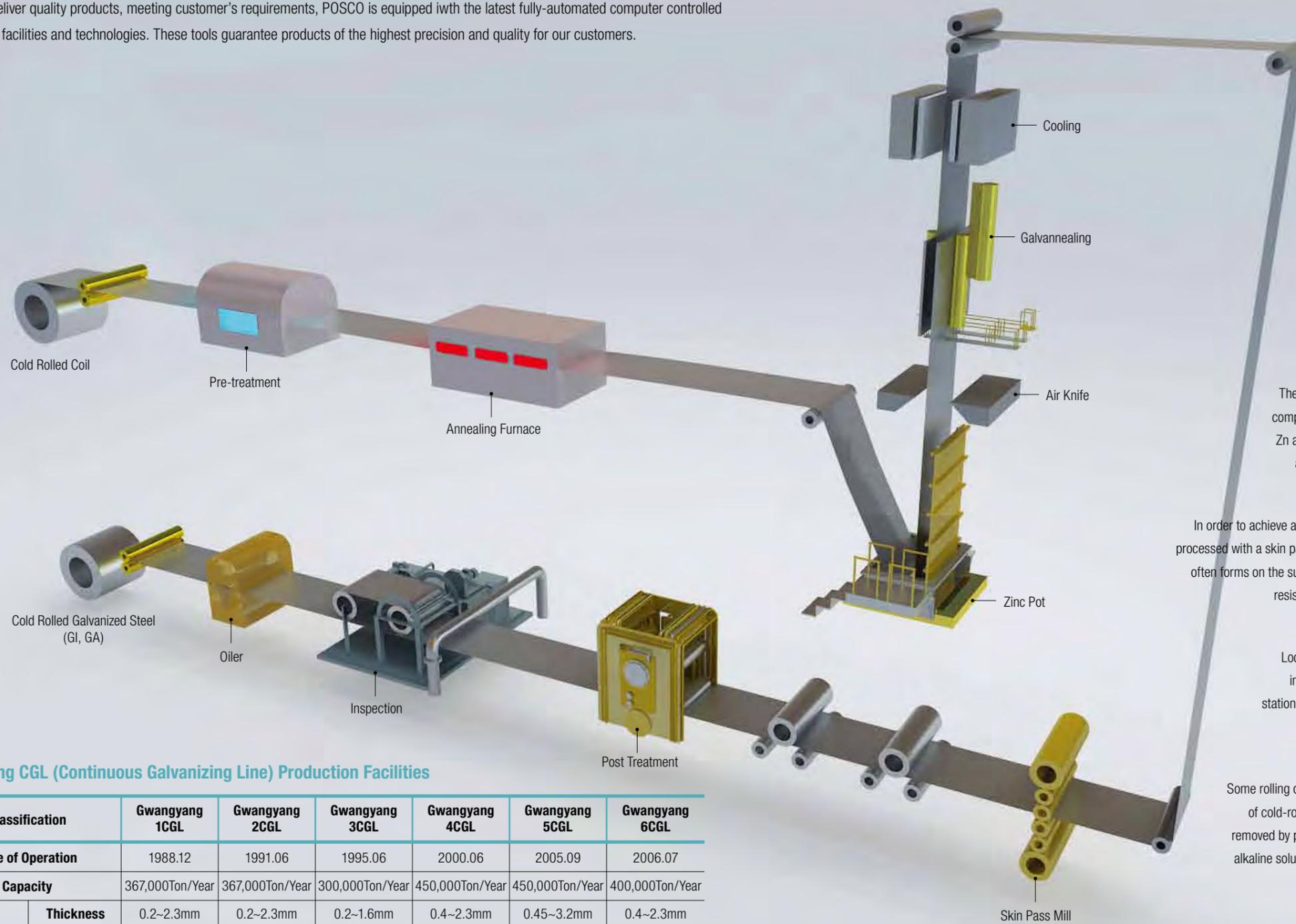
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.



Manufacturing Processes & Equipment

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Galvannealing

The surface of steel sheet can be coated with a zinc compound prior to reheating in an annealing process. Zn atoms diffuse into the Fe to create a Zn-Fe series alloy. This process is referred to as Galvannealing.



SPM & Chemical Treatment

In order to achieve a flat surface and elegant finish, the steel sheet is processed with a skin pass mill. In order to prevent the white rust, which often forms on the surface of activated zinc, and to improve corrosion resistance, the surface is coated with a Cr-free resin.



Inspection & Coiling

Located at the line's exit section are a side trimmer, inspection table and oil coating equipment. At this station all products are inspected and judged relative to material specifications required by the client.



Electrolytic Cleaning

Some rolling oil and other contaminants remain on the surface of cold-rolled steel sheets following processing. These are removed by passing the electrically charged sheet through an alkaline solution which induces an electro-chemical reaction.



Annealing

The material properties of pre-treated steel sheet can be altered and improved through re-crystallization during the annealing process.



Hot-Dip Galvanizing

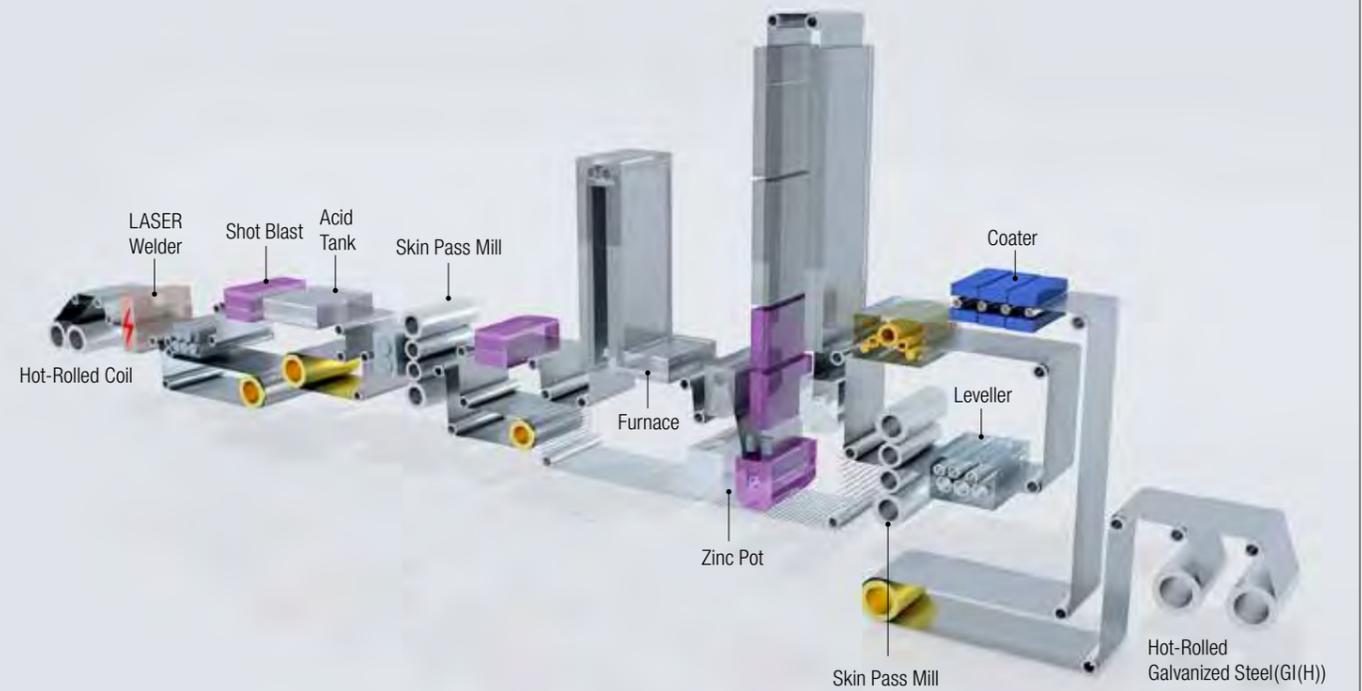
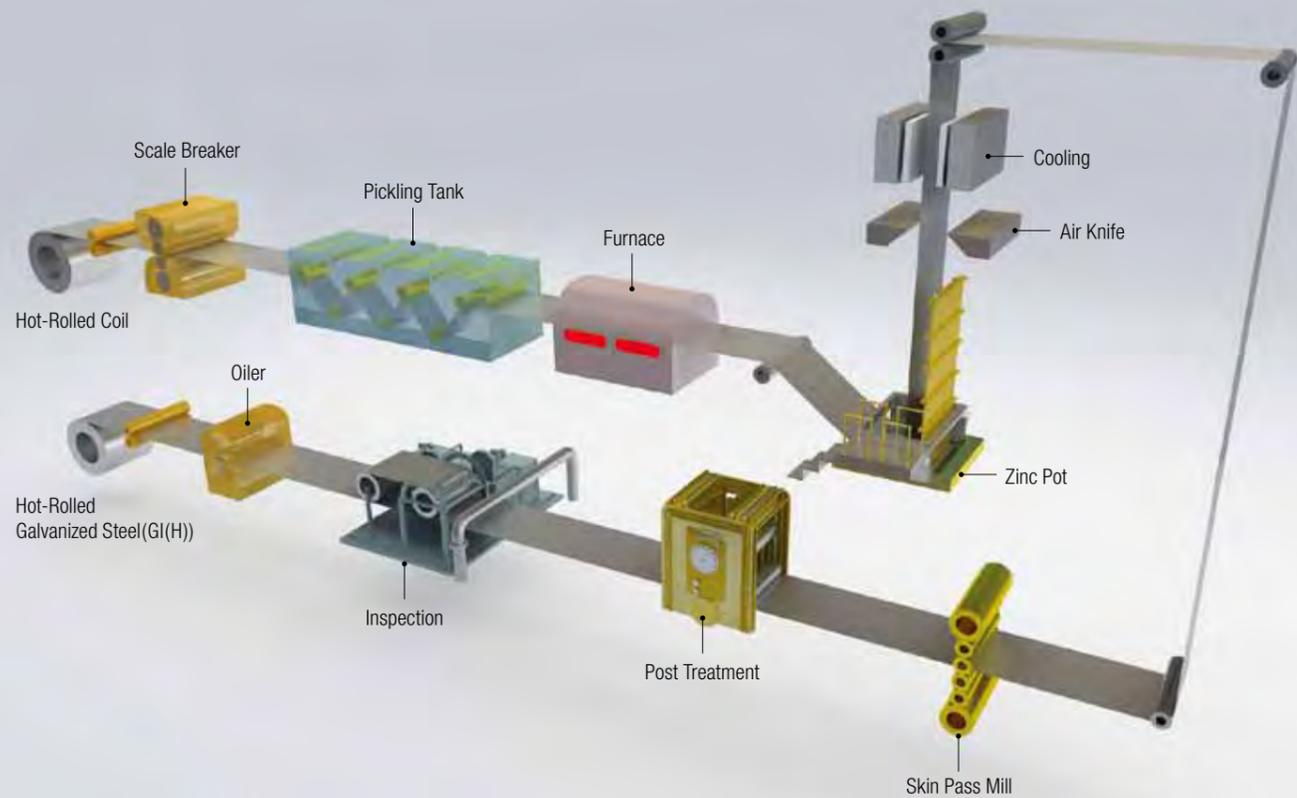
After passing through the annealing furnace, steel sheet is dipped into a zinc pot where molten Zn is coated onto the surface. The desired coating weight is achieved by removing excess zinc before solidification with high pressure air from an air knife.



Gwangyang CGL (Continuous Galvanizing Line) Production Facilities

Classification	Gwangyang 1CGL	Gwangyang 2CGL	Gwangyang 3CGL	Gwangyang 4CGL	Gwangyang 5CGL	Gwangyang 6CGL
Date of Operation	1988.12	1991.06	1995.06	2000.06	2005.09	2006.07
Capacity	367,000Ton/Year	367,000Ton/Year	300,000Ton/Year	450,000Ton/Year	450,000Ton/Year	400,000Ton/Year
Available Size	Thickness	0.2~2.3mm	0.2~2.3mm	0.2~1.6mm	0.4~2.3mm	0.4~3.2mm
	Width	720~1,860mm	720~1,570mm	600~1,270mm	900~1,860mm	800~1,860mm
	Weight	5~40ton	5~35ton	5~33ton	5~35ton	5~35ton
Coating Weight	60~300g/m ²	60~300g/m ²	60~300g/m ²	60~300g/m ²	60~300g/m ²	60~300g/m ²
Product Grade	Commercial, (light) Drawing, Deep Drawing, Extra-deep Drawing, Structural, High-strength Steel					
Chemical Treatment	Oiling, Cr-free, Phosphate, Metal Chlorides					
Type of Furnace	Vertical					
Inside Diameter	508 / 610mm					

Manufacturing Processes & Equipment



Gwangyang HCGL (High-speed Continuous Galvanizing Line) Production Facilities

Classification		Gwangyang HCGL
Date of Operation		2005.08
Capacity		616,000Ton/Year
Available Size	Thickness	1.4~4.5mm
	Width	720~1570mm
Coating Weight		~725(g/m ²)
Product Grade		Commercial, Structural
Chemical Treatment		Chromate, Cr-free, Oiling

Pohang CGL (Continuous Galvanizing Line) Production Facilities

Classification		Pohang #1CGL
Date of Operation		2012.04
Capacity		750,000Ton/Year
Available Size	Thickness	1.0~4.0mm
	Width	800~1670mm
Coating Weight		~725(g/m ²)
Product Grade		Commercial, Structural
Chemical Treatment		Chromate, Cr-free, Oiling

Hot-dip galvanized steel product properties

The product can be used in various applications such as construction materials, pipe, electronics, furniture, materials with molten zinc to the hot-rolled or cold-rolled steel products.

Product	Coating Layer Structure	Characteristics	Appearance
GI(H)		Hot-rolled steel plate is used as base metal for this product. While molten zinc solidifies on the surface of the steel sheet, normal zinc crystallization is suppressed creating fine crystals.	
GI		Cold-rolled steel plate is used as base metal for this product. While molten zinc solidifies on the surface of the steel sheet, normal zinc crystallization is suppressed creating fine crystals. The surface is flat and has a fine appearance after painting. Paintability is superior to ordinary products.	
GA		Through a thermal diffusion process, steel sheet and zinc react to produce an alloy layer. The weldability and the paintability are superior to traditional galvanized steel sheets. Fe in the alloy coating enhances corrosion resistance.	

Galvanized Steel Post Treatment

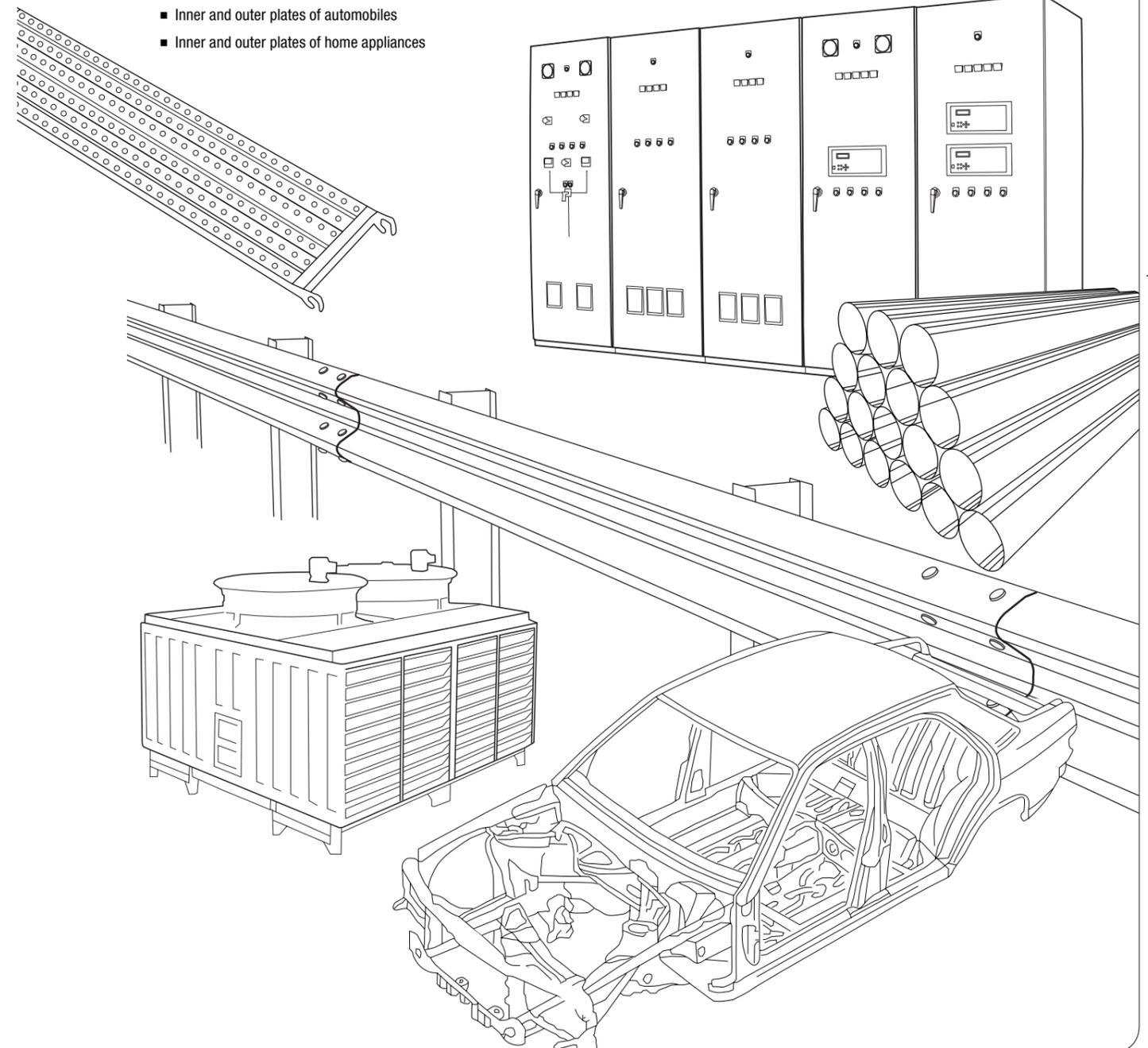
Product	Post Treatment Code	Full Name	Quality Properties	Remarks
GI(H)	NH	Non Chromate HGI	Corrosion Resistance	Gwangyang
	NP	Non Chromate Pohang	Corrosion Resistance	Pohang
	CL	Chromate-Light	Corrosion Resistance	Gwangyang, Pohang
GI	NC	Non Chromate	Corrosion Resistance	Gwangyang
	NE	Non Chromate Excellent	High Corrosion Resistance	Gwangyang
	NW	Non Chromate Weldability	Corrosion Resistance, Weldability	Gwangyang
GA	LP	Lubrication Phosphate	Lubrication	Gwangyang
	LM	Lubrication Metallic	Lubrication, Weldability	Gwangyang

Galvanized Steel(GI)

- Metal furniture
- Inner and outer plates of home appliances
- Material for painted steel
- Inner and outer plates of automobiles
- Construction materials
- Pipe

Galvannealed Steel(GA)

- Inner and outer plates of automobiles
- Inner and outer plates of home appliances



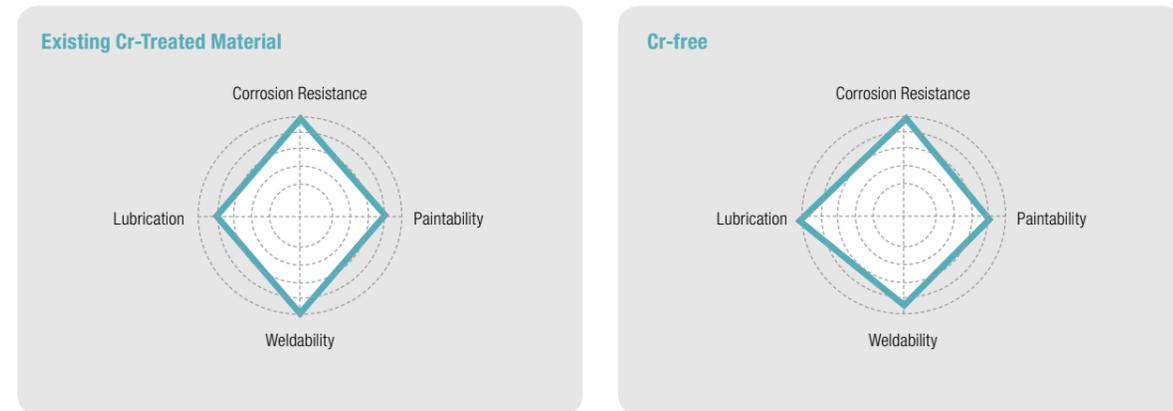
Properties

Composition, Mechanical Properties, Coating Weight

Composition / Mechanical properties : The products are composed of various metal components and have various mechanical properties in accordance with the design standards depending on various sizes and uses, such as CQ, DQ, DDQ, structural steel and high tensile steel, and so forth. (No effects on components/mechanical properties from the post-treatment)

Coating Weight : The products are manufactured with the coating weight ordered by the relevant client company and there is no change in the coating weight after a post-treatment.

Corrosion Resistance, Paintability, Weldability, Lubrication

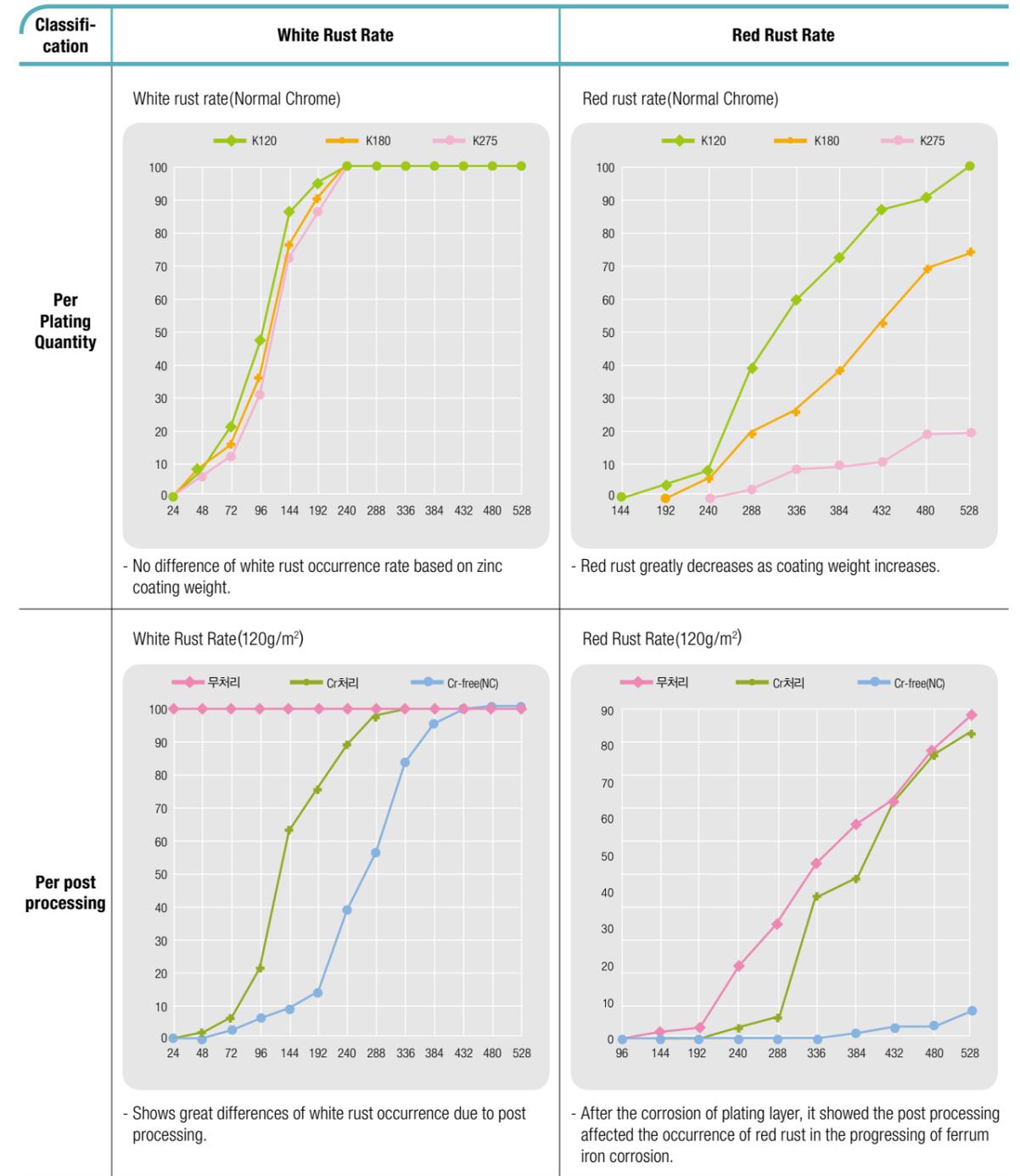


Formability

Hot-dip galvanized steel, produced through continuous galvanized processing, is superior in zinc adhesion and the galvanized layer will almost never exfoliate through the drawing process, due to the commonly fragile iron-zinc alloy layer being super thin. The hot-dip galvanized steel that is produced by vertical furnace, compared to the horizontal furnace-produced product, is superior in its formability, equally to cold-rolled steel. This allows many applications.

Comparing to galvanized steel, galvanized steel sheet has high hardness and somehow low ductility. This can cause powdering in the galvanized layer during the severe drawing processes. This effect tends to heighten as coating weight increases and it can also be affected by the oiling and press condition. Fortunately, the adaptation of new technology, such as a high frequency induction heater, to the relevant manufacturing processes and the development of some post-treatment technology for lubrication in order to improve the workability, it became available to apply the galvanized steel sheets even for some deep drawing parts more extensively.

Corrosion Resistance (Rust Occurrence Rate by Each Coating Weight and Post-Treatment)



Properties

Paintability

The corrosion resistance of painted hot-dip galvanized steel is greatly affected by the pre-coating process. Anti-corrosion oil is commonly applied to untreated steel, so thorough degreasing is essential for reliable adhesion of surface coatings such as phosphate, chromate or Cr-free pre-treatment layers. In addition, a high quality phosphate film can also be attained on galvanized steel in the form of iron-zinc alloy, which delivers exceptional coating adherence and corrosion resistance compared to commercial quality hot-dip galvanized steel.

Adherence (Cross-Cut Peeling Test)

Classification	Solvent Coating	Electrodeposit Coating	Powder Coating
Adherence			
Heat Cycle			

Salt Spray Test (X Scratch Peeling Test)

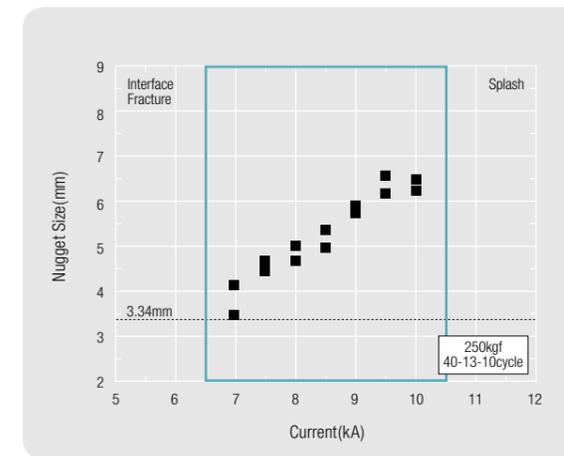
Classification	Bare GI (48hrs)	Solvent Coating (240hrs)	Electrodeposit Coating (360hrs)	Powder Coating (960hrs)
Before Peeling-off				
After Peeling-off				

Weldability

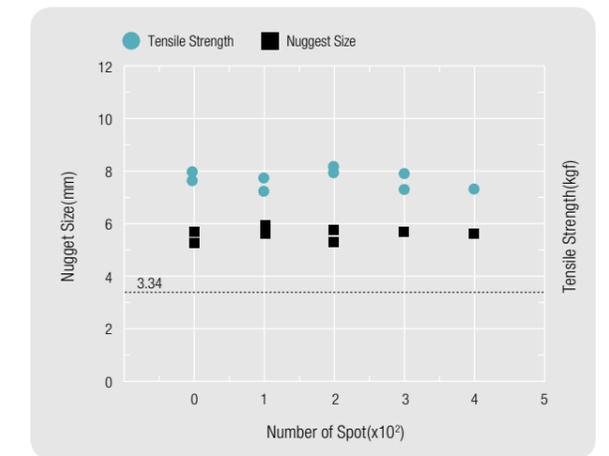
Galvanized Steel (GI)

- The zinc-coated layer has an electrical conductivity greater than that of iron and the amount of generated heat is somewhat decreased by low electrical resistance at the attached area.
- Because the melting point of zinc is lower than that of iron, continuous weldability is impaired by the attachment of zinc at the electrode.
- Because of the ductility of the zinc-coated layer, electrical density is lowered by the large sheet's contact area when compared with the electrode's pressing force.

Optimum Welding Current Range



Heating Pressure/Welding Current : 250kgf/8.5kA



Cr-free Product

Methods for improving weldability

Spot Welding	Seam Welding
<ul style="list-style-type: none"> • Raise welding current to 10~30% • Increase the flow-time of the current to 10%. • Slightly increase electrode pressure. • Use conical shaped Cr-Cu alloy electrode. • Serve the electrode frequently and cool it sufficiently with water. 	<ul style="list-style-type: none"> • Set the welding current higher. • Reduce internal defects and bubbles by increasing pressure. • Reduce the welding area while increasing on/off time ratio by alternating currents (adopting intermittent current). • Cool the electrode sufficiently with water.

Arc-Welding

In case of a shielded metal arc welding, it is appropriate to use a welding electrode covered with some surface coating materials having high salinity as a welding electrode with which a good quality of metal can be obtained. KSD7004 in E4303(lime titanium type), E4313(high titanium oxide), E4316(low hydrogen type) are favored.

Solderability

The soldering of galvanized sheet is made easier by using a suitable solvent without the need to remove the film by sandpaper. Chromated galvanized sheet is particularly excellent for soldering. Non-corrosive zinc chloride (15~20%), ammonium chloride (3.3~5%), or a mixture of both can be used as good solvents. After using solvent, it is necessary to wash the sheet sufficiently and dry it.

Galvannealed Steel Sheet (GA)

Resistance Welding

Welding galvanized steel is more difficult than welding cold rolled steel because it has lower electric resistance, a lower melting point, and wider contact area under electrode pressure. Galvannealed steel sheet, coated with a Fe-Zn alloy, has a higher melting point and greater hardness than pure zinc coated steel; thus weldability is enhanced.

Shield Metal Arc Welding

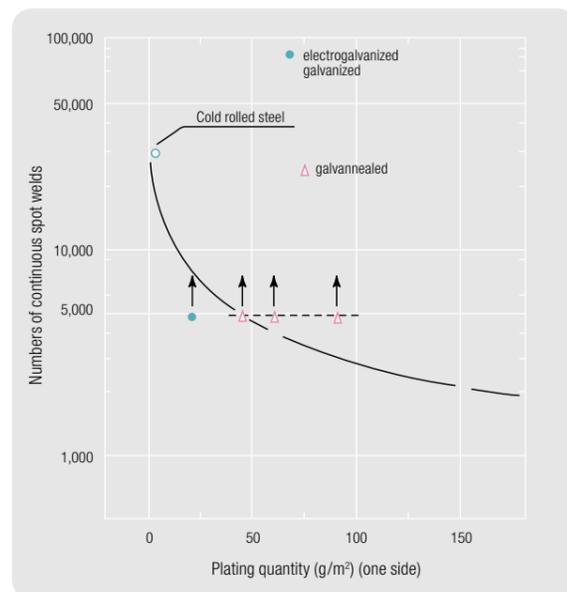
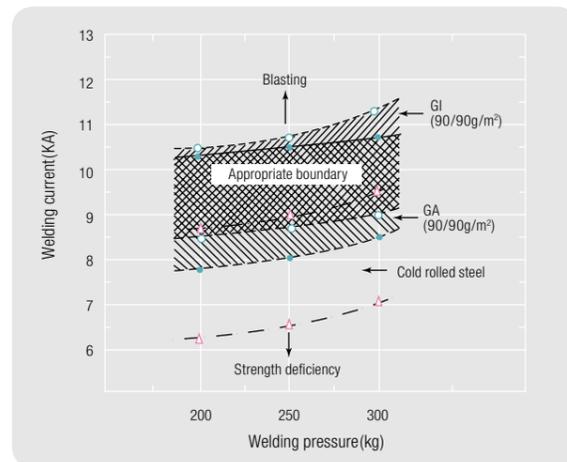
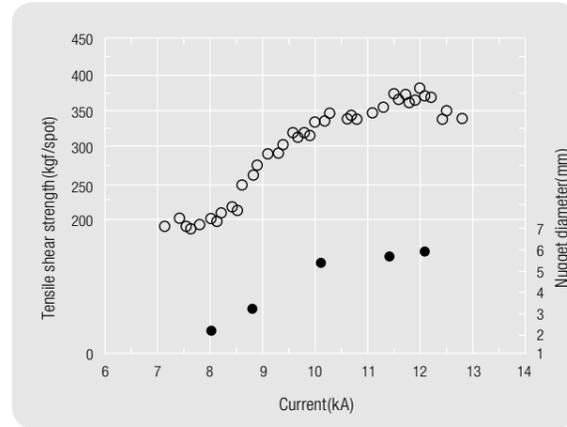
Has similar fine weldability to cold-rolled sheets

The illustration on the right shows the appropriate welding condition of galvanized plating steel sheet. The welding current boundary of galvannealed steel sheet is better than cold-rolled steel sheet.

- ※ Thickness : 0.8mm
- Electrode : 5.0mm ϕ (Cylinder-type with ends cut)
- Time : 10seconds

If the galvannealed steel sheet is continuously spot-welded, zinc covers electrode and deteriorates the weldability. This tendency goes up as the zinc amount increases. It is possible to continuously weld electrogalvanized steel sheets, which have low amount plating, more than 5,000 times. However the coating weight means higher electrode conditioning is required. It is possible to weld 5,000 times continuously with galvannealed steel sheet.

Change of strength of welded part and nugget diameter in accordance with welding current



Using Cold-Rolled Steel Plate

Standards Classification	POSCO	KS D 3506	JIS G3302	ASTM		EN
				89	95	
General Use	CGCC	SGCC	SGCC	A526	A653-CQ	DX51D
Lock Forming	CGCF	SGCD1	SGCD1	A527	A653-LFQ	-
Drawing	CGCD	SGCD2	SGCD2	A578	A653-DQ	DX52D
Deep Drawing	CGCP	SGCD3	SGCD3	-	-	DX53D
Non-aging (stabilized) deep drawing	CGCN	SGCD3N	SGCD3N	A642	A653-DQSK	DX54D
Non-aging extra deep drawing	CGCE	-	-	-	-	-
Structural Quality **1)	CGC35	SGC340	SGC340	A446 Gr A ¹⁾	A653-SQ230	S220GD
	-	-	-	Gr B	A653-SQ255	S250GD
	CGC41	SGC400	SGC400	Gr C	A653-SQ275	S280GD
	CGC45	SGC440	SGC440	Gr D	A653-SQ340	S320GD
	CGC50	SGC490	SGC490	Gr F	-	S350GD
High Strength Steel	CGCHS35	-	-	-	-	-
	CGCHS40	-	-	-	-	-
	CGCHS45	-	-	-	-	-
	CGCHS50	-	-	-	-	-
CGCHS60	-	-	-	-	-	-

Remarks) 1. Size for EN Structural Quality is EN10147.
2. The tensile strength of A446 Grade A is 310MPa(N/mm²)

Using Hot-Rolled Steel Plate

Standards Classification	POSCO	KS D 3506	JIS G3302	ASTM		EN
				89	95	
Drawing	CGHD	-	-	-	-	-
General Use	CGHC	SGHC	SGHC	A526-H	A653-CQ	EN-DX51DH
Lock Forming	-	-	-	A527-H	A653-LFQ	-
Structural Quality **1)	CGH35	SGH340	SGH340	-	-	EN-S250GDH
	CGH41	SGH400	SGH400	-	A653-SQ275	EN-S280GDH
	CGH45	SGH440	SGH440	A446-DH	A653-SQ341	EN-S320GDH
	CGH50	SGH490	SGH490	A446-FH	A653-SQ343	EN-S350GDH
	CGH55	SGH540	SGH540	A446-EMH	-	-

Specifications

△ Coating weight, thickness, width, length and shape correspond to KS standards. Please consult our quality manager for details.

KS Standard (KS 3506 95 : Hot-Dip Galvanized Steel and Coil)

■ Yield Point, Tensile Strength, Elongation and Non-aging Property

Using Cold-Rolled Steel Plate

Classification	Yield Point min N/mm ²	Tensile Strength min N/mm ²	Elongation, min., %						Test Piece
			Thickness, mm						
			0.25 ≤ t < 0.40	0.40 ≤ t < 0.60	0.60 ≤ t < 1.00	1.00 ≤ t < 1.60	1.60 ≤ t < 2.50	t ≤ 2.50	
SGCC	-	-	-	-	-	-	-	-	No.5 Rolling Direction
SGCD1	-	270	-	34	36	37	38	-	
SGCD2	-	270	-	36	38	39	40	-	
SGCD3	-	270	-	38	40	41	42	-	
SGC340	245	340	20	20	20	20	20	20	
SGC400	295	400	18	18	18	18	18	18	
SGC440	335	440	18	18	18	18	18	18	
SGC490	365	490	16	16	16	16	16	16	

- Remarks) 1. When the anti-aging characteristics is featured in the SGCD3 sheets and coils, the anti-aging characteristics is guaranteed for six (6) months after shipment from the manufacturer. Anti-aging refers to the characteristic preventing stretcher strains from occurring during manufacturing.
 2. In principle, tensile strength tests are not performed on plates with thickness under 0.25mm.
 3. SGCC products usually have a yield point more than 205N/mm² and a tensile strength more than 270N/mm².

Using Hot-Rolled Steel Plate

Classification	Yield Point (min., N/mm ²)	Tensile Strength (min., N/mm ²)	Elongation, min., %	Test Piece
SGHC	-	-	-	No.5 Rolling Direction
SGH340	245	340	20	
SGH400	295	400	18	
SGH440	335	440	18	
SGH490	365	490	16	
SGH540	400	540	-	

Remarks) SGHC products usually have a yield point more than 205N/mm² and a tensile strength more than 270N/mm².

■ Coating Weight

Minimum Coating Weight (both-sided coating)

Coating Weight Code	Average Value of Double-sided, Triple Spots Method	Average Value of Double-sided, Single Spot Method	KS D 3506	JIS G 3302	POSCO
60	60	51	(Z06), F06	(Z06), F06	K060, S060
80	80	68	Z08, F08	Z08, F08	K080, S080
100	100	85	Z10, F10	Z10, F10	K100, S100
120	120	102	Z12, F12	Z12, F12	K120, S120
180	180	153	Z18, (F18)	Z18, (F18)	K180
200	200	170	Z20	Z20	K200
220	220	187	Z22	Z22	K220
250	250	213	Z25	Z25	K250
275	275	234	Z27	Z27	K275
350	350	298	Z35	Z35	K350
450	450	383	Z45	Z45	K450
600	600	510	Z60	Z60	K600

- Remarks) 1. For non-alloy products, "Z" is added in the front of KS and JS, "K" in front of POSCO products. For alloy products, "F" is added in front of KS and JS, and "S" in front of POSCO products.
 2. Coat weight types Z35, Z45, Z60, F10, F12 and F18 are not applied to screw type 1, 2, and 3.
 3. For both-side, triple spots coating weight, the average value of the measurement of 3 test pieces is applied.
 4. For one-side, single spot coating weight, the minimum value of the measurement of 3 test pieces is applied.
 5. Separate consultation is available for the maximum coating weight on both sides.

■ Thickness Tolerances

Using Cold-Rolled Steel Plate

(Unit : mm)

Thickness	Width	w < 630	630 ≤ w < 1,000	1,000 ≤ w < 1,250	1,250 ≤ w < 1,600	w ≤ 1,600
		t < 0.25	±0.04	±0.04	±0.04	-
0.25 ≤ t < 0.40	±0.05	±0.05	±0.05	±0.06	-	
0.40 ≤ t < 0.60	±0.06	±0.06	±0.06	±0.07	±0.08	
0.60 ≤ t < 0.80	±0.07	±0.07	±0.07	±0.07	±0.08	
0.80 ≤ t < 1.00	±0.07	±0.07	±0.08	±0.09	±0.10	
1.00 ≤ t < 1.25	±0.08	±0.08	±0.09	±0.10	±0.12	
1.25 ≤ t < 1.60	±0.09	±0.10	±0.11	±0.12	±0.14	
1.60 ≤ t < 2.00	±0.11	±0.12	±0.13	±0.14	±0.16	
2.00 ≤ t < 2.50	±0.13	±0.14	±0.15	±0.16	±0.18	
2.50 ≤ t < 3.15	±0.15	±0.16	±0.17	±0.18	±0.21	
t ≤ 3.15	±0.17	±0.20	±0.20	±0.21	-	

Using Hot-Rolled Steel Plate for Commercial Quality

(Unit : mm)

Thickness	Width	w < 1,200	1,200 ≤ w < 1,500	1,500 ≤ w < 1,800	1,800 ≤ w < 2,300
		t < 0.25	±0.16	±0.17	±0.18
1.20 ≤ t < 1.60	±0.17	±0.18	±0.19	±0.22*	
1.60 ≤ t < 2.00	±0.18	±0.20	±0.22	±0.26*	
2.00 ≤ t < 2.50	±0.20	±0.22	±0.25	±0.27*	
2.50 ≤ t < 4.00	±0.22	±0.24	±0.27	±0.28*	
4.00 ≤ t < 5.00	±0.25	±0.27	-	-	
5.00 ≤ t < 6.00	±0.27	±0.27	-	-	
6.00 < t	±0.30	±0.31	-	-	

Remarks) *It is applied for a product with less than 2,000mm of the width.

Using Hot-Rolled Steel Plate for Structural Quality

(Unit : mm)

Thickness	Width	w ≤ 1,600	1,600 ≤ w < 2,000
		1.20 ≤ t < 1.60	±0.19
1.60 ≤ t < 2.00	±0.20	0.24	
2.00 ≤ t < 2.50	±0.21	0.26	
2.50 ≤ t < 3.15	±0.23	0.30	
3.15 ≤ t < 4.00	±0.25	0.35	
4.00 ≤ t < 5.00	±0.46	-	
5.00 ≤ t < 6.00	±0.51	-	

Specifications

■ Thickness of Upper Plating Layer

(Unit : mm)

Signs Marking the Coating Weights (Non-Alloyed)	Z06	Z08	Z10	Z12	Z18	Z20	Z22	Z25	Z27
Coating Thickness	0.013	0.017	0.021	0.026	0.034	0.040	0.043	0.049	0.054
Signs Marking the Coating Weights (Non-Alloyed)	Z35	Z45	Z60	F04	F06	F08	F10	F12	F18
Coating Thickness	0.064	0.080	0.102	0.008	0.013	0.017	0.021	0.026	0.034

■ Width Tolerance

(Unit : mm)

width	Tolerances		
	Using hot-rolled steel plate		Using cold rolled steel plate
	Mill Edge	Slit Edge	
w < 1,500	+25	+10	+7 0
1,500 < w	0	0	+10 0

■ Length Tolerance (sheet)

(Unit : mm)

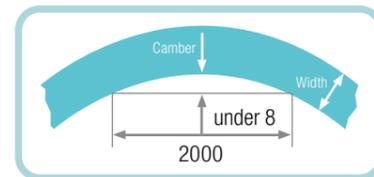
Using hot-rolled steel plate	Using cold rolled steel plate
+15 0	+15 0

■ Shape: Camber

Using Cold Rolled Steel Plate for Commercial Quality

(Unit : mm)

Length Width	Sheet		Coil
	l < 2,000	2,000 ≤ l	
w < 630	4	4 to 2,000 to any given length	
630 ≤ w	2	2 to 2,000 to any given length	



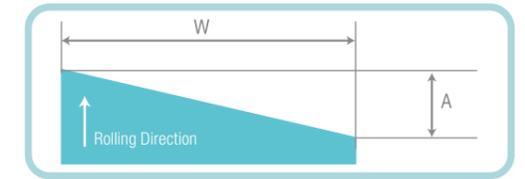
Using Hot-Rolled Steel Plate for Commercial Quality

Length Width	Sheet			Coil
	l < 2,500	2,500 ≤ l < 4,000	4,000 ≤ l	
w < 630	5	8	12	
630 ≤ w < 1,000	4	6	10	5 to 2,000 to any given length
1,000 ≤ w	3	5	8	

△ Coating weight, thickness, width, length and shape correspond to KS standards. Please consult our quality manager for details.

■ Squareness Camber

The squareness camber of galvanized plain sheets shall be indicated in $A/W \times 100(\%)$ shown in Fig. It shall not exceed 1%.



■ Flatness

Using Cold-Rolled Steel Plate

(Unit : mm)

Width	Wave	Center Wave	Edge Wave
w < 1,000	≤ 12	≤ 8	≤ 6
1,000 ≤ w < 1,250	≤ 15	≤ 9	≤ 8
1,250 ≤ w < 1,600	≤ 15	≤ 11	≤ 8
1,600 ≤ w	≤ 20	≤ 13	≤ 9

Using Hot-Rolled Steel Plate for Commercial Quality

Width Thickness	w < 1,250	1,250 ≤ w < 1,600	1,600 ≤ w < 2,000	2,000 ≤ w < 3,000	3,000 ≤ w
1.20 ≤ t < 1.60	≤ 18	≤ 20	-	-	-
1.60 ≤ t < 3.15	≤ 16	≤ 18	≤ 20	-	-
3.15 ≤ t < 4.00	-	≤ 16	-	-	-
4.00 ≤ t < 5.00	-	≤ 14	-	≤ 24	≤ 25
6.00 ≤ t	-	≤ 13	-	≤ 21	≤ 22

Remarks) Unless otherwise specified, the maximum value of steel flatness shall be 1.5 times of the above table on the steels of the minimum tensile strength spec of over 570N/mm² or the minimum yield point spec of over 430N/mm² or having equivalent chemical element or hardness.

Specifications

POSCO Specifications

Yield Point, Tensile Strength, Elongation

Using Cold-Rolled Steel Plate

POSCO Standards	Yield Point min N/mm ² (MPa)	Tensile Strength min N/mm ² (MPa)	Elongation, min., %					JS, KS Correspond Specs
			Thickness, mm					
			0.25 ≤ t < 0.40	0.40 ≤ t < 0.60	0.60 ≤ t < 1.00	1.00 ≤ t < 1.60	1.60 ≤ t ≤ 2.30	
CGCC(-E)	-	-	-	-	-	-	-	SGCC
CGCF-E	-	270	-	34	36	37	38	SGCD1
CGCD-E	-	270	-	36	38	39	40	SGCD2
CGCN-E	-	270	-	38	40	41	42	SGCD3
CGCE(-E)	-	270	-	40	42	43	44	-
CGCX(-E)	-	-	-	-	-	-	-	-
CGC35	245	340	20	20	20	20	20	SGC340
CGC41	295	400	18	18	18	18	18	SGC400
CGC45	335	440	18	18	18	18	18	SGC440
CGC50	365	490	16	16	16	16	16	SGC490
CGCHS35 (-E, BH, BH-E, ES, ES-E)	186	340	30	30	30	30	30	-
CGCHS40 (-E, BH, BH-E)	215	390	27	27	27	27	27	-
CGCHS45	275	440	25	25	25	25	25	-
CGCHS50	333	490	21	21	21	21	21	-
CGCHS60DP	340	590	20	20	20	20	20	-

Remarks) 1. CGCN, CGCE, CGCX are assured of their non-aging properties for 6 months after the shipment from the factory.
 2. (-E) of CODE spec : External plate spec, BH : Bake Hardening, ES : Deep Drawing Quality
 3. Consult the quality manager for more detailed property info on high tensile strength steel (CGCH-).

Using Hot-Rolled Sheet Plate

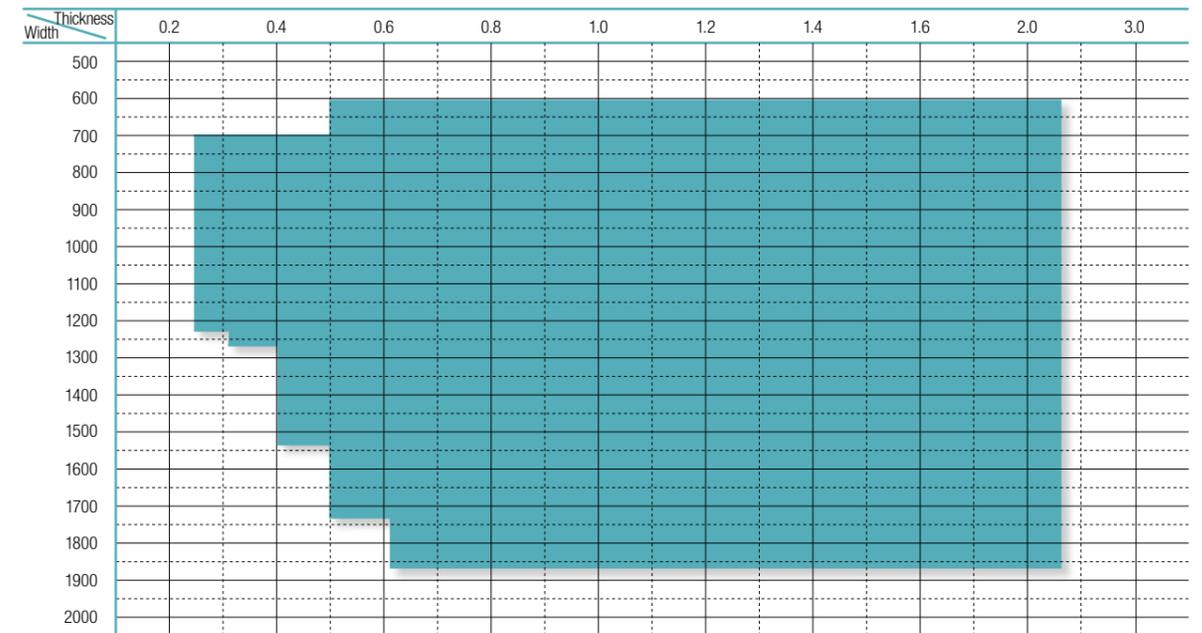
POSCO Standards	Yield Point min., N/mm ²	Tensile Strength min., N/mm ²	Elongation min., %	JS, KS Correspond Specs
CGHC	-	270	-	SGHC
CGHD	-	275	38	-
CGH35	245	340	20	SGH340
CGH41	295	400	18	SGH400
CGH45	335	440	18	SGH440
CGH50	365	490	16	SGH490
CGH55	400	540	16	SGH540

Remarks) CGHD: This product as a HGI for drawing is applied to some parts of cars and home electronics. (A switch box, etc.)

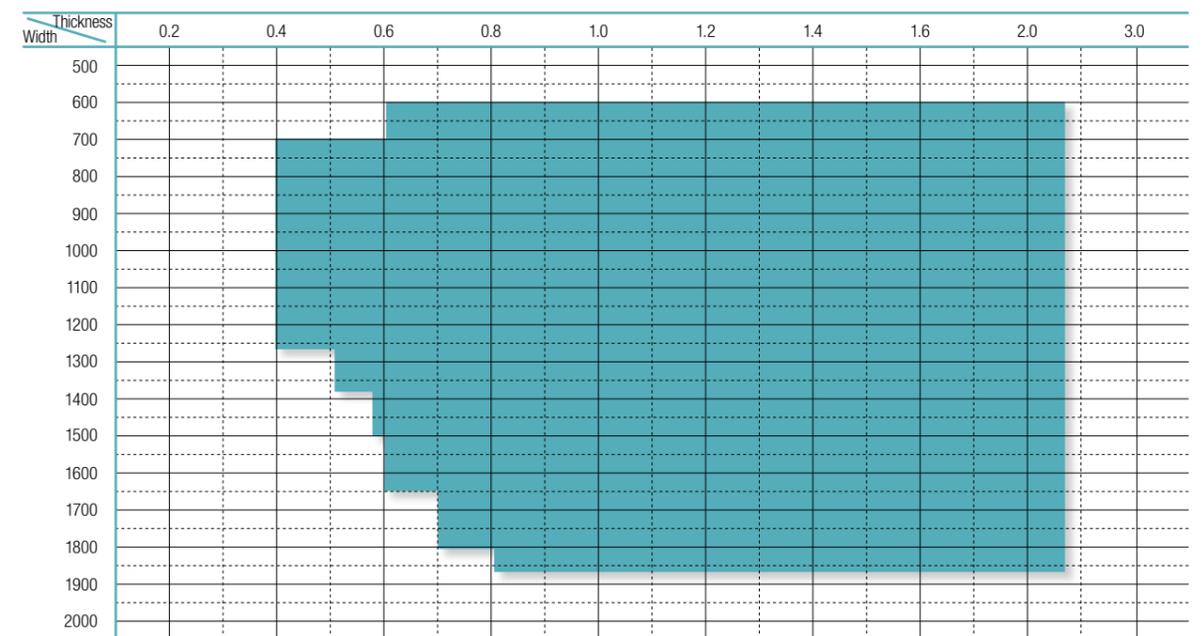
Available Dimensions

Galvanized Steel(GI, GA)

GI(CQ, LFQ)

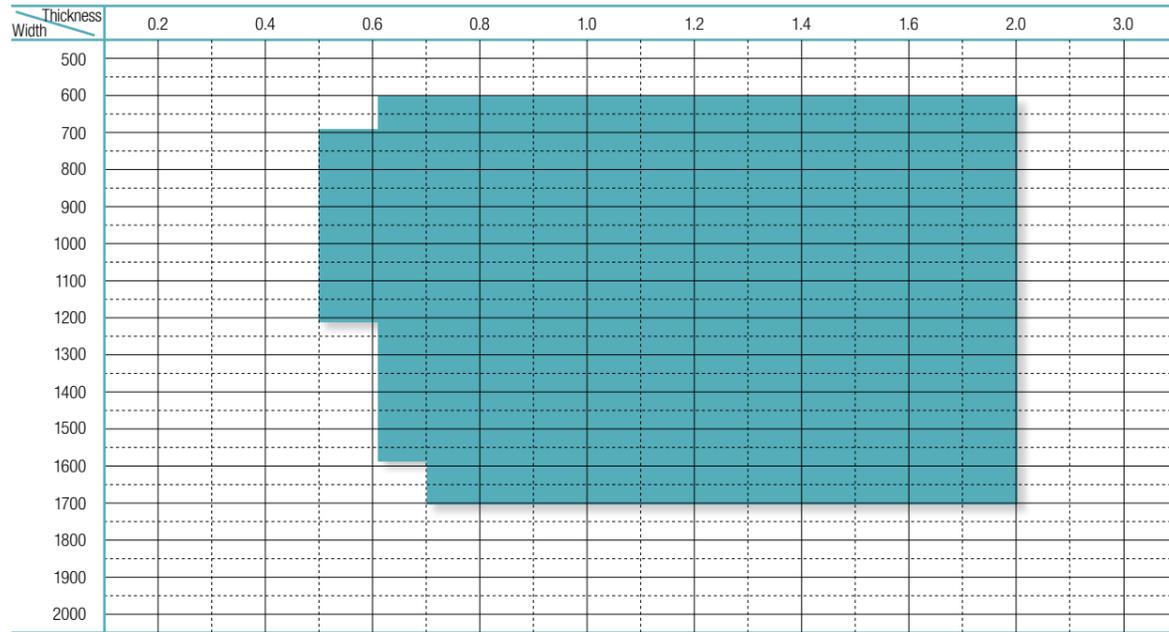


GI(DQ, DDO, DDN)

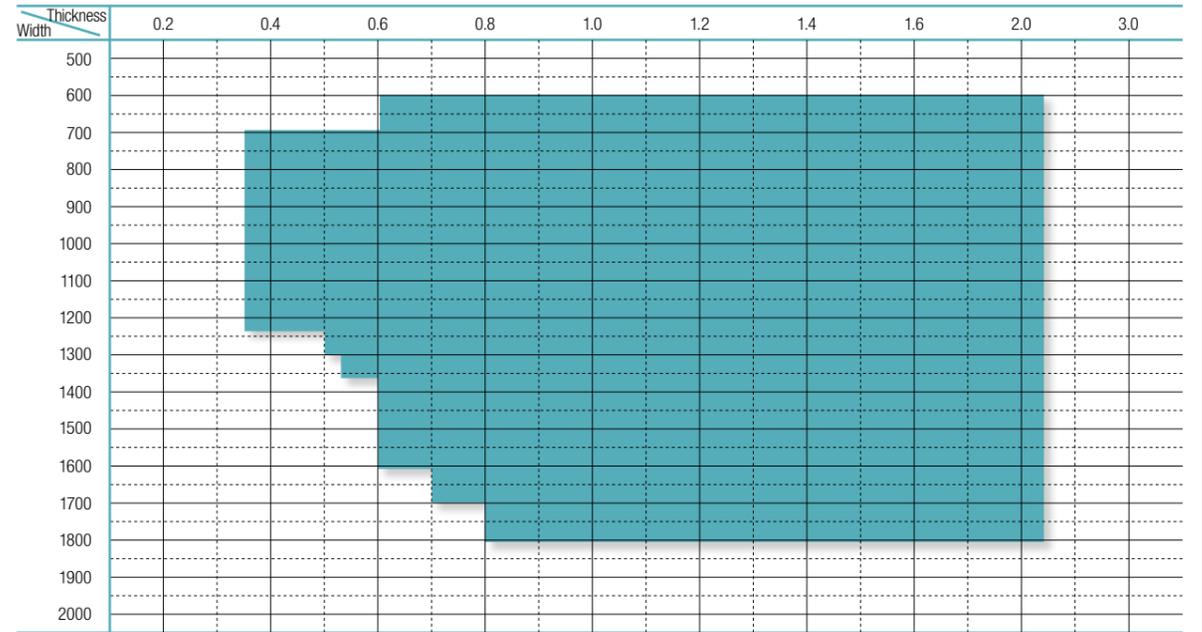


Available Dimensions

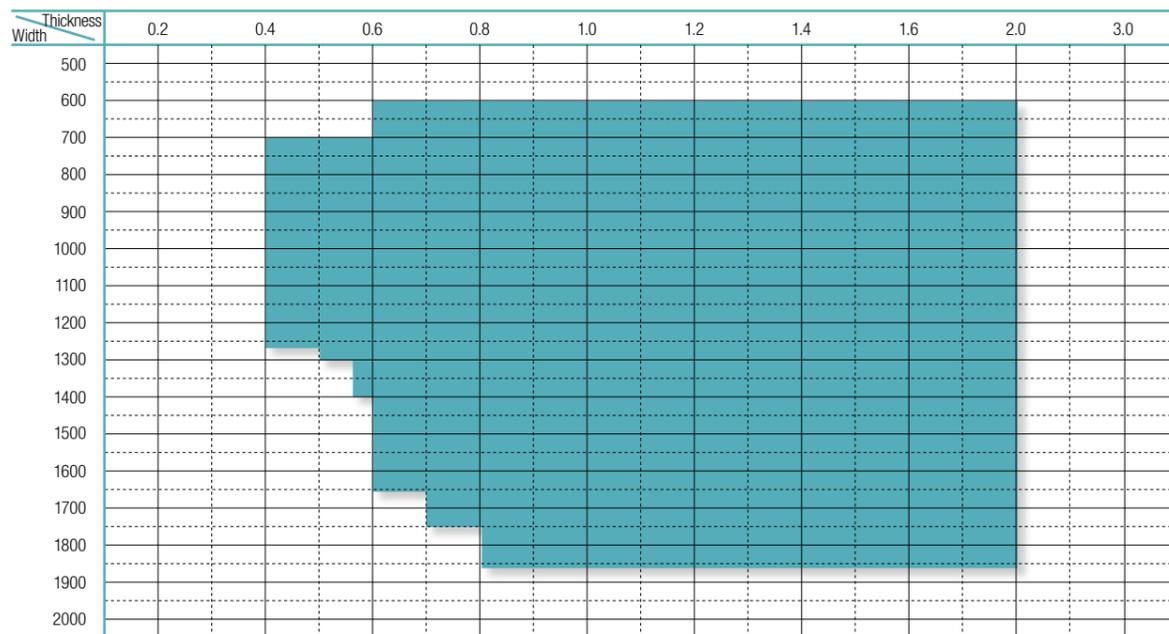
■ GI(EDDQ)



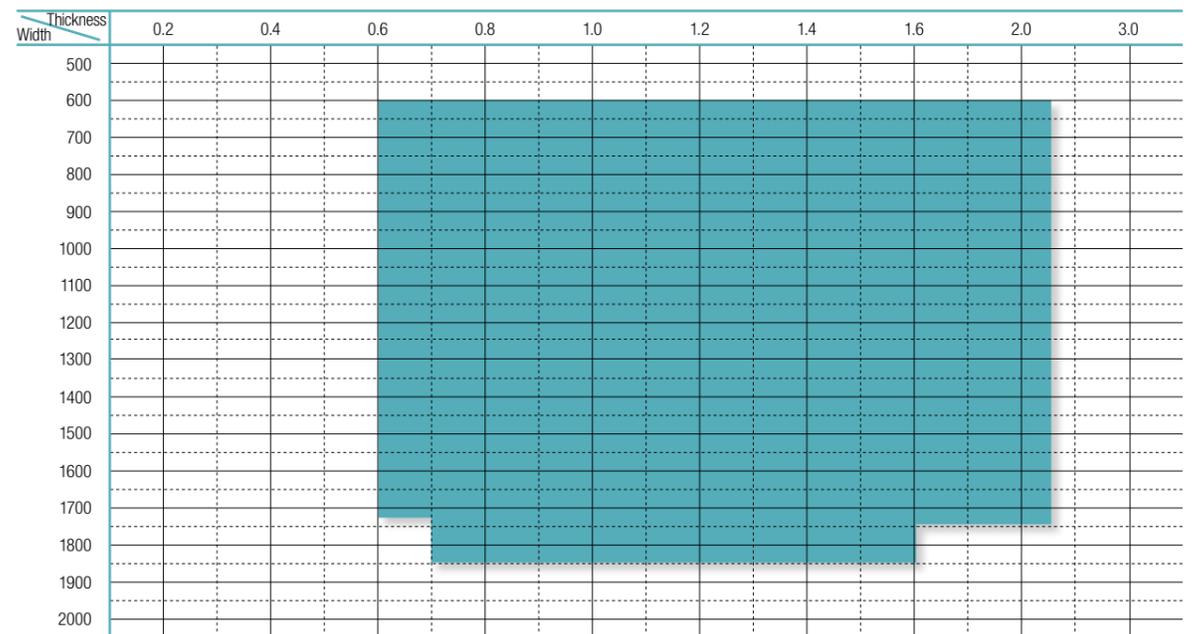
■ GI(Structural Quality)



■ GI(High Tensile Strength Steel)

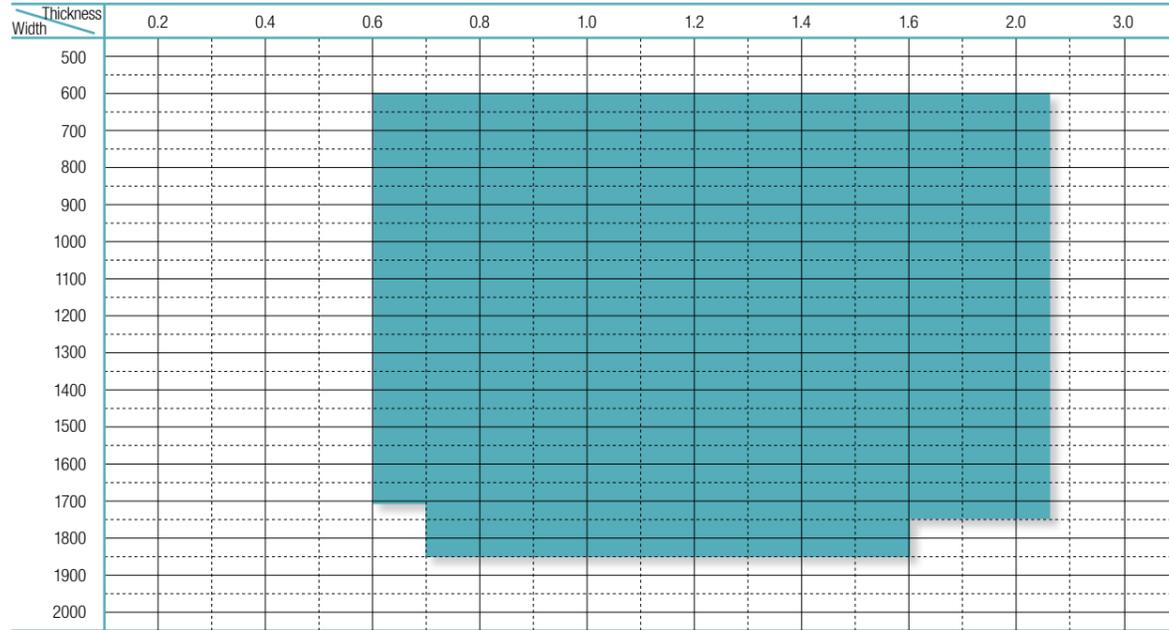


■ GA(CQ, DQ, DDQ)

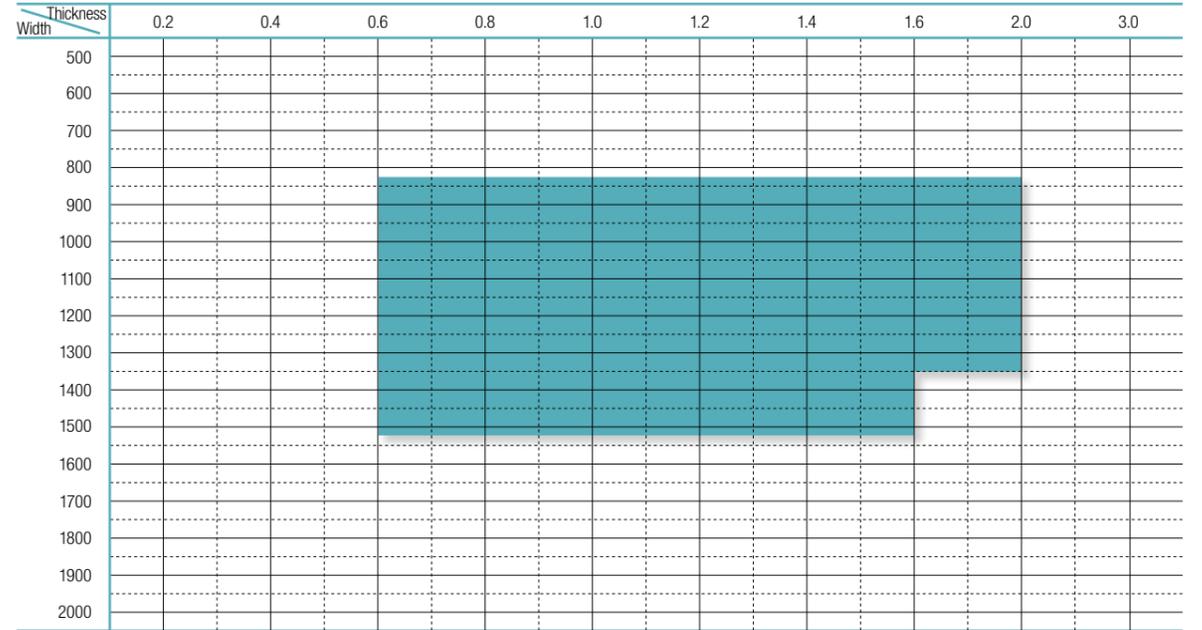


Available Dimensions

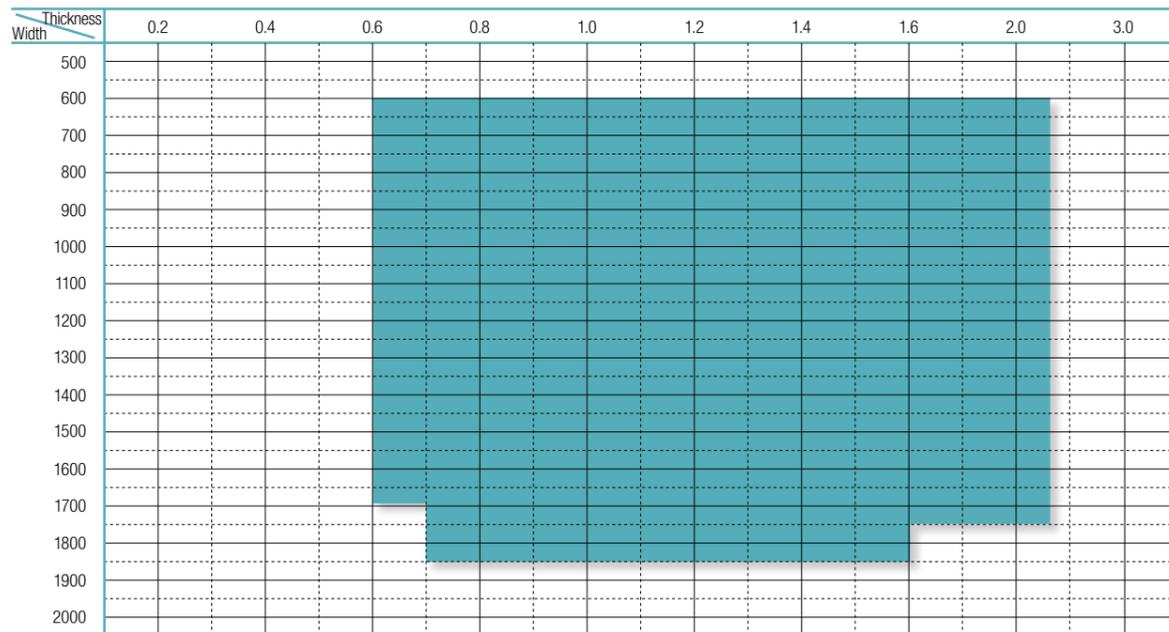
GA(EDDQ)



GA(Structural Quality)



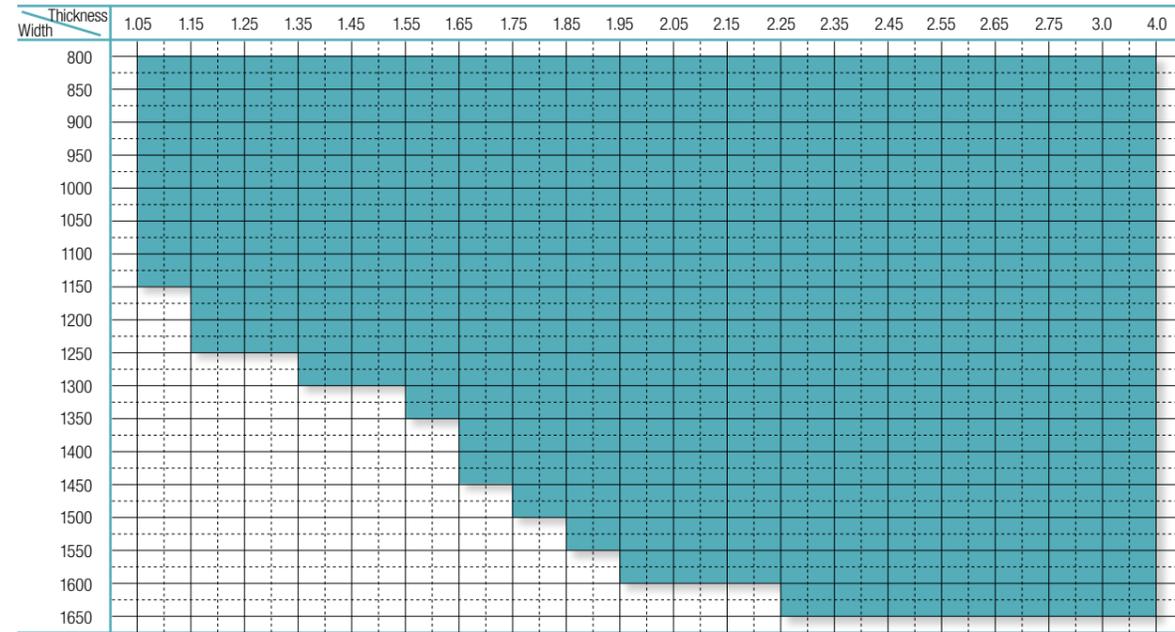
GA(High Tensile Strength Steel)



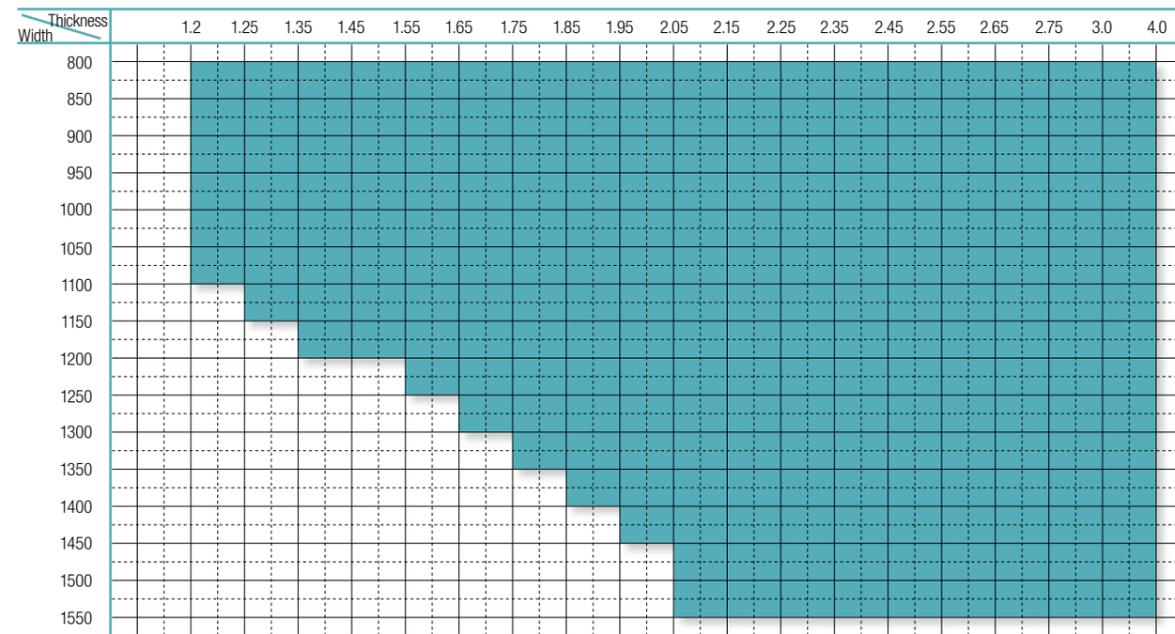
Available Dimensions

Available Dimensions for Pohang GI(H)

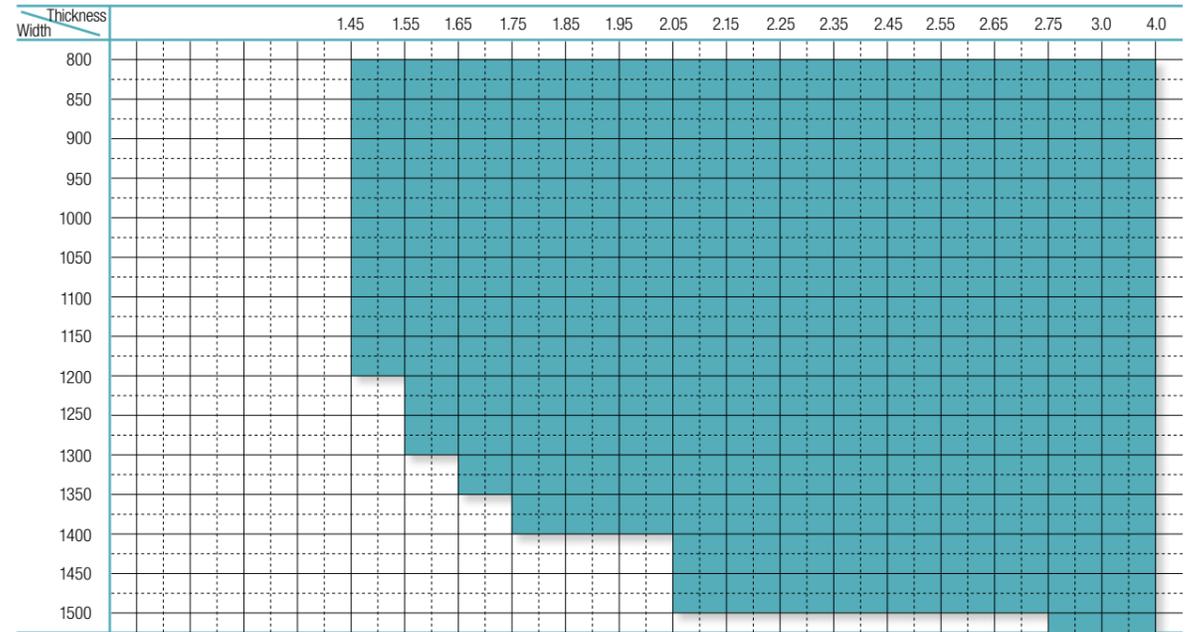
■ SGHC, SGH340



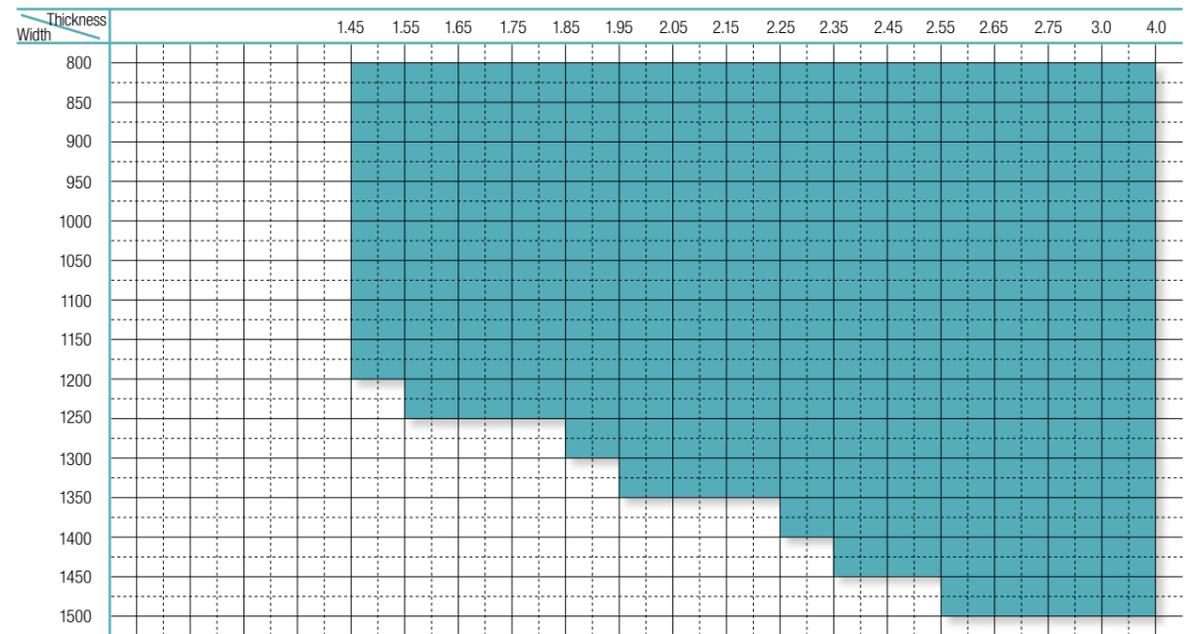
■ SGH400



■ SGH440, SGH490



■ SGH540



Please refer to the instructions mentioned below in order for you to select the products appropriate to your final usage when you place an order.

Specifications

It is important for you to select specific size appropriate for your final usage when you place an order for a product.

In addition, since there are various grades of products which you can choose from even in case of a product for commercial use, please consult with us when you place an order.

Surface treatment

Please select a post-treatment method of the product after the surface treatment and a surface treatment method appropriate to a condition under which the final product is used referring to the relevant catalog.

Post-Treatment

Cr-treated or Cr-free treated materials for a post-treatment is effective in preventing any white rust from the surface of a galvanized steel sheet.

Coating Weight

Please select a proper coating weight according to the targeted durable life-span of the coating weight and consider the conditions of usage, processing and the final product as well. A post-plating treated product is better under the environment that cause some corrosion, on the other hand, a foil plating method is better for a product requiring good formability and weldability.

Oiling

Customer can choose the oiling amount according to the usage conditions. However, if you place an order for untreated and un-oiled products at the same time, some white rust can be formed on the surface of the product.

Dimensions

The dimensions of a product greatly affect the actual yield ratio and the formability. If strict dimensions are required within the available sizes in the catalogs, please consult with us about it when you place an order.

Edge

In case of a product with which an edge can be selected, customer can either select a product with mill edge or slit edge depending on the product usage. If the edge of our company's product is used as that of a final product of a customer as it is, it is better to place an order as slit edge.

Weld Zone

In case of a coil product, a pickled weld zone and a plated weld zone could be mingled. Although such weld zones are relatively small parts of the product, their hardness is high and they are a little thick. Therefore, in case that it is hard for a customer to remove such parts, please select an option, 'No Mingle', then, we will take a measure for it.

Packaging

A packaging type could be selected according to the conditions of the transportation and storage of a product, but if nude packaging is selected, any warranty against white rust is not given.

Since hot-dip galvanized steel sheet cannot exert its characteristics well enough when used inappropriately, please take caution on the following matters.

Storage

Please be careful not to keep the products in a place where some moist or water can be smeared or the daily range of temperature is wide, but keep them in an airy place inside. And in case the wrapping paper, etc, is damaged while it is kept, please repair it right away and since some white rust is progressed to be formed in case of keeping them without using for a long time, even though the packing is perfect, please be careful for it not to be kept for a long time in stock. In case some moist or water is smeared onto the surface, please dry it right away and please be careful for the plated surface not to be damaged during transportation or working.

Processing

Since some lubricant containing a special additive makes zinc erode, please use some lubricant without any corrosive properties and, in case of using such corrosive lubricant inevitably, please remove it and treat the surface with an anti-corrosion agent after processing. In case of a product for processing, please select a size appropriate to the usage. Please avoid processing a product under the conditions with high moist, serious sulfurous acid gas or sooty smoke while taking much care of the processing environment.

Welding

In case of a resistance welding (RW), since zinc is attached to the electrode, it is necessary to clean it periodically. In case of a seam welding, the life span of the electrode can be extended by using the KNURL-GEAR DRIVE System. In case of a high-temperature brazing, especially, please avoid brazing with a GA material. Since some fumes are generated when welding, please weld a product at an airy place.

Usually, a hot-dip galvanized product is not good for soldering with some general flux.

Degreasing

It is good for degreasing to use a weak alkaline degreasing agent, a natural degreasing agent or an organic solvent. Since a strong alkaline degreasing agent corrodes zinc, please do not use such agents.

Coating

Since zinc is a highly active metal, it is hard to get a superior adhesiveness if it is coated directly to the surface of a hot-dip galvanized steel sheet without some additional treatments.

Aging

As time passes, a product can have some problems with deteriorated formability, stretcher-strain or fluting phenomena.

Therefore, please use a non-aging steel sheet in order for you to prevent such problems.

Usage

In case of using in a different way from the original usage from the time ordered, it can have some problems while being processed, so, please be careful not to use it in such a way.

The others

In case of using a processed product, if some special treatments, such as coating, etc., are not done on the plated surface, the effect of using a plated steel sheet decreases. (The corrosion levels of the products can be varied depending on the conditions to be used.) So, please be careful of it.

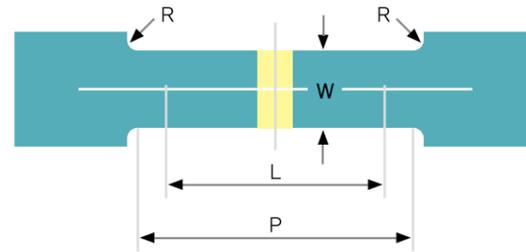
Testing Methods

Tension Test

A tension test is a basic testing method to measure the yield point, the tensile strength and the elongation of a steel sheet. In case of a usual tension test, some load is increased until the test piece is broken while some load is added to a fixed test piece.

Test Piece

The kinds and sizes, etc. of test pieces are specified in all of the specifications, such as KS, JIS and ASTM, etc. in order for you to prepare for a test piece to be used for a tension test. In case of a cold-rolled steel sheet, a way of selecting a test piece, which is specified in KS B 0801 No.5, is generally used.



P Parallel Body Length = around 60mm
L Gauge Length
W Width
R Shoulder Radius = 15mm

Results from a Tension Test

The results from a tension test are used as the most basic standards to judge the workability and formability.

- Elongation(E_l)

The higher the elongation is, the better the formability is.

- Yield Point(YP)

The lower the yield point is, the better the shape of a final product is.

- Yield Ratio ($\frac{\text{Yield Point}}{\text{Tensile Strength}}$, YR)

The lower the yield ratio is, the wider the gap between the yield point and the tensile strength is, and the wider the gap is, the better the shape freezing property of a steel sheet is when it is processed at the same strength level.

- Elastic Modulus(E)

A elastic modulus is inversely proportional to the inverse elasticity of a steel sheet. The lower the inverse elasticity is, the better the shape of a final product is.

- Work Hardening Exponent(n)

When some stress is put onto materials, a deformed part becomes hard in order for it to be constrained not to be deformed more and the force of deformation is spread to the other un-deformed parts in order for the whole parts of a material to be deformed evenly. Since the bigger the work hardening exponent is, the quicker and the evener the spread of deformation becomes, such kind of material is considered as the one with a good formability.

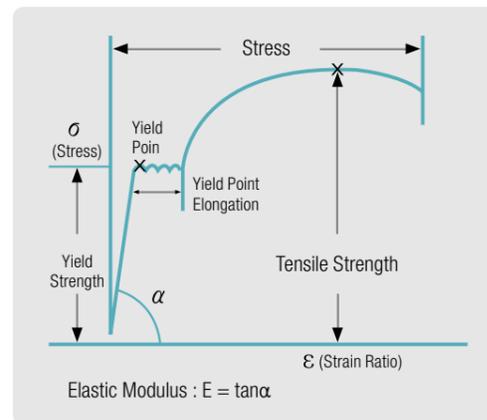
- Plastic Deformation Factor(r)

$$\frac{\ln w_0 / w}{\ln t_0 / t}$$

$$\frac{\ln w_0 / w}{\ln t_0 / t}$$

(w₀, w = width before or after a test, t₀, t = thickness before or after a test)

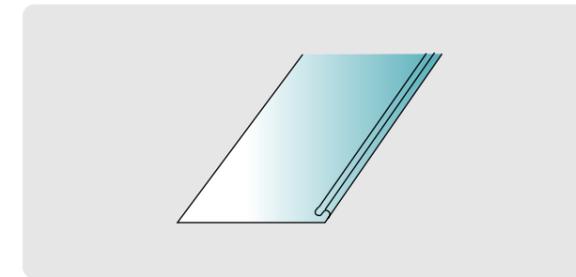
The reduction ratio of the part in the thickness-wise direction is inversely proportional to the value, r, and the reduction ratio of the part in the width-wise direction is proportional to the value, r. And the bigger the value, r, is, the harder a steel sheet is cracked and the easier the steel sheet is worked.



Coating Weight/adhesiveness Test

The coating weight and adhesiveness test are done after sampling some test pieces from the top and bottom of each coil.

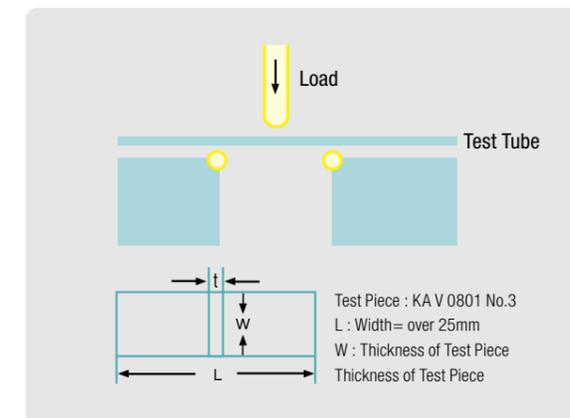
- Coating Weight: It is judged with the average value calculated by measuring the coating weights on the front and the back side of three areas widthwise by using an X-ray dry analysis method.
- Adhesiveness: After conducting a lock forming test, the plated status of the deformed area should be checked with the naked eye.



▲ Shape of a Steel Strip after it passes a Lock Forming Machine

Hardness Test

The hardness of steel sheets is closely related to the unique characteristics, such as their strength, durability and workability, etc. Therefore, a hardness test is often used as a means of understanding the other characteristics of steel sheets since it makes us understand the unique characteristics of steel sheets relatively easily. Rockwell hardness test is usually used to measure the hardness of a cold-rolled steel sheet.



Test Piece : KA V 0801 No.3
L : Width = over 25mm
W : Thickness of Test Piece
Thickness of Test Piece

Appendix

■ Unit Weight of a Steel Sheet

Thickness of Sheet \ Mass of Zinc-Coating (g/m ²)	60	100	120	180	220	275
0.20	1.670	17.20	1.753	1.814	1.875	1.951
0.23	1.906	19.56	1.989	2.050	2.111	2.187
0.25	2.062	2.112	2.145	2.206	2.267	2.343
0.27	2.220	2.270	2.303	2.364	2.425	2.501
0.30	2.455	2.505	2.538	2.599	2.660	2.736
0.35	2.848	2.898	2.931	2.992	3.053	3.129
0.40	3.240	3.290	3.323	3.384	3.445	3.521
0.45	3.632	3.682	3.715	3.776	3.837	3.913
0.50	4.025	4.075	4.108	4.169	4.230	4.306
0.55	4.418	4.468	4.501	4.562	4.623	4.699
0.60	4.810	4.860	4.893	4.954	5.015	5.091
0.70	5.595	5.645	5.678	5.739	5.800	5.876
0.80	6.380	6.430	6.463	6.524	6.585	6.661
0.90	7.165	7.215	7.248	7.309	7.370	7.446
1.0	7.950	8.000	8.033	8.094	8.155	8.231
1.2	9.520	9.570	9.603	9.664	9.725	9.801
1.4	11.09	11.14	11.17	11.23	11.30	11.37
1.6	12.66	12.71	12.74	12.80	12.86	12.94
1.8	14.23	14.28	14.31	14.37	14.44	14.51
2.0	15.80	15.85	15.88	15.94	16.00	16.08
2.3	18.16	18.21	18.24	18.30	18.36	18.44
2.8	22.08	22.13	22.16	22.22	22.28	22.36
3.2	25.22	25.27	25.30	25.36	25.42	25.50

■ Hardness Conversion Table

Rockwell Hardness			Vickers Hardness HV	Brinell Hardness HB(10/500)	Rockwell Hardness			Vickers Hardness HV	Brinell Hardness HB(10/500)
B	F	30-T			B	F	30-T		
100	113.3	80.8	235	202	55	88.1	51.9	100	89
99	112.7	80.1	229	195	54	87.5	51.3	99	87
98	112.1	79.5	224	193	53	87.0	50.7	98	86
97	111.6	78.9	218	184	52	86.5	50.0	96	85
96	111.0	78.2	214	179	51	85.9	49.4	95	84
95	110.5	77.6	209	175	50	85.3	48.7	94	83
94	109.9	76.9	205	171	49	84.8	48.1	93	82
93	109.3	76.3	200	167	48	84.2	47.5	92	81
92	108.8	75.7	196	163	47	83.7	46.8	91	80
91	108.2	75.0	192	160	46	83.1	46.2	90	79
90	107.7	74.4	188	157	45	82.5	45.5	89	79
89	107.1	73.7	184	154	44	82.0	44.9	88	78
88	106.6	73.1	180	151	43	81.4	44.3	87	77
87	106.0	72.4	176	148	42	80.9	43.6	86	76
86	105.4	71.8	173	145	41	80.3	43.0	85	75
85	104.9	71.2	170	142	40	79.8	42.3	84	75
84	104.3	70.5	166	140	39	79.2	41.7	83	74
83	103.8	69.9	163	137	38	78.6	41.1	82	73
82	103.2	69.2	160	135	37	78.1	40.4	81	72
81	102.6	68.6	156	133	36	77.5	39.8	80	72
80	102.1	68.0	154	130	35	77.0	39.1	80	71
79	101.5	67.3	150	128	34	76.4	38.5	79	70
78	101.0	66.7	147	126	33	75.8	37.9	78	69
77	100.4	66.0	145	124	32	75.3	37.2	78	69
76	99.9	65.4	142	122	31	74.7	36.6	77	68
75	99.3	64.8	140	120	30	74.2	35.9	77	67
74	98.7	64.1	137	118	28	73.1	34.6	-	66
73	98.2	63.5	134	116	26	71.9	33.4	-	65
72	97.6	62.8	132	114	24	70.8	32.1	-	64
71	97.1	62.2	129	112	22	69.7	30.8	-	63
70	96.5	61.6	127	110	20	68.6	29.5	-	61
69	95.9	60.9	125	109	18	67.5	28.2	-	60
68	95.4	60.3	123	107	16	66.4	27.0	-	59
67	94.8	59.6	120	106	14	65.2	25.7	-	59
66	94.3	59.0	119	104	12	64.1	24.4	-	58
65	93.7	58.4	117	102	10	63.0	23.1	-	57
64	93.2	57.7	115	101	8	61.9	21.8	-	56
63	92.6	57.1	113	99	6	60.8	20.6	-	55
62	92.0	56.4	111	98	4	89.7	19.3	-	55
61	91.5	55.8	109	96	2	58.5	18.0	-	54
60	90.9	55.2	107	95	0	57.4	16.7	-	53
59	90.4	54.5	106	94					
58	89.8	53.9	104	92					
57	89.2	53.2	103	91					
56	88.7	52.6	102	90					

Weight for One Steel Sheet by Ordered Coating Grade

Mass of Zinc-coating	60g/m ²															100g/m ²														
	762					914					1,000					1,219					762					914				
	Width (mm)																													
Length(mm) Thickness of Sheet (mm)	1,829	2,131	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	2,000	2,438	2,743	3,048	3,658	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048
0.20	2.33	2.72	3.10	3.49	3.88	2.79	3.26	3.72	4.19	4.65	3.34	4.96	5.58	6.21	7.45	2.40	2.80	3.20	3.59	4.00	2.88									
0.23	2.66	3.10	3.54	3.98	4.43	3.19	3.72	4.25	4.78	5.31	3.81	5.66	6.37	7.08	8.50	2.73	3.18	3.63	4.09	4.54	3.27									
0.25	2.88	3.35	3.83	4.31	4.79	3.45	4.02	4.59	5.17	5.74	4.12	6.13	6.90	7.66	9.19	2.94	3.43	3.92	4.41	4.91	3.53									
0.27	3.09	3.61	4.12	4.64	5.16	3.71	4.33	4.95	5.57	6.18	4.44	6.60	7.42	8.25	9.90	3.16	3.69	4.22	4.74	5.27	3.80									
0.30	3.42	3.99	4.56	5.13	5.70	4.10	4.79	5.47	6.15	6.84	4.91	7.30	8.21	9.12	10.9	3.49	4.07	4.65	5.24	5.82	4.19									
0.35	3.97	4.63	5.29	5.95	6.62	4.76	5.55	6.35	7.14	7.93	5.70	8.46	9.52	10.6	12.7	4.04	4.71	5.38	6.06	6.73	4.85									
0.40	4.52	5.27	6.02	6.77	7.53	5.42	6.32	7.22	8.12	9.03	6.48	9.63	10.8	12.0	14.4	4.59	5.35	6.11	6.88	7.64	5.50									
0.45	5.06	5.91	6.75	7.59	8.44	6.07	7.08	8.09	9.11	10.1	7.26	10.8	12.1	13.5	16.2	5.13	5.59	6.84	7.70	8.55	6.16									
0.50	5.61	6.54	7.48	8.41	9.35	6.73	7.85	8.97	10.1	11.2	8.05	12.0	13.5	15.0	17.9	5.68	6.63	7.57	8.52	9.47	6.81									
0.55	6.16	7.18	8.21	9.23	10.3	7.39	8.62	9.84	11.1	12.3	8.84	13.1	14.8	16.4	19.7	6.23	7.26	8.30	9.34	10.4	7.47									
0.60	6.71	7.82	8.94	10.1	11.2	8.04	9.38	10.7	12.1	13.4	9.62	14.3	16.1	17.9	21.4	6.77	7.90	9.03	10.2	11.3	8.13									
0.70	7.80	9.10	10.4	11.7	13.0	9.35	10.9	12.5	14.0	15.6	11.2	16.6	18.7	20.8	24.9	7.87	9.18	10.5	11.8	13.1	9.44									
0.80	8.88	10.4	11.9	13.3	14.8	10.7	12.4	14.2	16.0	17.8	12.8	19.0	21.3	23.7	28.4	8.96	10.5	11.9	13.4	14.9	10.8									
0.90	9.99	11.7	13.3	15.0	16.6	12.0	14.0	16.0	18.0	20.2	14.3	21.3	24.0	26.6	31.9	10.1	11.7	13.4	15.1	16.8	12.1									
1.0	11.1	12.9	14.8	16.6	18.5	13.3	15.5	17.7	19.9	22.1	15.9	23.6	26.6	29.5	35.4	11.2	13.0	14.9	16.7	18.6	13.4									
1.2	13.3	15.5	17.7	19.9	22.1	15.9	18.6	21.2	23.9	26.5	19.0	28.3	31.8	35.4	42.4	13.3	15.6	17.8	20.0	22.2	16.0									
1.4	15.5	18.0	20.6	23.2	25.8	18.5	21.6	24.2	27.8	30.9	22.2	33.0	37.1	41.2	49.5	15.5	18.1	20.7	23.32	25.9	18.6									
1.6	17.6	20.6	23.5	26.5	29.4	21.2	24.7	28.2	31.7	35.3	25.3	37.6	42.3	47.0	56.5	17.7	20.7	23.6	26.6	29.5	21.3									
1.8	19.8	23.1	26.4	29.7	33.1	23.8	27.7	31.7	35.7	39.6	28.5	42.3	47.6	52.9	63.5	19.9	23.2	26.5	29.8	33.2	23.9									
2.0	22.0	25.7	29.4	33.0	36.7	26.4	30.8	35.2	39.6	44.0	31.6	47.0	52.8	58.7	70.5	22.1	25.8	29.4	33.1	36.8	26.5									
2.3	25.3	29.5	33.7	38.0	42.2	30.4	35.4	40.5	45.5	50.6	36.3	54.0	60.7	67.5	81.0	25.4	29.6	33.8	38.1	42.3	30.4									
2.8	30.8	35.9	41.0	46.1	51.3	36.9	43.1	49.2	55.4	61.5	44.2	65.6	73.8	82.0	98.5	30.8	36.0	41.1	46.3	51.4	37.0									
3.2	35.2	41.0	46.9	52.7	58.6	42.2	49.2	56.2	63.2	70.3	50.4	75.0	84.3	93.7	112	35.2	41.1	47.0	52.8	58.7	42.3									

60g/m ²															120g/m ²																			
914					1,000					1,219					762					914					1,000					2,134				
2,134	2,438	2,743	3,048	2,000	2,438	2,743	3,048	3,658	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	2,000	2,438	2,743	3,048	3,658						
3.35	3.83	4.31	4.79	3.44	5.11	5.75	6.39	7.67	2.44	2.85	3.26	3.66	4.07	2.93	3.42	3.91	4.39	4.88	3.51	5.21	5.86	6.51	7.82											
3.81	4.36	4.90	5.45	3.91	5.81	6.54	7.27	8.72	2.77	3.23	3.70	4.16	4.62	3.33	3.88	4.43	4.99	5.54	3.98	5.91	6.65	7.39	8.87											
4.12	4.71	5.29	5.88	4.22	6.28	7.06	7.85	9.42	2.99	3.49	3.99	4.48	4.98	3.59	4.18	4.78	5.38	5.98	4.29	6.37	7.17	7.97	9.56											
4.43	5.06	5.69	6.32	4.54	6.75	7.59	8.44	10.1	3.21	3.74	4.28	4.81	5.35	3.85	4.49	5.13	5.77	6.42	4.61	6.84	7.70	8.56	10.3											
4.88	5.58	6.28	6.98	5.01	7.44	8.38	9.31	11.2	3.54	4.13	4.72	5.30	5.90	4.24	4.95	5.65	6.36	7.07	5.08	7.54	8.49	9.43	11.3											
5.65	6.46	7.27	8.07	5.80	8.61	9.69	10.8	12.9	4.09	4.77	5.45	6.13	6.81	4.90	5.72	6.53	7.35	8.17	5.86	8.71	9.801	10.9	13.1											
6.42	7.33	8.25	9.17	6.58	9.78	11.0	12.2	14.7	4.63	5.40	6.17	6.95	7.72	5.56	6.48	7.40	8.33	9.26	6.65	9.88	1.1	12.3	14.8											
7.18	8.20	9.23	10.3	7.36	10.9	12.3	13.7	16.4	5.18	6.04	6.90	7.76	8.63	6.21	7.24	8.28	9.31	10.3	7.43	11.0	12.4	13.8	16.6											
7.95	9.08	10.2	11.4	8.15	12.1	13.6	15.1	18.2	5.60	6.53	7.47	8.40	9.331	6.72	7.84	8.95	10.1	11.2	8.04	11.9	13.4	14.9	17.9											
8.71	9.95	11.2	12.4	8.94	13.3	14.9	16.6	19.9	6.27	7.32	8.36	9.41	10.5	7.53	8.78	10.0	11.3	12.5	9.00	13.4	15.1	16.7	20.1											
9.48	10.8	12.2	13.5	9.72	14.4	16.3	18.1	21.7	6.82	7.96	9.09	10.2	11.4	8.18	9.54	10.9	12.3	13.6	9.79	14.5	16.4	18.2	21.8											
11.0	12.6	14.2	15.7	11.3	16.8	18.9	21.0	25.2	7.92	9.23	10.5	11.9	13.2	9.49	11.1	12.7	14.2	15.8	11.4	16.9	19.0	21.2	25.3											
12.5	14.3	16.1	17.9	12.9	19.1	21.5	23.9	28.7	9.01	10.5	12.0	13.5	15.0	10.8	12.6	14.4	16.2	18.0	12.9	19.2	21.6	24.0	28.8											
14.1	16.1	18.1	20.1	14.4	21.4	24.1	26.8	32.2	10.1	11.8	13.5	15.1	16.8	12.1	14.1	16.1	18.2	20.2	14.5	21.5	24.2	26.9	32.3											
15.6	17.8	20.1	22.3	16.0	23.8	26.8	29.7	35.7	11.2	13.1	14.9	16.8	18.7	13.4	15.7	17.9	20.1	22.4	16.1	23.9	26.9	29.9	35.8											
18.7	21.3	24.0	26.7	19.1	28.4	32.0	35.6	42.7	12.6	14.7	16.8	18.9	21.1	15.2	17.7	20.2	22.7	25.2	18.1	26.9	30.3	33.7	40.4											
21.7	24.8	27.9	31.0	22.3	33.1	37.3	41.4	49.7	15.6	18.2	20.8	23.3	25.9	18.7	21.8	24.9	28.0	31.1	22.3	33.2	37.4	41.5	49.8											
24.8	28.3	31.9	35.4	25.4	37.8	42.5	47.2	56.7	17.8	20.7	23.7	26.6	29.6	21.3	24.8	28.4	31.9	35.5	25.5	37.9	42.6	47.3	56.8											
27.8	31.8	35.8	39.8	28.6	42.4	47.8	53.1	63.7	19.9	23.3	26.6	29.9	33.2	23.9	27.9	31.9	35.9	39.9	28.6	42.5	47.9	53.2	63.8											
30.9	35.3	39.7	44.2	31.7	47.1	53.0	58.9	70.7	22.1	25.8	29.5	33.2	36.9	26.6	31.0	35.4	39.8	44.2	31.8	47.2	53.1	59.0	70.8											
35.5	40.6	45.7	50.7	36.4	54.1	60.9	67.7	81.2	25.4	29.7	33.9	38.1	42.4	30.5	35.6	40.6	45.7	50.8	36.5	54.2	61.0	67.8	81.3											
43.2	49.3	55.5	61.7	44.3	65.8	74.0	82.2	98.7	30.9	36.0	41.2	46.3	51.5	37.1	43.4	49.4	55.6	61.8	44.3	65.9	74.18	82.3	98.8											
49.3	56.3	63.4	70.4	50.5	75.1	84.5	93.9	113	35.3	41.1	47.0	52.9	58.8	42.3	50.6	56.4	63.4	70.5	50.6	75.2	84.6	94.0	113											

Mass of Zinc-coating	180g/m ²															220g/m ²														
	762					914					1,000					1,219					762					914				
	Width (mm)																													
Length(mm) Thickness of Sheet (mm)	1,829	2,131	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	2,000	2,438	2,743	3,048	3,658	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048	1,829	2,134	2,438	2,743	3,048
0.20	2.53	2.95	3.37	3.79	4.21	3.03	3.54	4.04	4.56	5.05	3.63	5.39	6.07	6.74	8.09	2.61	3.05	3.48	3.92	4.36	3.14									
0.23	2.86	3.33	3.84	4.28	4.76	3.43	4.00	4.57	5.14	5.71	4.10	6.09	6.86	7.62	9.14	2.94	3.43	3.92	4.41	4.90	3.53									
0.25	3.08	3.59	4.10	4.61	5.12	3.69	4.30	4.91	5.53	6.15	4.41	6.56	7.38	8.20	9.84	3.16	3.69	4.21	4.74	5.27	3.79									
0.27	3.30	3.84	4.39	4.94	5.49	3.95	4.61	5.27	5.93	6.59	4.73	7.03	7.91	8.78	10.5	3.38	3.94	4.51	5.07	5.63	4.05									
0.30	3.62	4.23	4.83	5.43																										

■ Dimensions Comparison Table

Dimensions	U. S. G		B. W. G		B. G		S. W. G		M. S. G		C. S. G	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
10	3.572	0.1406	3.40	0.134	3.175	0.1250	3.251	0.128	3.416	0.1345	-	-
11	3.175	0.1250	3.05	0.120	2.827	0.1113	2.946	0.116	3.037	0.1196	-	-
12	2.778	0.1094	2.77	0.109	2.517	0.0991	2.64	0.104	2.657	0.1046	2.753	0.1084
13	2.381	0.0938	2.41	0.095	2.240	0.0882	2.34	0.092	2.278	0.0897	2.372	0.0934
14	1.984	0.0781	2.11	0.083	1.994	0.0785	2.03	0.080	1.897	0.0747	1.994	0.0785
15	1.786	0.0703	1.83	0.072	1.775	0.0699	1.83	0.072	1.709	0.0673	1.803	0.0710
16	1.558	0.0625	1.65	0.065	1.588	0.0625	1.63	0.064	1.519	0.0598	1.163	0.0635
17	1.429	0.0563	1.47	0.058	1.412	0.0553	1.42	0.056	1.367	0.0538	1.461	0.0575
18	1.2700	0.0500	1.25	0.049	1.257	0.0495	1.22	0.048	1.214	0.0478	1.311	0.0516
19	1.1113	0.0438	1.07	0.042	1.118	0.0440	1.02	0.040	1.062	0.0418	1.158	0.0456
20	0.0525	0.0375	0.89	0.035	0.996	0.0392	0.91	0.036	0.912	0.0359	1.006	0.0396
21	0.8731	0.0344	0.81	0.032	0.886	0.0349	0.81	0.032	0.836	0.0329	0.930	0.0366
22	0.7938	0.0313	0.71	0.028	0.794	0.0313	0.71	0.028	0.760	0.0299	0.853	0.0336
23	0.7144	0.0281	0.64	0.025	0.707	0.0278	0.61	0.024	0.683	0.0269	0.777	0.0306
24	0.6350	0.0250	0.56	0.022	0.629	0.0248	0.56	0.022	0.607	0.0239	0.701	0.0276
25	0.5556	0.0219	0.51	0.020	0.560	0.0220	0.51	0.020	0.531	0.0209	0.627	0.0247
26	0.4763	0.0188	0.46	0.018	0.498	0.0196	0.46	0.018	0.455	0.0179	0.551	0.0217
27	0.4366	0.0172	0.41	0.016	0.443	0.0175	0.417	0.0164	0.417	0.0164	0.513	0.0202
28	0.3969	0.0156	0.36	0.014	0.397	0.0156	0.346	0.0148	0.378	0.0149	0.475	0.0187
29	0.3572	0.0141	0.33	0.013	0.353	0.0139	0.345	0.0136	0.343	0.0135	0.437	0.0172
30	0.3175	0.0125	0.30	0.012	0.312	0.0123	0.315	0.0124	0.305	0.0120	0.399	0.0157
31	0.2778	0.0109	0.25	0.011	0.279	0.0110	0.295	0.0116	0.267	0.0105	0.361	0.0142
32	0.2580	0.0102	0.23	0.009	0.249	0.0098	0.274	0.0108	0.246	0.0097	0.340	0.0134
33	0.2381	0.0094	0.20	0.008	0.221	0.0087	0.254	0.0100	0.229	0.0090	-	-
34	0.2183	0.0086	0.18	0.007	0.196	0.0077	0.234	0.0092	0.208	0.0082	-	-
35	0.1984	0.0078	0.13	0.005	0.175	0.0069	0.213	0.0084	0.191	0.0075	-	-

Unit Conversion Table

■ Weight

Dimensions	Kilogram	Ounce	Pound	Net Ton	Gross Ton	Metric Ton
	kg	oz	lb	nt	gt	t
Kilogram(kg)	1	35.2740	2.20463	0.001102	0.(3)9842	0.001
Ounce(oz)	0.02835	1	0.06250	0.(4)3125	0.(4)2790	0.(4)285
Pound(lb)	0.045359	16	1	0.0050	0.(3)4464	0.(3)4536
Net Ton(nt)	907.185	32000	2000	1	0.89286	0.90719
Gross Ton(gt)	1016.05	35840	2240	1.12	1	1.0605
Metric Ton(t)	1000	35274	2204.62	1.10231	0.9842	1

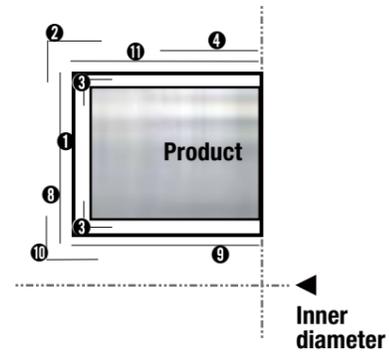
■ Length

Dimensions	Millimeter	Centimeter	Meter	Inch	Foot	Yard	Mile
	mm	cm	m	in	ft	yd	mi
Millimeter(mm)	1	0.1	0.001	0.03937	0.0032808	0.0010936	0.(6)6214
Centimeter(cm)	10	1	0.01	0.3937	0.032808	0.010936	0.(5)6214
Meter(m)	1000	100	1	39.37	3.28084	1.09361	0.(3)6214
Inch(in)	25.40	2.540	0.0254	1	0.0833	0.02778	0.(4)1578
Foot(ft)	304.8	30.48	0.3048	12	1	0.3333	0.(3)1894
Yard(yd)	914.4	91.44	0.9144	36	3	1	0.(3)5682
Mile(mi)	1609350	160935	1609.35	63360	5280	1760	1

Packaging



Name of outer pack



Name of cross-sectional pack

GALVANIZED STEEL

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NO	Name	Material
①	PP VCI WRAP	VINYL
②	OUTER RING	STEEL
③	CORNER WRAP	ANTI-RUST BOARD
④	OUTER PROTECT BOARD	STEEL
⑤	HORIZONTAL BAND	STEEL
⑥	CENTER BAND	PET
⑦	VERTICAL BAND	STEEL
⑧	SIDE BOARD	PLASTIC
⑨	INNER PROTECT BOARD	PLASTIC
⑩	INNER RING	STEEL
⑪	OUTER PROTECT BOARD	ANTI-RUST BOARD

* Packing Type and materials are changeable.

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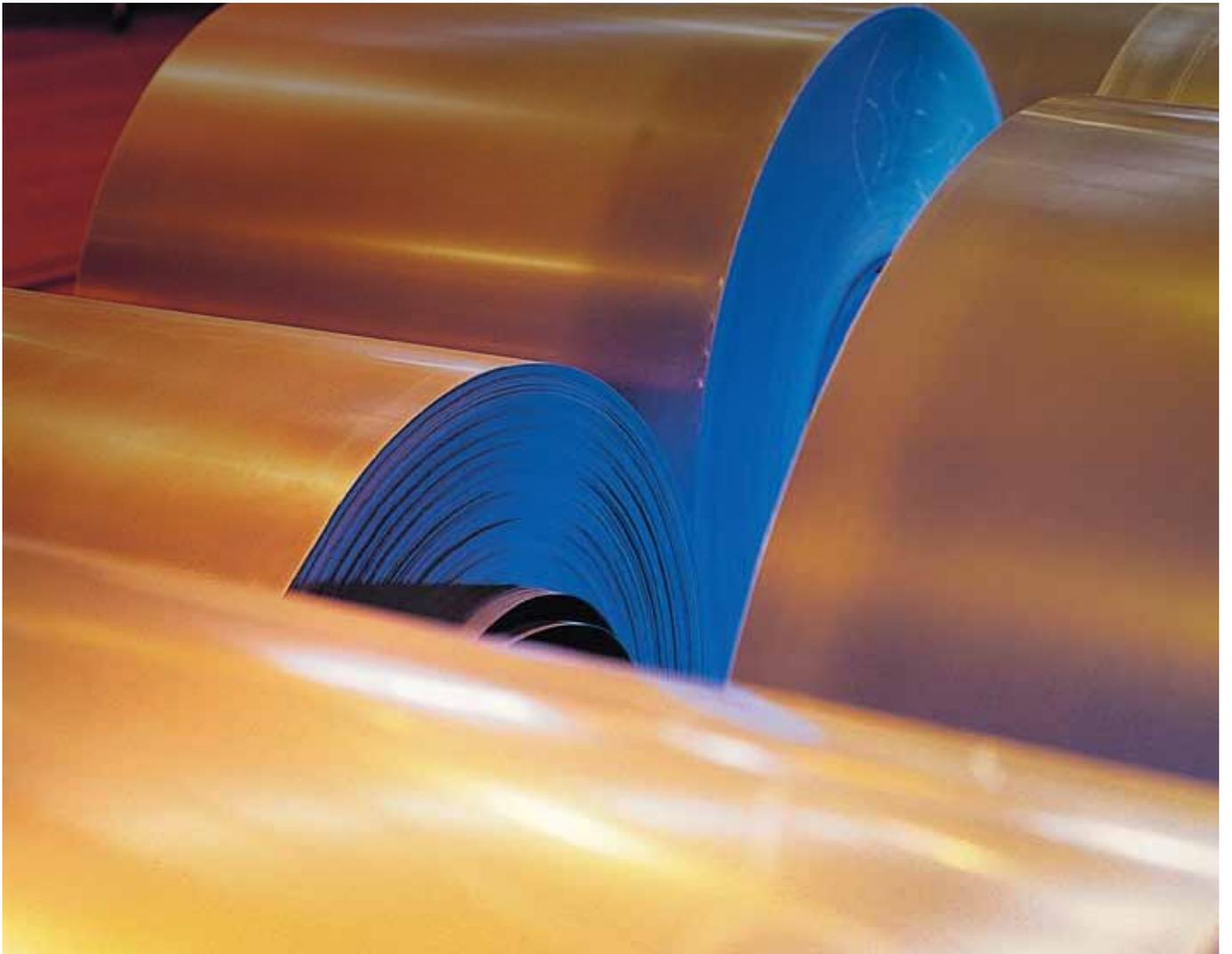


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ELECTRO GALVANIZED STEEL

posco





Our Electro-galvanized steels are produced with advanced processes and equipment to ensure consistent quality. We offer two types of galvanizing coating, Pure-Zn and Zn-Ni alloy and a variety of post-treatments including phosphate-based coatings, Cr-free resin, and anti-corrosion oiling. Our electro-galvanized steel products display excellent corrosion resistance as well as versatility in machinability, weldability, and paintability, making them popular materials for automobile, home appliances, building interior, metal furniture, and many other applications.

ELECTRO GALVANIZED STEEL

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Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

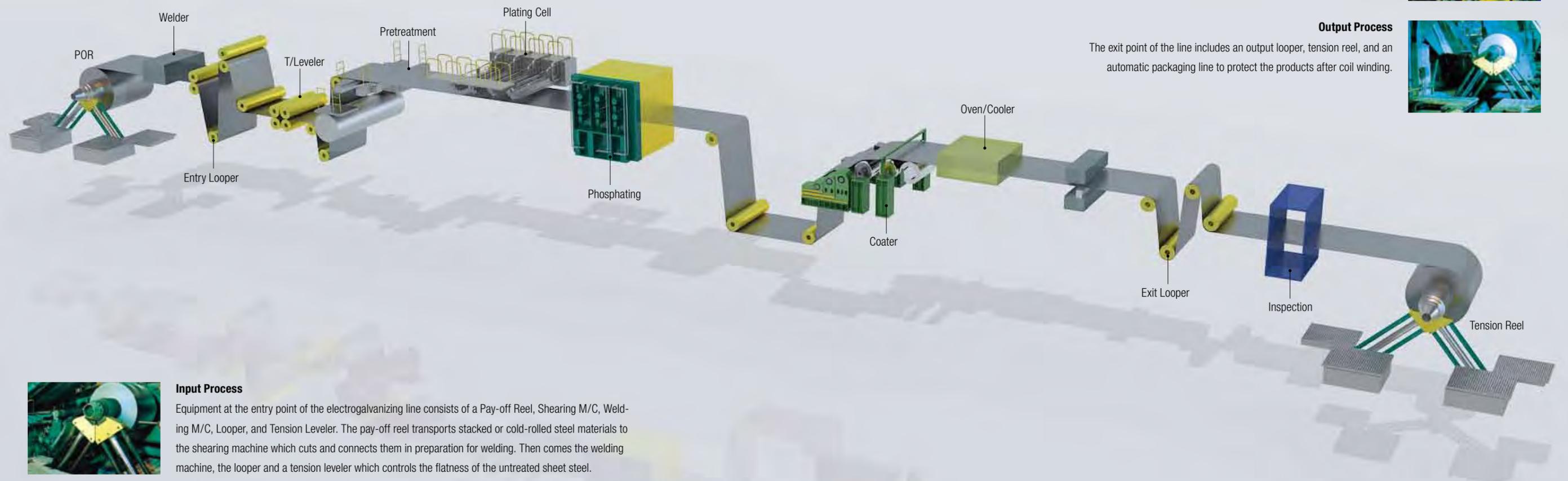
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.



Manufacturing Process & Equipment

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Input Process

Equipment at the entry point of the electrogalvanizing line consists of a Pay-off Reel, Shearing M/C, Welding M/C, Looper, and Tension Leveler. The pay-off reel transports stacked or cold-rolled steel materials to the shearing machine which cuts and connects them in preparation for welding. Then comes the welding machine, the looper and a tension leveler which controls the flatness of the untreated sheet steel.



Pre-Treatment Process

An electrolytic cleaning line consists of an electrolysis tank, an acid bath and a rinse tank to remove contaminants and oxide films from the surface of the steel before electroplating.



Electric Galvanizing Equipment

POSCO produces electro-galvanized steel sheet using the LCC-H (Liquid Cushion Cell-Horizontal) galvanizing process. In this process, the steel is coated on both sides simultaneously as it passes horizontally through the line.

Phosphate Thin-Film Coating Process

A phosphate thin-film is applied to the surface of the zinc layer through chemical or electro-chemical reactions. The film is intended to provide temporary anti-corrosion protection and to generate a secure painting substrate.



Anti-Fingerprinting Process

An organic, inorganic or organic-inorganic hybrid film is applied to the surface of sheet steel in order to supplement its corrosion resistance and to enhance desirable properties such as resistance to fingerprint marks and workability.



Output Process

The exit point of the line includes an output looper, tension reel, and an automatic packaging line to protect the products after coil winding.



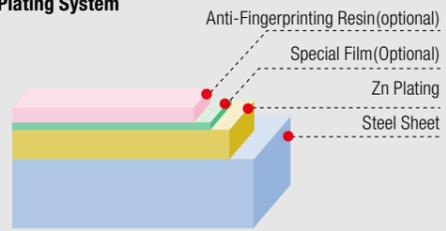
Manufacturing Products

Status of Products Manufactured with Each Equipment of POSCO EGLs

Division		Gwangyang		Pohang	
Year of Completion (Streamlined)		#1 EGL	#2 EGL	#1 EGL	#2 EGL
		'90.8('11.8)	'97.8	'86.12('09.12)	'09.1
Production Capability (Thousand Tons/Year)		400	300	300	300
Size(mm)	Thickness	0.4~2.3	0.4~2.0	0.4~2.3	0.4~2.0
	Width	800~1,860	700~1,570	800~1,650	800~1,650
Zinc Plating		Zn Galvanizing	Zn Galvanizing	Zn Galvanizing Zn-Ni Alloy Plating	Zn Galvanizing
Types of Post-Treatments		No treatment, Oiling, Phosphating, Anti-fingerprinting	No treatment, Oiling, Phosphating, Anti-fingerprinting	No treatment, Oiling, Phosphating, Anti-fingerprinting, (Zn-Ni) Coating for fuel tanks	No treatment, Oiling, Phosphating, Anti-fingerprinting

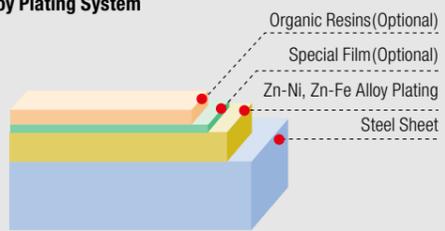
Types of Galvanizing & Structures of Coated Films

Zn Plating System



For post-treatment, various methods are offered such as no treatment, oiling, phosphating, anti-fingerprinting, black resin, etc. Electro-galvanized steels with these types of coatings are popular in the home appliance industry.

Alloy Plating System



For post-treatment, various methods are offered such as oiling, phosphating, functional resin (for fuel tanks), etc. Electro-galvanized steel with these types of coating are used in the automotive industry.

Characteristics of Electro-Galvanized Steel Sheets

Zn Electro-Galvanized Steel Sheets

Workability

Since it has less coating weight and has no heat-affected zones during the manufacturing process compared with GI and GA, it secures the material characteristics and workability at the same levels of those of the base metals, that is, cold-rolled (CR) sheets.

Corrosion Resistance

Fe can be protected by the sacrificial anode reactions caused by the galvanic actions of Zinc and, in case that it is exposed to air, a thin film is formed on the surface to prevent it from being corroded. (Some post-coated steel sheets are used for automobiles in order to increase the anti-corrosion property.)

Paintability

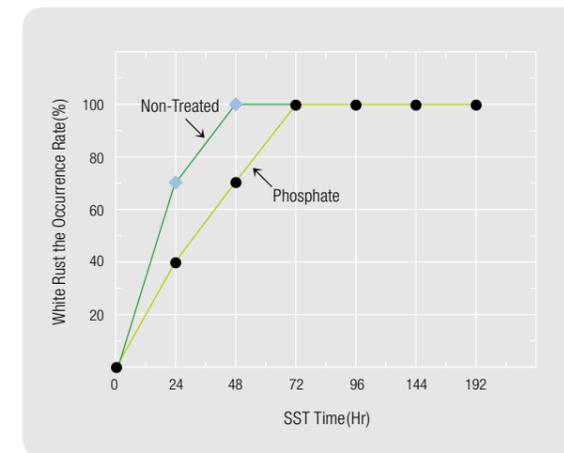
Its flat and even surface secures the good conditions for painting and a phosphate treatment improves its paint adhesion and anticorrosion properties after painting.

Weldability

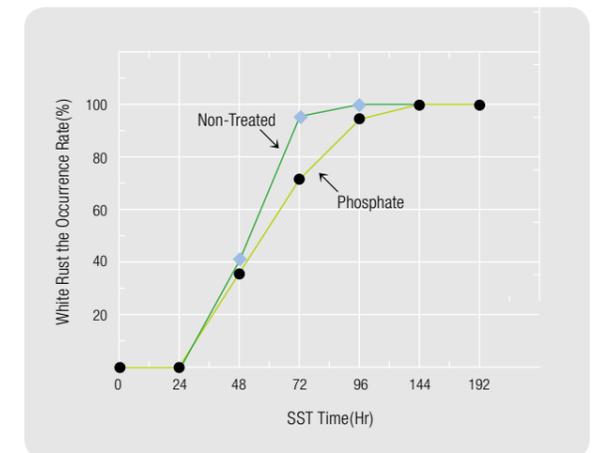
Pure Zn galvanized steel sheets weldability is a little poor since their electrical conductivity is inferior to that of cold-rolled steel sheets. But it is possible to conduct a spot or a seam welding with satisfaction along with the appropriate welding conditions and the application of some post-treatments.

Comparison of Anti-Corrosion Levels of Non-Treated and Phosphate-Treated Zn-Galvanized Steel Sheets.

White Rust Test

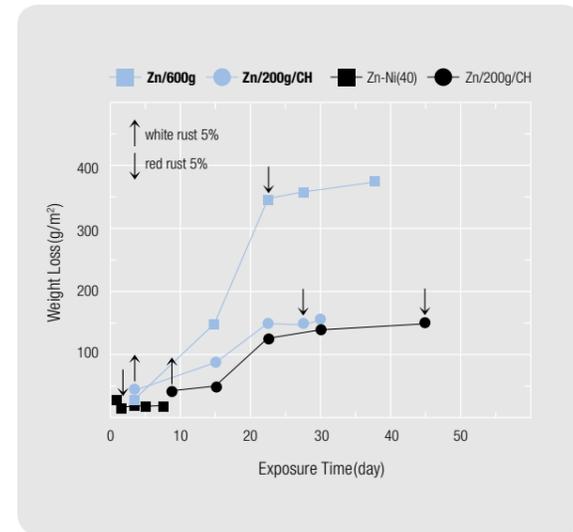


Red Rust Test

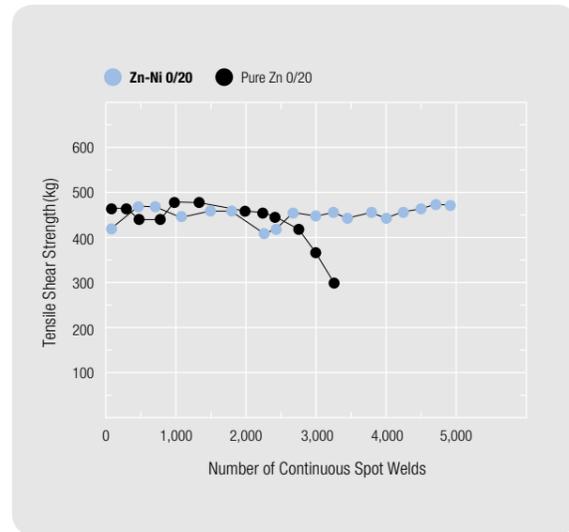


Zn-Ni Alloy Plated Steel Sheets

This product has been developed in order to improve the anti-corrosion durability (to prevent the through-hole corrosion). And also, since the coated layer of this product is solid and has a higher melting point than those of other plated layers by adding some Ni, its coated layer does not easily soften or melt unlike Pure Zn coated layer and it is also possible to conduct a low current welding compared to Pure Zn galvanized steel sheets and has a superior corrosion resistance, which prevents the steel sheets from being corroded for a long period of time.



Corrosion Resistance Comparison :
Pure Zn vs. Zn-Ni



Weldability Comparison :
Pure Zn vs. Zn-Ni

Pure Zn Plating

Characteristics

- Paint Adhesion(Phosphate-treated)
- Corrosion Resistance
(High Corrosion Resistance: Cr-Free)
- Anti-Fingerprint Property
(Anti-Fingerprint Treatment)
- Corrosion Resistance After Painting

Applications

- Inner & Outer Panels of Home Appliances
- Materials for Painted Steel Sheets
- Materials for Architectural Interior & Exterior Works & Metal Furniture

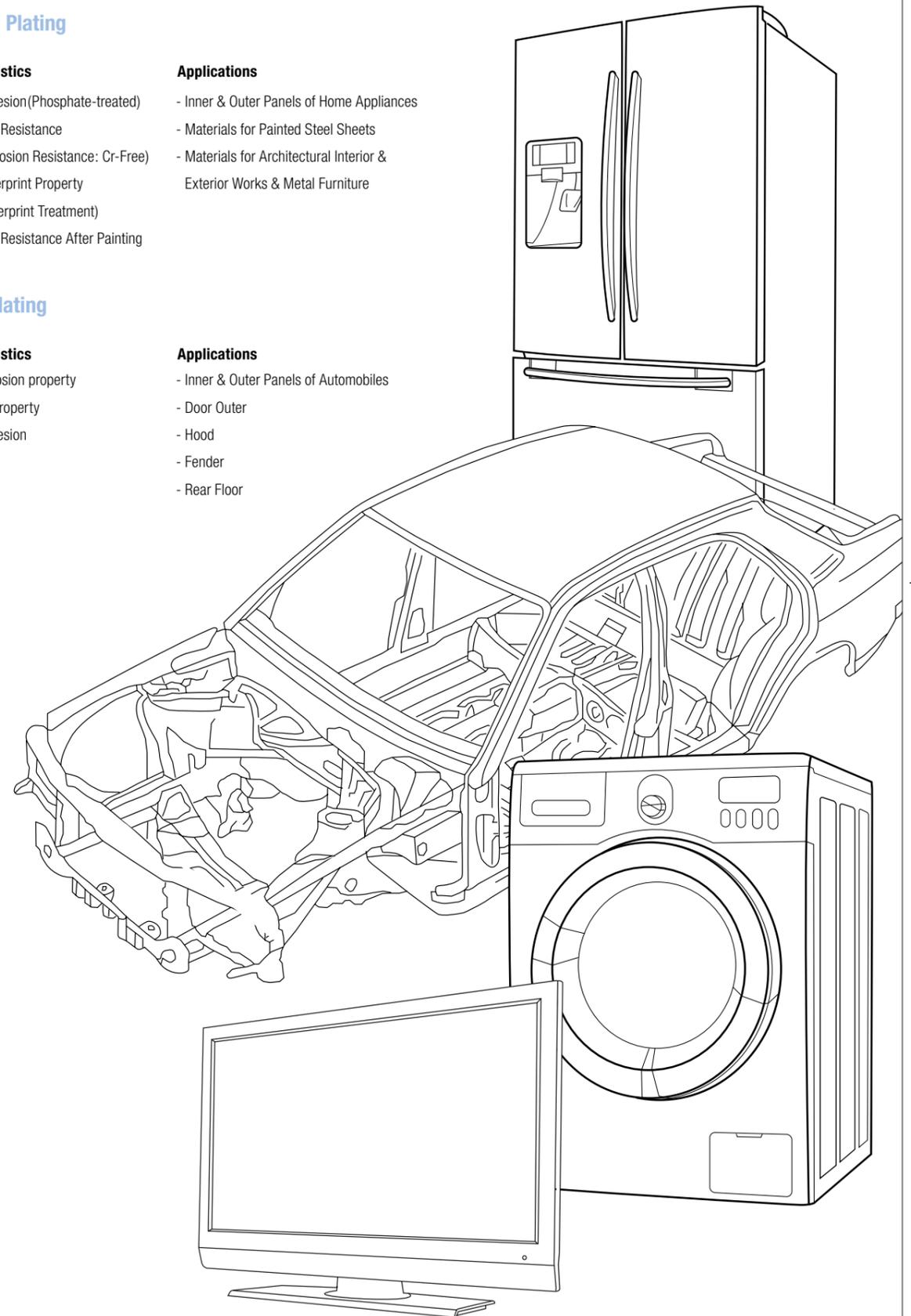
Zn-Ni Plating

Characteristics

- Anti-Corrosion property
- Welding Property
- Paint Adhesion

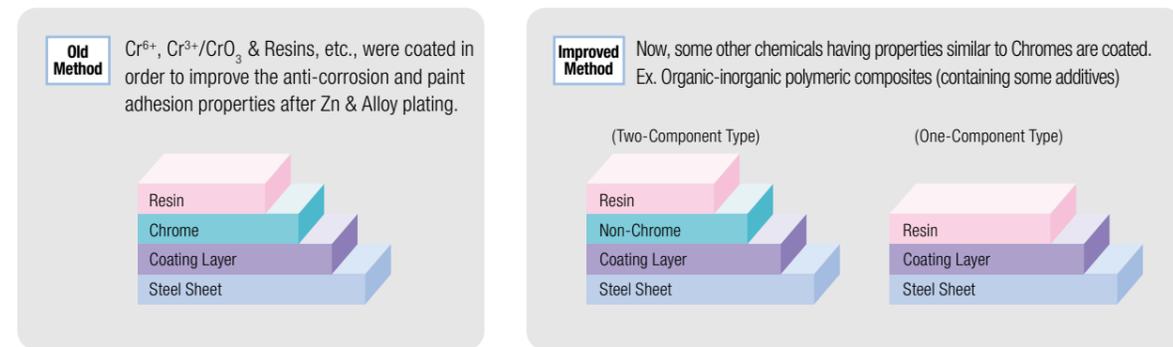
Applications

- Inner & Outer Panels of Automobiles
- Door Outer
- Hood
- Fender
- Rear Floor



Types of Surface-treated Products

Structure of Coated Film



* Cr⁶⁺ (Hexavalent Chrome): It has superior economic efficiency and anti-corrosion property, but is a pollutant fatally damaging a human body that is subject to some environmental regulations.

Post-Treatment Code

Division	Post-Treatment Codes	Full Name	Quality Characteristics
Non-Treated	XX	-	-
Phosphate	PL	Phosphate Light	Paintability
	PM	Phosphate Metallic	Paintability, Corrosion Resistance, Workability
Anti-Finger Printed	AG	Antifinger General	Anti-Fingerprinting Property, Corrosion Resistance, Conductivity
	AL	Antifinger Lubricant	Anti-Fingerprinting Property, Corrosion Resistance, Resistance to blackening-after-processing
	AC	Antifinger Conductivity	Anti-Fingerprinting Property, Corrosion Resistance, Conductivity
	AF	Antifinger Formability	Anti-Fingerprinting Property, Corrosion Resistance, Workability
black resin	BT, BL	-	-
For Fuel Tanks	GX	-	Solvent Resistance, Workability, Paintability

Status of Post-treated Products

Division	Post-Treatment Code	Structure of Coated Layers	Characteristics	Main Usage	Manufacturing Facility Location	
Pure-Zn	EG non-treated steel	XX	Zn Steel	Corrosion Resistance, Smooth surface	Color steel sheets Home appliances/ Components of Furniture	Pohang & Gwangyang
	Phosphate-treated steel	PL PM	Phosphate Zn Steel	Coating adhesion	For painting for separate parts, Home appliances	Pohang & Gwangyang
	AG/AL (Anti-finger General/Lubrication)	AG/AL	resin-based top-coating resin-based bottom-coating Zn Steel	Corrosion Resistance, Anti-Fingerprinting Property	For LCD, For copiers For computer parts	Pohang
	Fingerprint resistant steel	AF (Anti-finger Formability)	Resins for Anti-Fingerprinting Phosphate Zn Steel	Workability formability	For electronic appliances (for deep processing)	Gwangyang
	AC (Anti-finger Conductivity)	AC	Resins for Anti-Fingerprinting Zn Steel	Conductivity	For OA	Gwangyang
Black resin-treated steel		BT BL	Black resin-treated Cr-free bottom-coating Zn Steel Service Coating	Corrosion Resistance, Coating adhesion Color	For exterior surfaces of home appliances	Pohang
Zn-Ni	Non-treated	XX	Zn-10~15% Ni Steel	Raw corrosion resistance, Weldability, Paintability	For interior and exterior surfaces of automobiles and automotive parts	Pohang
	Fuel tanks	GX	Resin Zn-Ni Steel	Gasoline resistance, Weldability, Corrosion Resistance	For automotive fuel tanks, Radiator Support	Pohang

Characteristics of Post-Treated Products

Characteristics of Post-treated Products

Non-Treated

Since some white rust can be formed on the surface of this product without any post-treatments after plating, it should be used right after being delivered.

Oil-Coated

For the purpose of protecting the surface temporarily until the client uses the product, oil is coated on the surface, so it has a strong white rust resistance. Since non-treated steel sheets are easily affected by white rust in general, small amount of oil is coated on the surface of most of steel sheets. However, if a client wants to conduct a sophisticated painting work on the surface of such steel sheets, the surface should be cleaned by skimming off all the oil.

Phosphate-Coated

This coating method is applied to some steel sheets, which are used by clients in order for them to use them after painting without any pretreatments, so, such steel sheets are used for manufacturing some components of industrial electronic appliances, such as air-conditioners, refrigerators & distribution panel cases, etc. It has a superior paintability, but its anti-corrosion property is inferior to that of resin-coated steel sheets like anti-fingerprinted products.

Anti-Fingerprinted

It is a surface treatment method to be done for the purpose of preventing any inferiority like pollution by fingerprints or stains left on the surface of galvanized steel sheets while being dealt with or processed. Due to some organic-inorganic coating treatments, it has some superior properties, such as high corrosion resistance, vivid surface color and high workability, etc.

Products for Fuel Tanks of Automobiles

For a preparation of environmental regulations on Pb-coated products, some eco-friendly, Pb- or Cr-free steel sheets are being developed by replacing the old Pb- or Cr-coated products. Such steel sheets have some superior properties, such as high corrosion resistance and superior workability.

Anti-Fingerprinted Steel Sheets

Types and Quality Characteristics of Anti-Fingerprinted Steel Sheets

Division	Post-Treatment Code	Quality Characteristics					
		Corrosion Resistance	Anti-Fingerprinting Property Solvent Resistance	Workability	Weldability	Conductivity	Paintability Printability
Anti-Finger Printing Property	AG	●	◎	○	○	◎	◎
	AL	●	●	◎	○	◎	◎
	AC	●	◎	○	◎	●	◎
	AF	◎	◎	●	○	—	◎

●: Very Good ◎: Good ○: Ordinary

Application of Anti-Fingerprinted Steel Sheets



Anti-Fingerprinted Steel Sheets

Characteristics of Post-Treated Products

Division	Detailed Assessment Methods	Assessment Criteria*	Assessment Tools
Resin Coating Weight(mg/m²)	Resin Volume Analysis After some plated layers are resolved by some hydrochloric acid	-	ICP, AA, XRF
Anti-Fingerprinting Property(ΔE)	Color Differences before and after coating the white base line	ΔE ≤ 0.5	A Spectrum Color Sensor
Chemical Resistance (ΔE)	Solvency Color Differences before / after rubbing with acetone (A special solution can be used by an order of a client, if necessary)	ΔE ≤ 2.0	A Spectrum Color Sensor
	Alkali Concentration in cleaning solution 5%, 5minutes, 45°C, stirring), Color difference before / after treatments	ΔE ≤ 2.0	A Spectrum Color Sensor
Blackness Resistance(ΔE)	RH 85%, 60°C, 110hrs whiteness before and after a passage of time	ΔL* ≤ 1.5	Hot Humidifier
Corrosion Resistance	Flat side & Ericshen processed point Initial white rusting point	Temporary Rust Resist : ≥24hr Anti-Fingerprint Resist : ≥72-96hr High Corrosion : ≥96-120hr	Salt spray Test
Coat/Print Adhesiveness	Coating/Baking(150°C, 20minutes, 20-25μm) 100wood logs(1mm gap)	Remaining Coating 100/100	Cross-Cutter
Workability (Friction, Blackening)	•Drawing Speed : 1,000mm/min •Bead Radius : R 4.75	Friction Coefficient ≤0.20 Treated Zone : ΔE ≤ 1.5	D. Bead Tester
Conductivity	Surface Resistivity Measurements using	0.2mΩ under	LORESTA-EP, GP
Weldability	•Pressure : 250kgf •Weld Time : 16cycle •Electrode : Cu-Cr(RWMA Class II)	Appropriate Welding Current Range : 5.0-9.0KA	Spot Welder

* The items of basic assessment criteria as general standards of our company can be changed on a client's demand.

■ Corrosion Resistance

■ Parts of Flat Sheet Metal

48hr


72hr


■ Parts of Processed Sheet Metal

48hr


72hr


•Test Solution: De-Ionized Water, Concentration of Solution : NaCl 5±0.5%, Specific Gravity of Solution : 1.0259~1.0329 (at 35°C)
•Test Methods Corrosion Resistance : Specimen Holder, Angle: 20°, Air Saturator Temperature: 47°C

■ Chemical Resistance

*Checking the color difference between the surfaces after conducting a salt spray test (SST) for 48 hours following a chemical solution treatment

■ Perspiration Resistance

- Artificial Perspiration (ph : 4.5)
- NaH₂PO₄ 12H₂O 8g+NaCl 8g+Acetic acid 5g

■ Alkaline Oil Skimming

- Solution: Concentration of Skim Off Solution: 5%
- Treatment Conditions : 45°C 5min Spray






■ Solvent Resistance*

*As a special analysis item, checking the color difference between the surfaces after conducting a salt spray test (SST) following a rubbing process with the relevant solvent

■ Benzene




■ White Gasoline




■ Non-Washed Oil

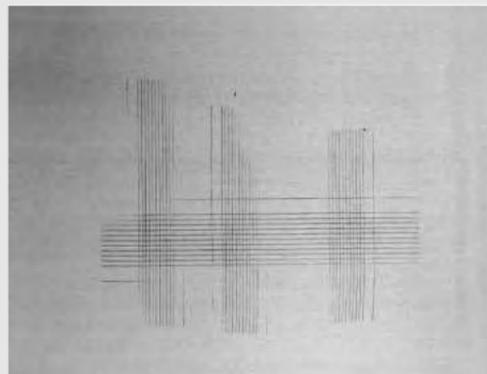



Anti-Fingerprinted Steel Sheets

■ Paintability / Printability

■ Evaluation of Paintability

- Type of Paint : Melamine-Alkyd
- Painting Method : liquid spray painting
(Baking Temperature : 175°C×20min, Membrane : 20μm)



■ Evaluation of Printability

- Type of Paint : Seiko1300EX, 1400CEX ink
- Painting Method : Silk Screen Printing
- Adhesion Assessment (/Test) Method:
After a salt spray test (SST), a tape peel-off test



■ Workability

■ Friction Coefficient Measurement

- Friction Testers
- Frictions Tester Requirements
Load : 600kgf(0.5kgf/mm²)
Speed : 1,000m/min
Distance : 100mm



■ Blackening Resistance property on Frictional Surface

- Testing the Surface Color Differences after a Draw Bead Test
- Color Differences between the Surfaces processed according to the quality control standards: $\Delta E \leq 1.5$

Old Cr-Coated Products
(Friction Coefficient: 0.3)



Cr-Free
(Friction Coefficient: 0.08)



■ Conductivity

■ LORESTA-GP, EP

- Average Value of Measurements at 9 companies (offices, stores) using the products



■ Weldability

■ Assessment Method for Welding Current Range

- Fracture Shapes and Existence of Splashes on the Welded Part after a Tensile Test

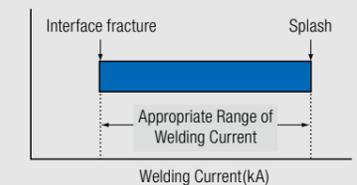
■ Assessment Method for Electrode Lifespan

- Maximum Number of Weld Points (Nugget Diameter: more than 5√t) with which the base metal was not fractured after conducting a tensile test by a 100 welding points gap up to 2,000 welding points.



〈AC Spot Welder : 75kVA〉

Electrodes	Welding Conditions
Cu-Cr (RWMA Class II)	<ul style="list-style-type: none"> - Current : 6~12.5kA - Pressure : 250kgf - Weld Time : 16 cycle



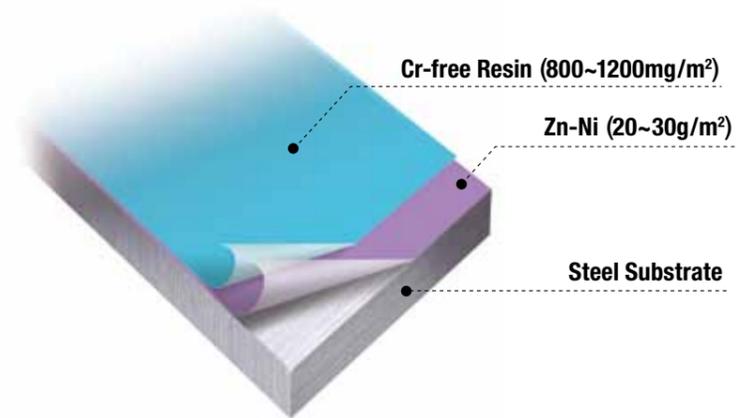
■ Results of Weldability Test

Division	General Cr-Free Products	High-Speed Welded Cr-Free Products
Welding Current	5.0~9.0kA	6.5~11.5kA
Number of Weld Points	800~1,500	Over 1,500 Weld Points

Main Usage

Environmental restrictions on Pb compounds preclude the use of traditional Pb-Sn plating methods for automotive fuel tanks. This eco-friendly Cr-free product was developed as a replacement of Pb, Pb-Sn Plating Product.

Structure of Galvanized Layers



Quality Characteristics

Division	Gasoline Corrosiveness	Paintability	Workability (Friction Coefficient)	Weldability		Corrosion Resistance SST(600h)
				Spot	Seam	
Improvement(Cr-free)	○	○	0.121	5.2~8.2kA	12~16kA	Red Rust < 1%
Previous(Pb-Sn)	○	△	0.133	6~8kA	13~16kA	Red Rust < 1%

Available Sizes & Mechanical Properties

Division	POSCO		Bend Test	
	Pure-Zn	Zn-Ni	Bend Angle	Radius of Flexure
Class 1	EGSC	ENSC	180°	Completely Contact
Class 2	EGSD	ENSD		
Class 3	EGSP	ENSP		
	EGSN	ENSN		
Structural Quality*	EGSE	ENSE		2.0 Times the Sheet Thickness
	EG37	EN37		2.0 Times the Sheet Thickness
High Tensile Steel*	EGCHSP60TR	ENCHSP60TR	Completely Contact	
	EGCHSP35R	ENCHSP35R		
	EGCHSP40R	ENCHSP40R		
	EGCHSP35E	ENCHSP35E		
	EGCHSP38E	-		

Note) *Marked Dimensions should be determined after an advance consultation with us.

POSCO			Corresponding Dimensions		
Mechanical Properties			Notes	JIS/KS	ASTM
YP(Mpa)	TS(Mpa)	EL(%)			
-	≥270	≥37	Shallow Drawing Quality	SECC	A591-CQ
-	≥270	≥28	Drawing Quality	SECD	A591-DQ
-	≥270	≥40	Deep Drawing Quality	-	-
-	≥270	≥40	Non-aging Deep Drawing Quality	SECE(N)	A591-DQSK
-	≥270	≥46	Non-aging Extra-Deep Drawing Quality	-	-
(≥270)	≥360	≥20	Structural Quality(37kg Grade)	-	-
≥350	≥590	≥17	Commercial Quality(60kg Grade)	-	-
≥180	≥340	≥34	Drawing Quality(35kg Grade)	-	-
≥220	≥390	≥31	Drawing Quality(40kg Grade)	-	-
≥160	≥340	≥34	Deep Drawing Quality(35kg Grade)	-	-
≥200	≥370	≥33	Deep Drawing Quality(38kg Grade)	-	-

Note) 1. It is necessary to consult with us for the value in the ().
2. Please consult with us additionally, if you want some high tensile steel sheets in the corresponding dimensions.

POSCO Specifications

KS & JIS Standards

Two types of zinc coating weights, that is, the same weight on both sides and differentiated weights on each side, are applied to the steel sheets and steel coils. The standard and minimum Zn coating weights are marked with a code combining the coating weight of each side while dividing two weights with a slash (/). The marking methods are as follows.

For Steel Sheets

Minimum coating weights on the "top/bottom" sides (e.g.: E16/E16)

For Steel Coils

Minimum coating weights on the "outer/inner" surfaces of coil (e.g.: E8/E16)

When attaching a label indicating an application of "differentiated coating weights" on two sides of the steel sheets or coils, a letter "D" is written after the minimum coating weight code on the surface with the label. (e.g.: 30/10D)

Zn Coating Weight Marking Codes	Minimum Zn Coating Weight (One Side)		Standard Coating Weight	Corresponding Zinc Thickness(mm) / One Side
	Both-Sided Coating	Single Side, Differential Galvanizing		
EB	2.5	-	3	0
E8	8.5	8.0	10	0.001
E16	17.0	16.0	20	0.003
E24	25.5	24.0	30	0.004
E32	34.0	32.0	40	0.005
E40	42.5	40.0	50	0.006

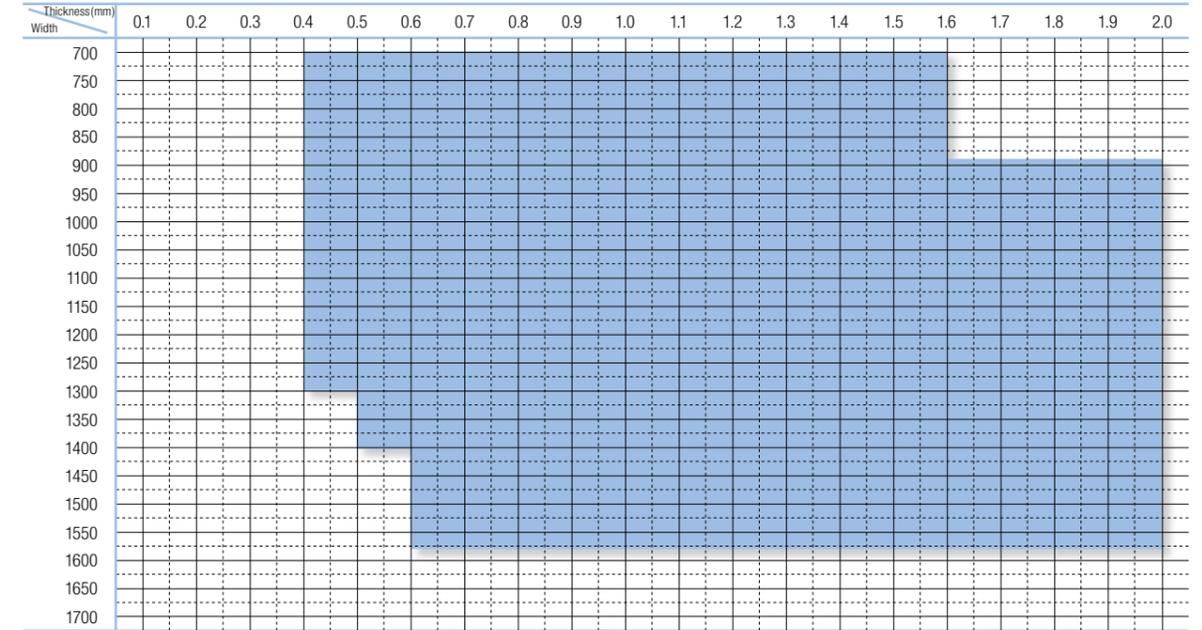
Note 1. Coating Weight Marking Codes exceeding 1.40g/m² and Minimum Coating Weight are determined with an agreement between an orderer and a manufacturer.
2. The thickness codes of Electro-galvanized steel sheets are written down to the first place below decimal point by using the Zn Content level, 7.1g/cm², referring to KSA 0021 (the Rounding-off Method).

ASTM Standards

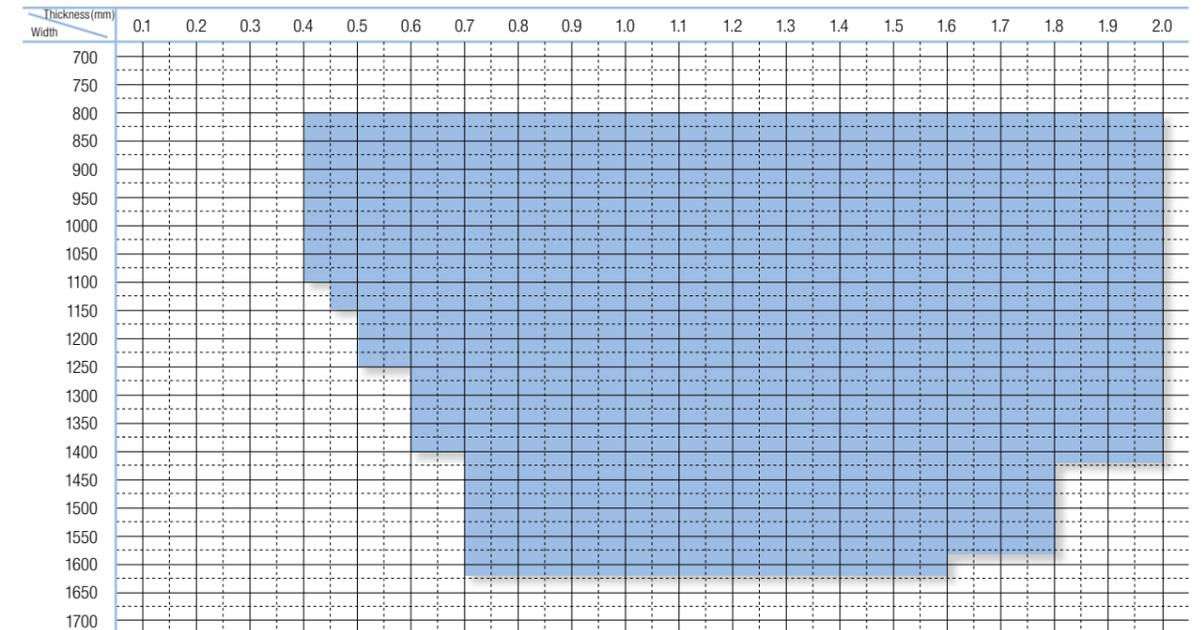
Division	Minimum Value (3) Points		Minimum Value (1) Points	
	Coating Weight Both Side		Coating Weight Both Side	
	oz/ft ²	g/m ²	oz/ft ²	g/m ²
A	-	-	-	-
B	0.08	24	0.07	22
C	0.16	48	0.15	0.003

Available Dimensions

Pohang



Kwangyang



Size Tolerances

⚠ The size tolerances are based on the standards of KS and JIS.
When you demand some different sizes from those specified below, it is necessary to consult with us in addition.

Thickness Tolerances

(Unit : mm)

Thickness \ Width	Thickness Tolerances				
	less than 630	over 630 up to 1,000	over 1,000 up to 1,250	over 1,250 up to 1,600	over 1,600
over 0.25 below 0.40	±0.04	±0.04	±0.04	-	-
over 0.40 below 0.60	±0.05	±0.05	±0.05	±0.06	-
over 0.60 below 0.85	±0.06	±0.06	±0.06	±0.06	±0.07
over 0.85 below 1.00	±0.06	±0.06	±0.07	±0.08	±0.09
over 1.00 below 1.25	±0.07	±0.07	±0.08	±0.09	±0.11
over 1.25 below 1.60	±0.08	±0.09	±0.10	±0.11	±0.13
over 1.60 below 2.00	±0.10	±0.11	±0.12	±0.13	±0.15
over 2.00 below 2.30	±0.12	±0.13	±0.14	±0.15	±0.17

Note) 1. Thickness tolerance is applied by adding the Zn thickness to the ordered thickness.
2. A measuring point can be placed anywhere within 15mm inside the edge.
3. In case of using some cold-rolled base metal sheets.

Width Tolerance (of mill edges)

(Unit : mm)

Width	Base Metal Sheets	Cold Rolled Sheets
	less than 1,250	
1,250 over		10 0

Length Tolerance

(Unit : mm)

Length	Base Metal Sheets	Cold Rolled Sheets
	less than 2,000	
over 2,000 less than 4,000		+15 0
over 4,000 less than 6,000		+20 0

Maximum Flatness Tolerance

(Unit : mm)

Width	Deformation	Wave	Edge Wave	Center Wave
		less than 1,000	12	8
over 1,000 less than 1,250	15	9	8	
over 1,250 less than 1,600	15	11	8	
over 1,600	20	13	9	

(In case of using some cold-rolled base metal sheets)

Maximum Straightness Tolerance

(Unit : mm)

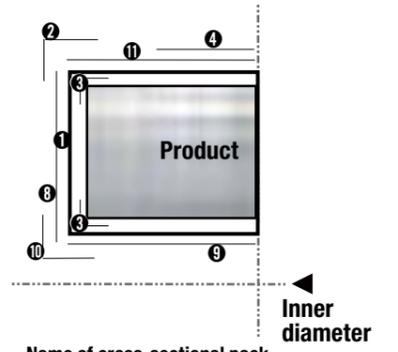
Width	Length	Sheet		Coil
		less than 2,000	over 2,000	
less than 630		4	4 in an arbitrary length of 2,000	
over 630		2	2 in an arbitrary length of 2,000	

(In case of using some cold-rolled base metal sheets)

Packing



Name of outer pack



Name of cross-sectional pack

Inner diameter

NO	Name	Material
①	PP VCI WRAP	VINYL
②	OUTER RING	STEEL
③	CORNER WRAP	ANTI-RUST BOARD
④	OUTER PROTECT BOARD	STEEL
⑤	HORIZONTAL BAND	STEEL
⑥	CENTER BAND	PET
⑦	VERTICAL BAND	STEEL
⑧	SIDE BOARD	PLASTIC
⑨	INNER PROTECT BOARD	PLASTIC
⑩	INNER RING	STEEL
⑪	OUTER PROTECT BOARD	ANTI-RUST BOARD

* Packing Type and materials are changeable.



Ordering Information / Cautions on Use

When you place an order, please check the following matters according to the main uses of the products.

Product Name & Dimensions Please select the appropriate product name and dimensions depending on the main purposes of the relevant product referring to this catalog.

Usage, Post-Treatment It is very important to designate some appropriate post-treatment methods depending on the quality emphasized and the environments to use since we control the quality appropriately to each purpose of use.

Coating Weight Please select a coating weight appropriate according to the required corrosion resistance level, conditions to use and the processing method. In case of highlighting its corrosion resistance property, please select post-treated plating method and in case of emphasizing workability, select a foil plating method.

Oiling Please select either method of an oiling with anti-rust oil or no-oiling. Please select an oiling method in order to improve an interim anti-rust property and reduce any fingerprinting contamination or damages while in use. Since some white rust can be formed on the surface of a product without oiling, please handle them carefully while keeping in mind of the Cautions given below.

Dimensions The available dimensions to be manufactured are based on the standard thickness, width and length specified by the KS, JIS and ASTM Standards and the other dimensions are available by a tolerance of 0.05mm for thickness and 1mm for width and length on demand.

EDGE Please designate either a mill or slit edge type according to the conditions to use. Especially, for a product with which a stern controlling of the width is required, it is recommended to select a slit edge type.

Packaging Weight Please select the maximum net weight for steel coils (if necessary, minimum net weight) according to your unloading capability or work conditions.

- Sheet Metal: Over 3 tons incl.

- Sheet Coils: A tonnage between 5 and 30 tons

In other cases, it is required to consult with us.

In addition, the average net weights of the products, which are actually delivered, are determined based on the relationship between the maximum net weight and the dimensions.

Inner & Outer Diameters In case of steel coils, please designate the exact inner & outer diameters according to the specifications of an un-coiler equipped into your shear line system.

Inclusion of Pickled Weld Seam In some cases of cold-rolled galvanized steel sheets, a weld seam or zone is sometimes included during the pickling process. If it is difficult depending on the usage, please designate non-inclusion of any pickled weld seam or zone in advance. But, in this case, the size of steel coil is limited.

Dimensional Tolerance(Thickness, Width and Length) However, there are some cases that some specifications should be strictly met according to the conditions to use, such as precision in assembly and of components, etc. In case of such a demand, please check the specifications in advance by consulting with us.

Electro-galvanized steel cannot deliver the robust quality and performance expected unless handled in the proper manner. Please take care to heed the following guidelines during use.

Surface management Please be cautious not to damage or mar the surface during transit or manufacturing.

Processing Please take sufficient care of the processing environment. Refrain from processing steel at high temperature or in areas with high concentrations of toxic or corrosive fumes.

Storage Please store steel in a dry place. Do not store the steel where it may be exposed to moisture or where temperature changes are large. Please avoid outdoor storage as this accelerates rust formation.

Inventory Period To the extent possible, please minimize the duration of storage of your stock.

ELECTRO GALVANIZED STEEL

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AUTOMOTIVE STEEL





POSCO provides automotive steel to world-class car makers in Japan, America and Europe as well as the Korean home market. All our products undergo strict quality certification processes which serve as a guarantee of their high quality. By serving the needs of our customers through new steelmaking technology and the development of specialized products, POSCO is solidifying its status as "the leading global manufacturer of automotive structural materials."

AUTOMOTIVE STEEL

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Introduction of Steelworks



Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Gwangyang Steelworks is the world's largest integrated steel mill. It features an optimal plant layout with carbon steel processing and high-mill processing capabilities, producing automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.

With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products hot-rolled steel, plate, cold-rolled steel, car steel, API steel, etc.

Crude steel production 20.231 million tons (as of 2013)

The POSCO Quality

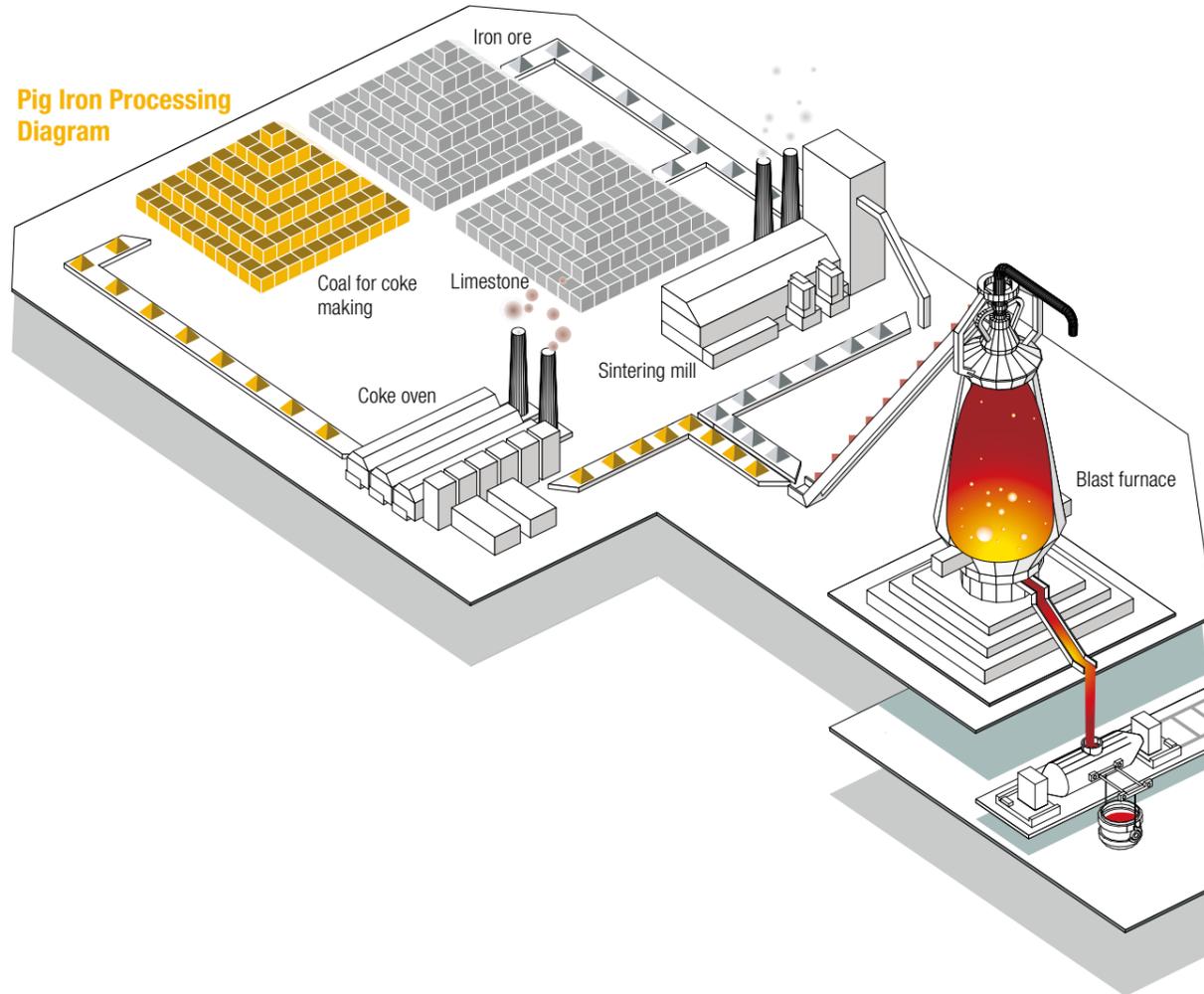
Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.

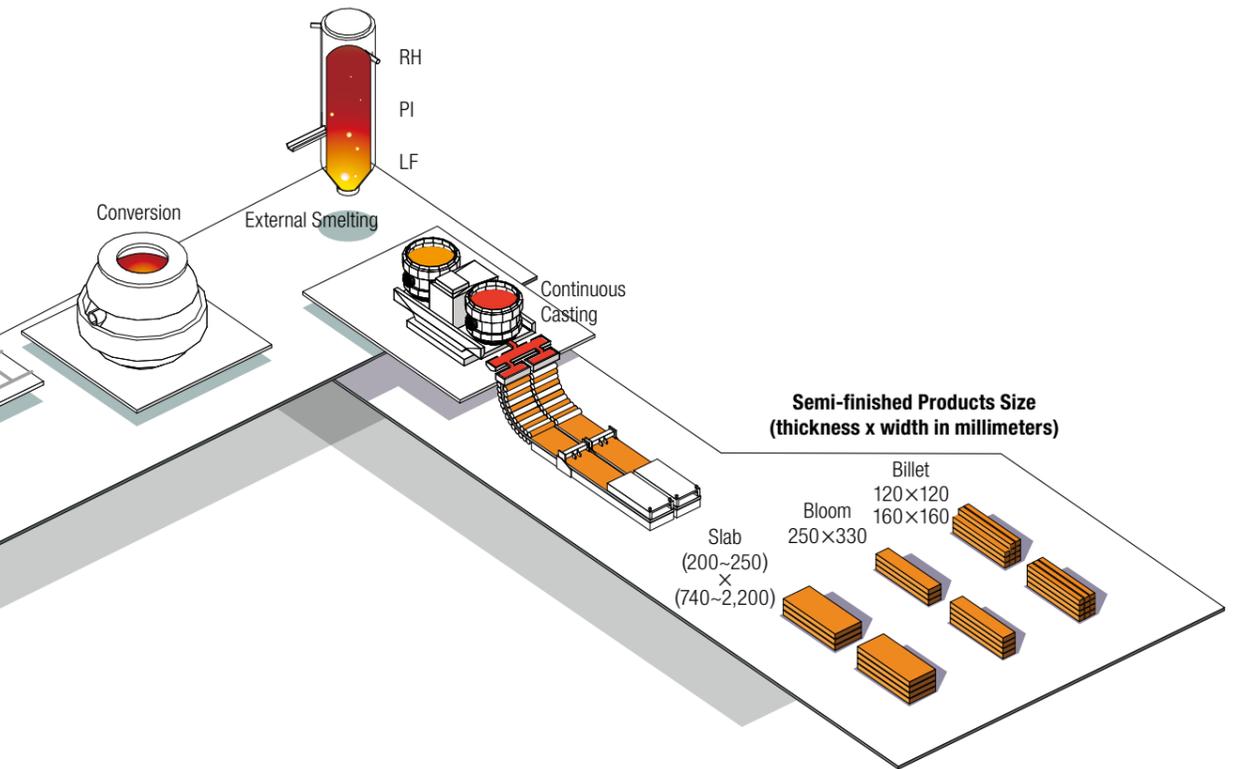


Manufacturing Processes

Pig Iron Processing Diagram



Steelmaking/Continuous Casting Processes



Stages of Pig Iron Processing in Detail

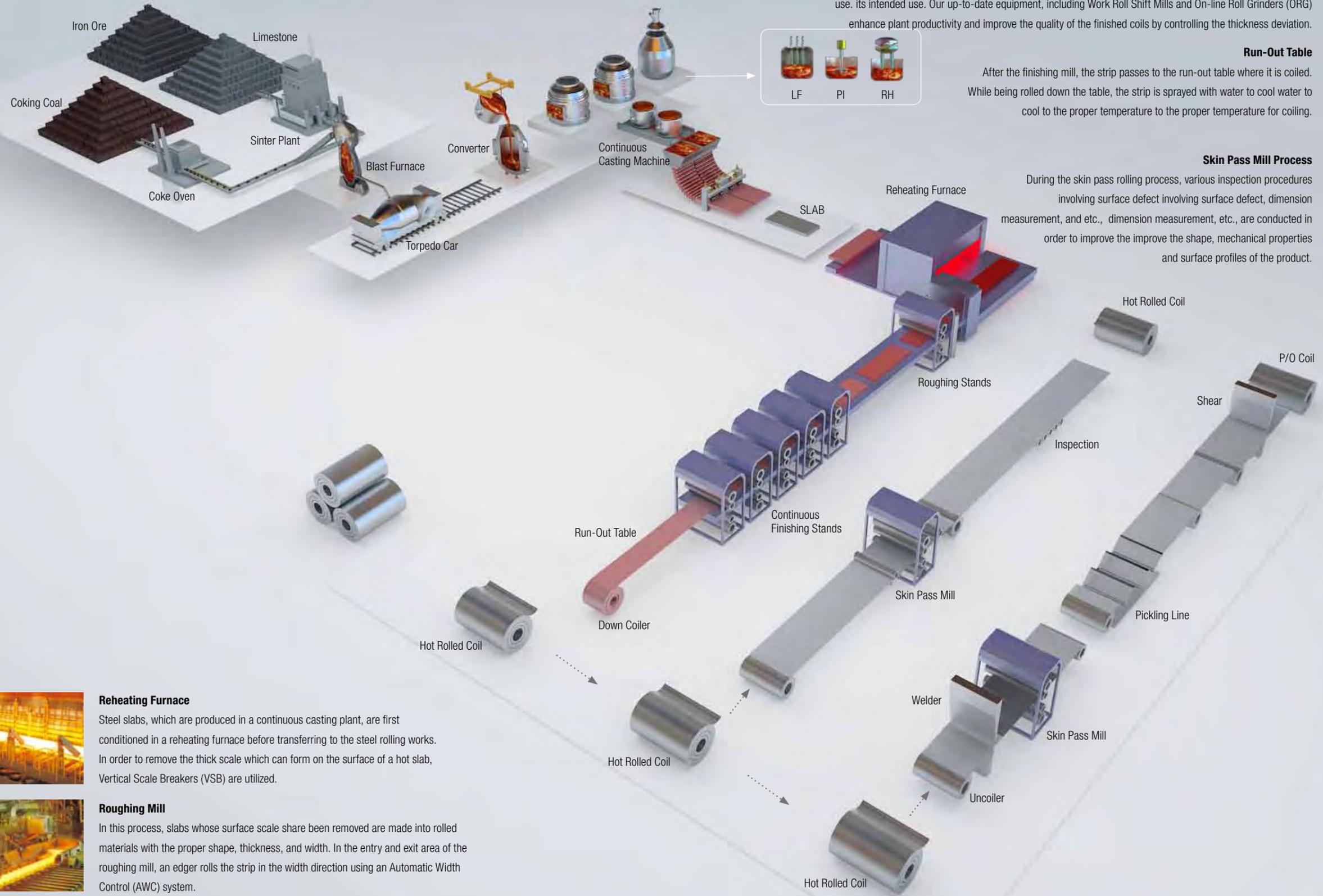
Process	Description
Sintering	Iron ore, the main ingredient in steelmaking, is sorted by size into subgroups such as pelletized ore (10~25mm), lump ore (larger than 25mm), and fine ore (less than 10mm). After being crushed and sorted at the raw material factory, lump ore is sent to post-processing facilities in the form of pelletized or fine ore.
Fuel treatment	Limestone and powdered coke are mixed with fine ore, which is produced from crushing lump ore. The mixture is first heated at about 1,200°C, cooled, and then crushed into sintered ore of 10~50mm granule dimensions. - Operating facilities: five in Pohang and four in Gwangyang
Coke treatment	Coke is produced by heating various coals over 1,000°C to remove water and ash. The suitable grain size of coke to be used in blast furnaces is 25~75mm considering air permeability and chemical reactivity. - Operating facilities: five in Pohang and four in Gwangyang
Blast Furnace	Sintered ore, lump coke and other powdered raw materials are introduced at the top of the furnace in multiple stages. Then, the bottom of the furnace is brought up to a temperature of about 1,100°C to heat the coke/iron ore mixture, inducing a reduction reaction to produce molten iron. - Operating facilities: six in Pohang (including the first COREX furnace) and five in Gwangyang

Steelmaking/Continuous Casting Processes

Process	Description
Converter	- Molten iron in the furnace is converted to molten steel by adding oxygen, and Impurities are removed during this process. - Pohang: 3 converters of 100-ton capacity each at the 1st steelmaking plant, 3 converters of 300-ton capacity each at the 2nd steelmaking plant - Gwangyang: 3 converters of 250-ton capacity each at the 1st steelmaking plant, 3 converters of 250-ton capacity each at the 2nd steelmaking plant
Additional Refining Facilities	These processes remove impurities and make subtle adjustments to the chemical composition of the molten steel product of the converter.
	RH - Acronym for Reinstahl Hutenerwerke & Heraus - Ar or N ₂ is blown into the molten steel ladle to remove an impurity in this process, hydrogen gas, and to separate and raise non-metallic inclusions to the surface. - Decarbonizing can be accomplished by adding an oxygen injection process.
	PI - Powder injection - Through a lance, powders such as Ca-Si are injected to remove sulfuric elements. Non-metallic inclusions are separated and then raised to the surface by stirring the bottom of the molten steel volume.
LF	- Ladle Furnace - During this process, a high current electric arc is used to increase the temperature of the molten steel.
Continuous Caster	- Molten steel, which has undergone external refining processes (RH, PL and LF), is poured into molds to produce specific desired shapes. Intermediate products such as slabs, blooms, and billets are produced.

Manufacturing Processes & Equipment (Hot Rolling)

In order to deliver quality products, meeting customer's requirements, POSCO is equipped with the latest fully-automated computer controlled cutting edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Finishing Mill

The purpose of finishing rolling is to adjust the thickness and width of a coil to the specified dimensions and to produce a smooth surface and shape at a desired finishing temperature appropriate for its intended use. Our up-to-date equipment, including Work Roll Shift Mills and On-line Roll Grinders (ORG) enhance plant productivity and improve the quality of the finished coils by controlling the thickness deviation.



Run-Out Table

After the finishing mill, the strip passes to the run-out table where it is coiled. While being rolled down the table, the strip is sprayed with water to cool water to cool to the proper temperature to the proper temperature for coiling.



Skin Pass Mill Process

During the skin pass rolling process, various inspection procedures involving surface defect involving surface defect, dimension measurement, and etc., dimension measurement, etc., are conducted in order to improve the improve the shape, mechanical properties and surface profiles of the product.



Reheating Furnace

Steel slabs, which are produced in a continuous casting plant, are first conditioned in a reheating furnace before transferring to the steel rolling works. In order to remove the thick scale which can form on the surface of a hot slab, Vertical Scale Breakers (VSB) are utilized.

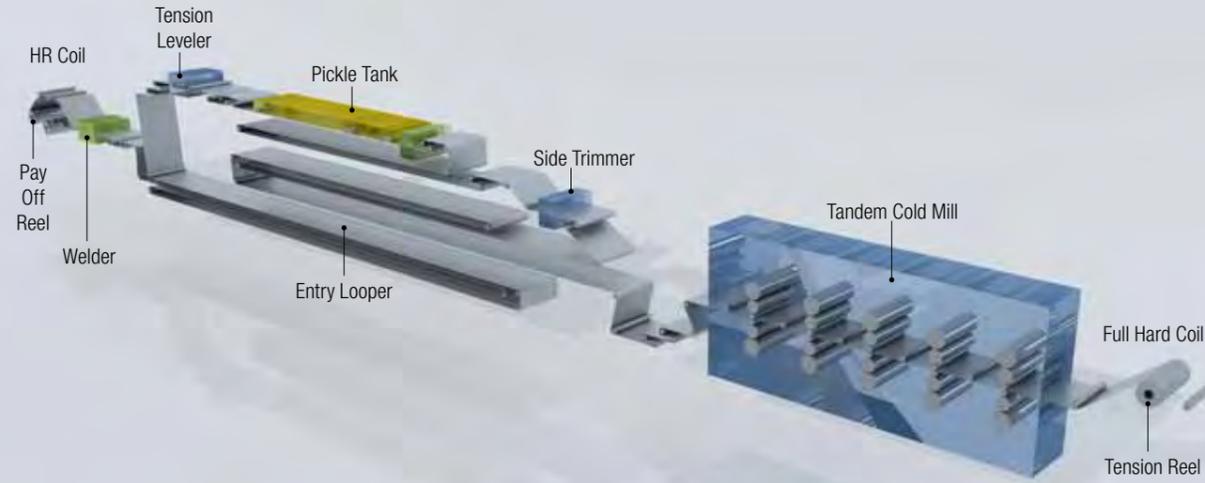


Roughing Mill

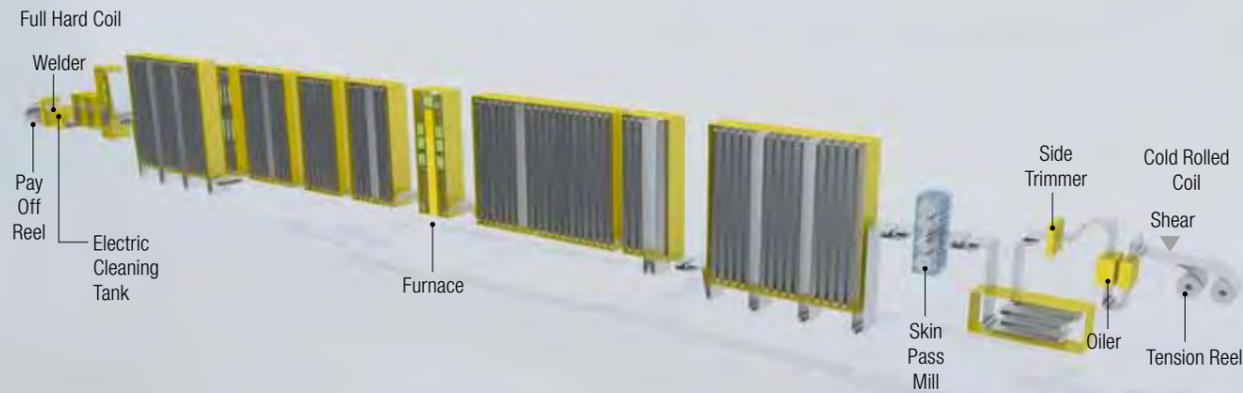
In this process, slabs whose surface scale have been removed are made into rolled materials with the proper shape, thickness, and width. In the entry and exit area of the roughing mill, an edger rolls the strip in the width direction using an Automatic Width Control (AWC) system.

Manufacturing Processes & Equipment (Cold Rolling)

PL/TCM (Pickling Line and Tandem Cold Mill)



CAL (Continuous Annealing Line)



Pickling

The hot-rolled coil passes through a pickling line, where scale breaker machines and hydrochloric acid solutions are used to remove surface scale and oxide film, which cause surface flaws during the final stage of cold rolled steel processing.



Cold Rolling

Pickled coils are cold rolled in tandem mills to a specified thickness, typically 40–90%, of original material dimensions. Fully automated thickness and shape adjustment is ensured through state of the art process machinery.



Electrolytic Cleaning

The purpose of electrolytic cleaning is to remove lubricant oil and contaminants on the cold rolled steel prior to the annealing process. All traces of surface oil are removed through mechanical and chemical action as the cold rolled coil passes through an alkaline solution bath.



Annealing

After cold-rolling, the steel is hard and brittle, and its grains are elongated in the rolling direction. To obtain the desired grain structure and improve the mechanical properties, the material is reheated in a furnace and subjected to cycles of rapid heating and cooling. Steel products with extra deep drawing qualities and high tensile strength can be produced via this high productivity manufacturing method. Two annealing methods are commonly used: batch annealing and continuous annealing.



Temper Rolling

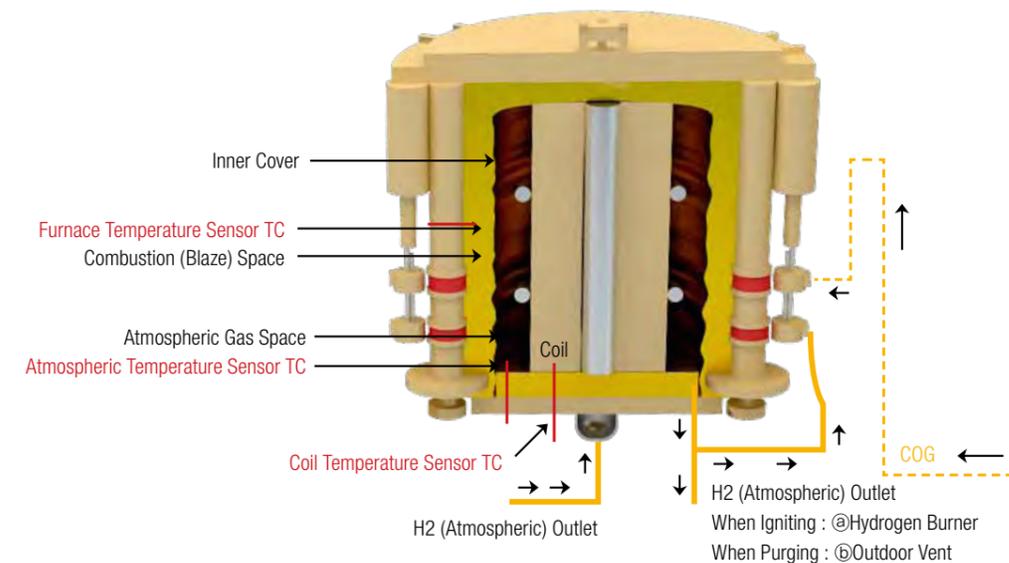
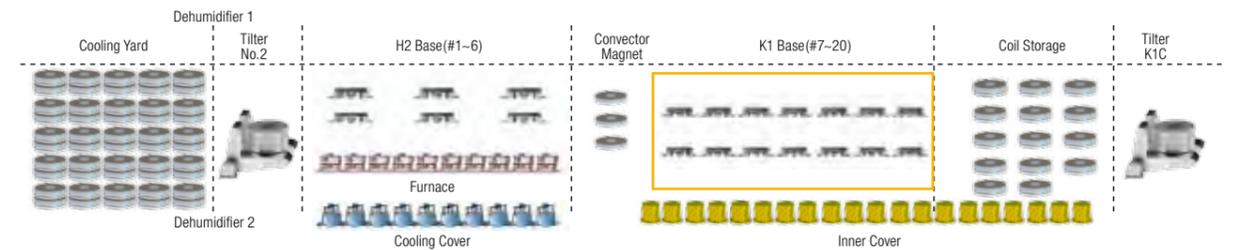
A final rolling process is performed in order to remove minor surface defects such as stretch marks and to produce a smooth, lustrous surface. Temper rolling results in a further thickness reduction of about 1%.



Finishing and Inspection

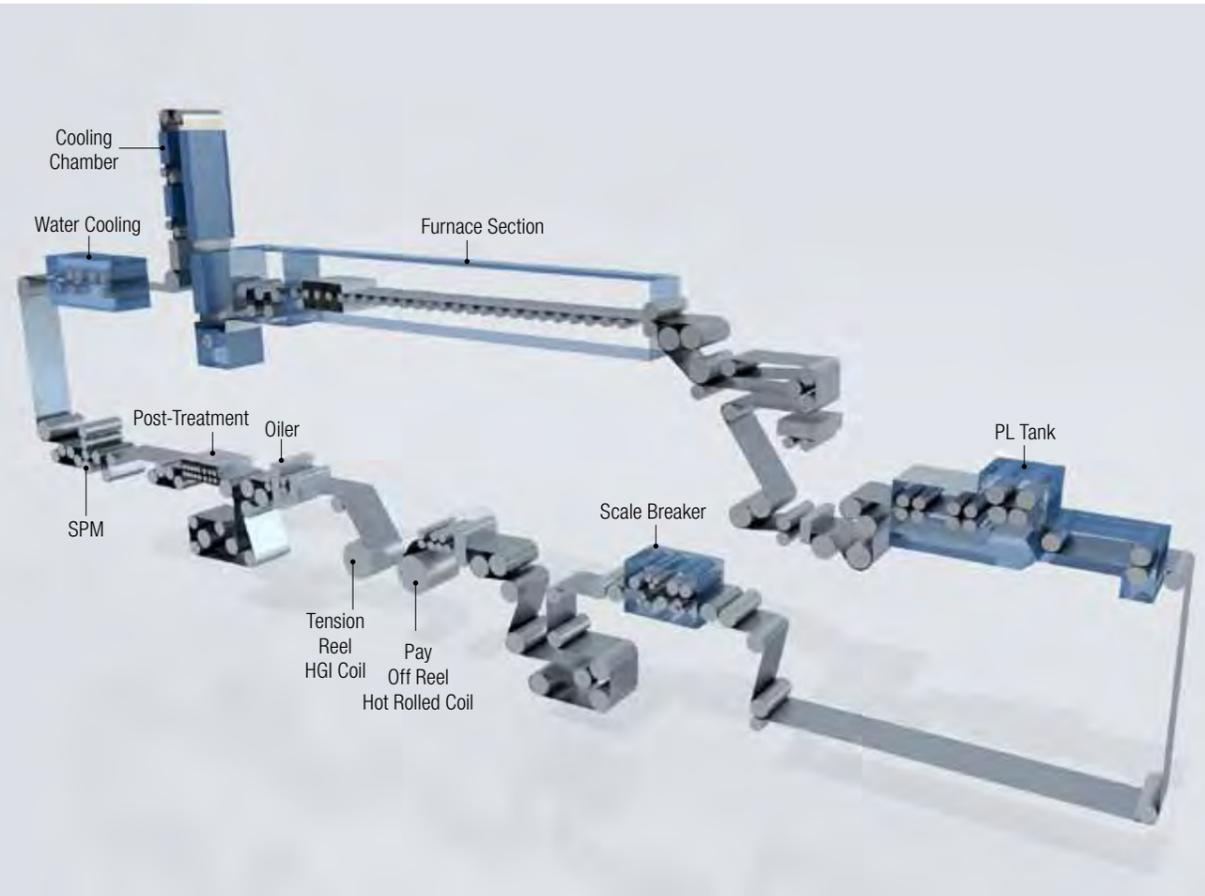
During this final stage of manufacturing, cold rolled strips are trimmed to customer specified size. The finished product is subject to final inspection, where thickness, width and surface quality are verified. Samples are sent for laboratory testing of mechanical properties as appropriate for specific end use.

BAF (Batch Annealing Furnace)



Manufacturing Processes & Equipment (Rolling)

Pickled & Hot-dipped Galvanized Steel (HGI) Manufacturing Processes



Electrolytic Cleaning
Residual rolling oil and other contaminants remain on the surface of cold-rolled steel sheets following processing. These are removed by passing the electrically charged sheet through an alkaline solution which induces an electro-chemical reaction.



Galvannealing
The surface of steel sheet can be coated with a Zinc compound prior to reheating in an annealing process. Zn atoms diffuse into the Fe to create a Zn-Fe series alloy. This process is referred to as Galvannealing.



Annealing
The material properties of pre-treated steel sheet can be altered and improved through re-crystallization during the annealing process.



SPM & Chemical Treatment
In order to achieve a flat surface and elegant finish, the steel sheet is processed with a skin pass mill. In order to prevent the occurrence of white rust, which often forms on the surface of activated Zinc, and to improve corrosion resistance, the surface is coated with a Cr-free resin.

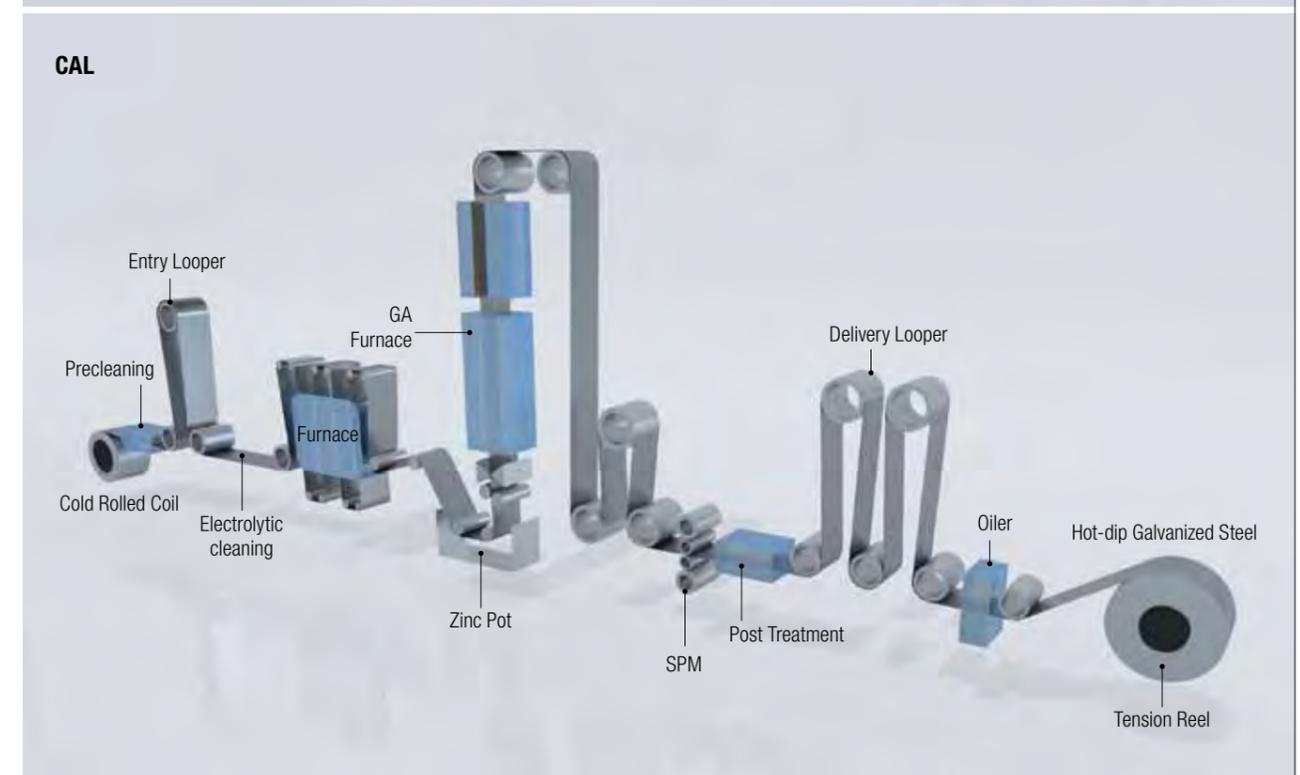
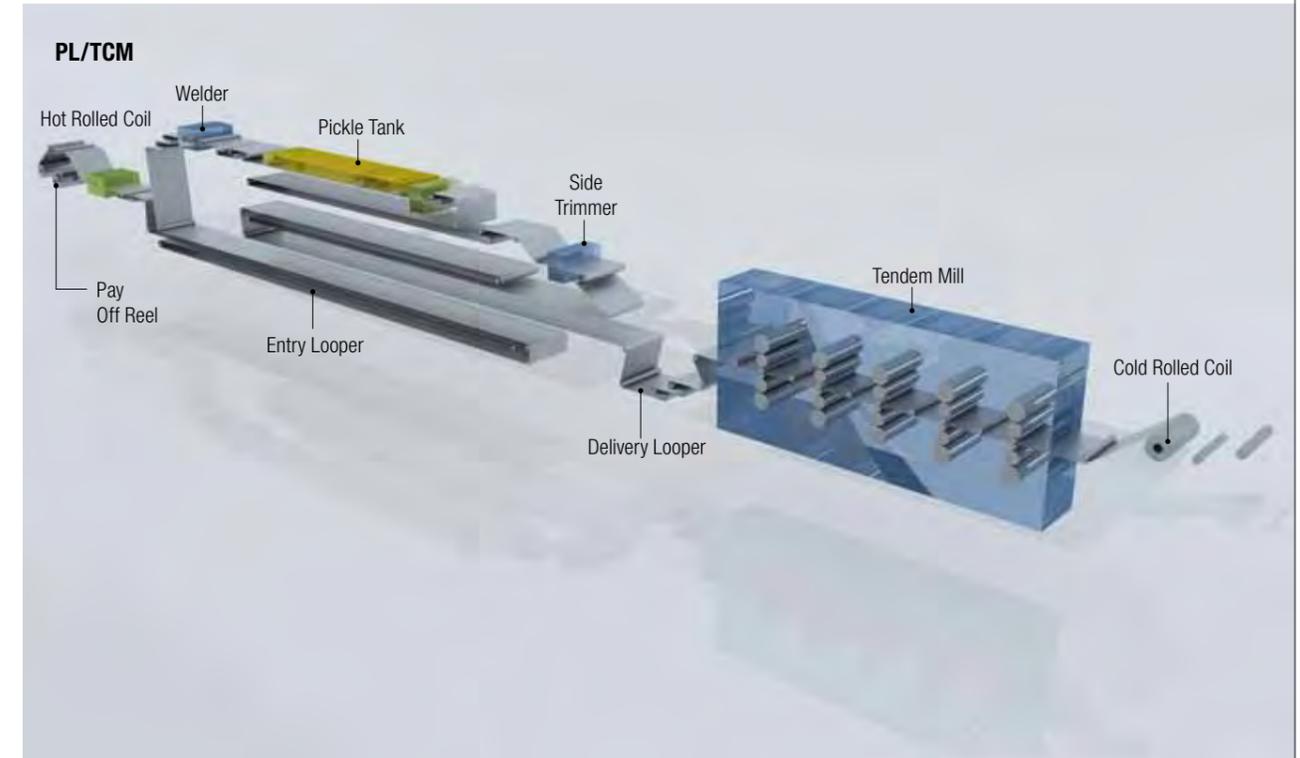


Hot-Dip Galvanizing
After passing through the annealing furnace, steel sheet is dipped into a Zinc pot where molten Zinc is coated onto the surface. The desired coating weight is achieved by removing excess Zinc before solidification with high pressure air from an air knife.



Inspection & Coiling
Located at the line's exit section are a side trimmer, inspection table and oil coating equipment. At this station all products are inspected and judged relative to material specifications required by the client.

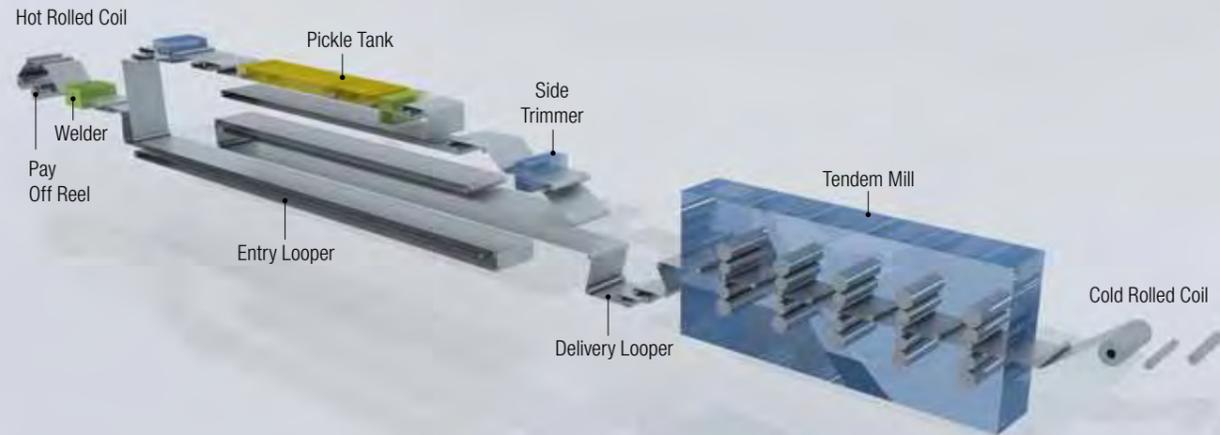
Hot-dip Galvanized Steel (GI, GA) Manufacturing Processes



Manufacturing Processes & Equipment

Electro-Galvanized Steel (EGI) Manufacturing Processes

PL/TCM



Input Process

Equipment at the entry point of the electrogalvanizing line consists of a Pay-off Reel, Shearing M/C, Welding M/C, Looper, and Tension Leveler.



Pre-Treatment Process

An electrolytic cleaning line consists of an electrolysis tank, an acid bath, and a rinse tank to remove contaminants and oxide films from the surface of the steel before electroplating.



Electric Galvanizing Equipment

POSCO produces electro-galvanized steel sheet using the LCC-H (Liquid Cushion Cell-Horizontal) galvanizing process. In this process, the steel is coated on both sides simultaneously as it passes horizontally through the line.



Phosphate Thin-Film Coating Process

A phosphate thin-film is applied to the surface of the zinc layer through chemical or electro-chemical reactions. The film is intended to provide temporary anti-corrosion protection and to generate a secure painting substrate.



Anti-Fingerprinting Process

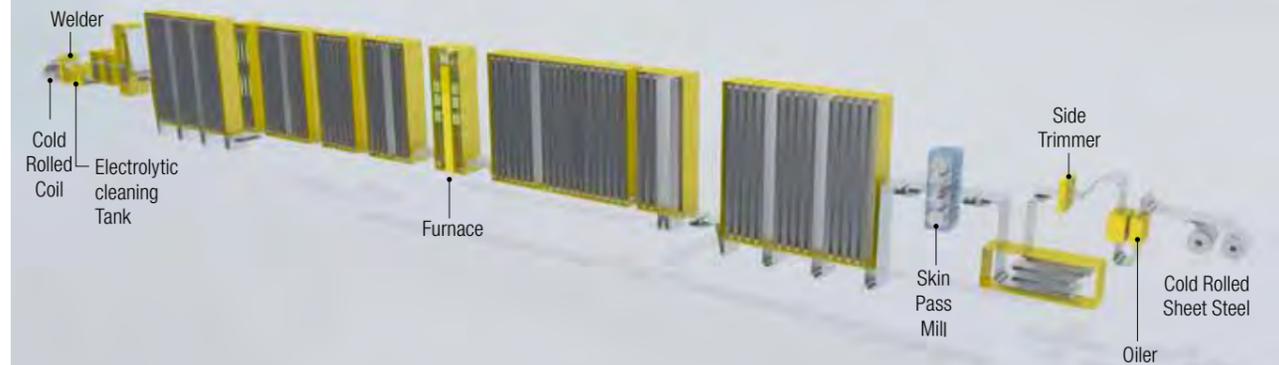
An organic, inorganic, or organic-inorganic hybrid film is applied to the surface of sheet steel in order to supplement its corrosion resistance and to enhance desirable properties such as resistance to fingerprint marks and workability.



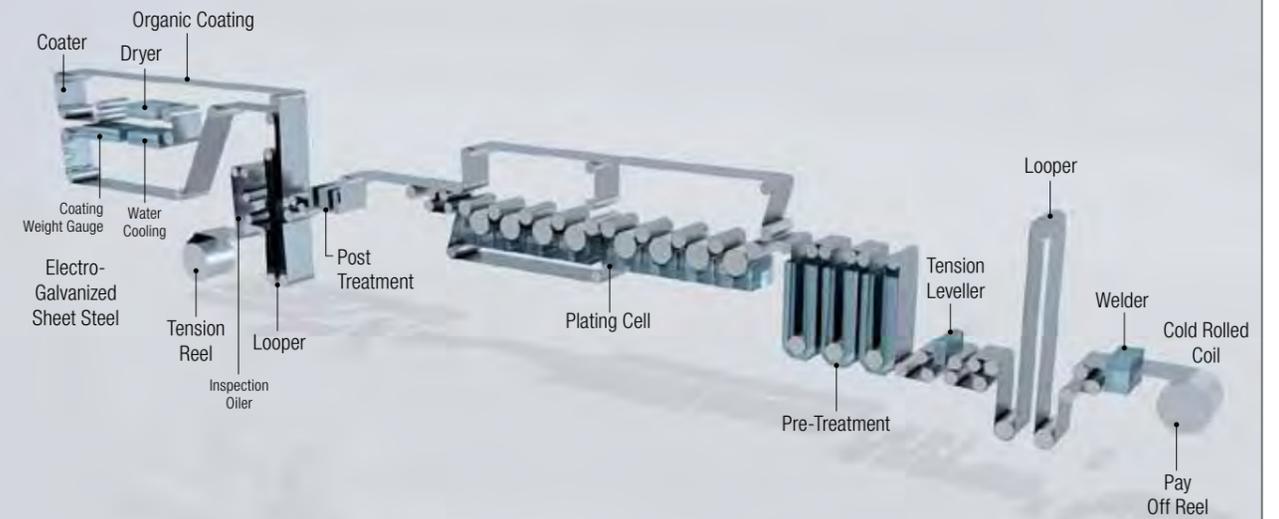
Output Process

The exit point of the line includes an output looper, tension reel, and an automatic packaging line to protect the products after coil winding.

CAL



EGL

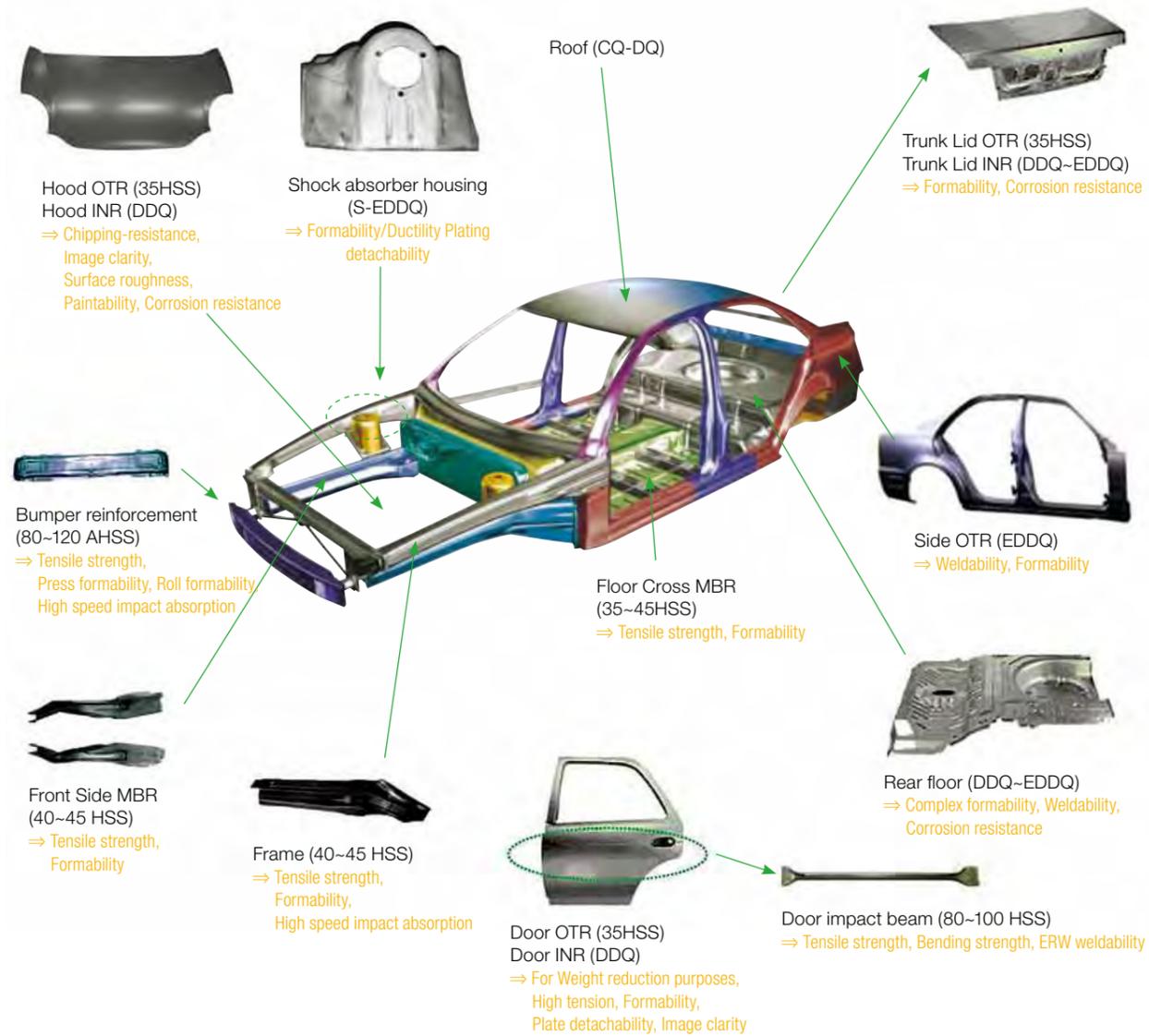


Principal Applications

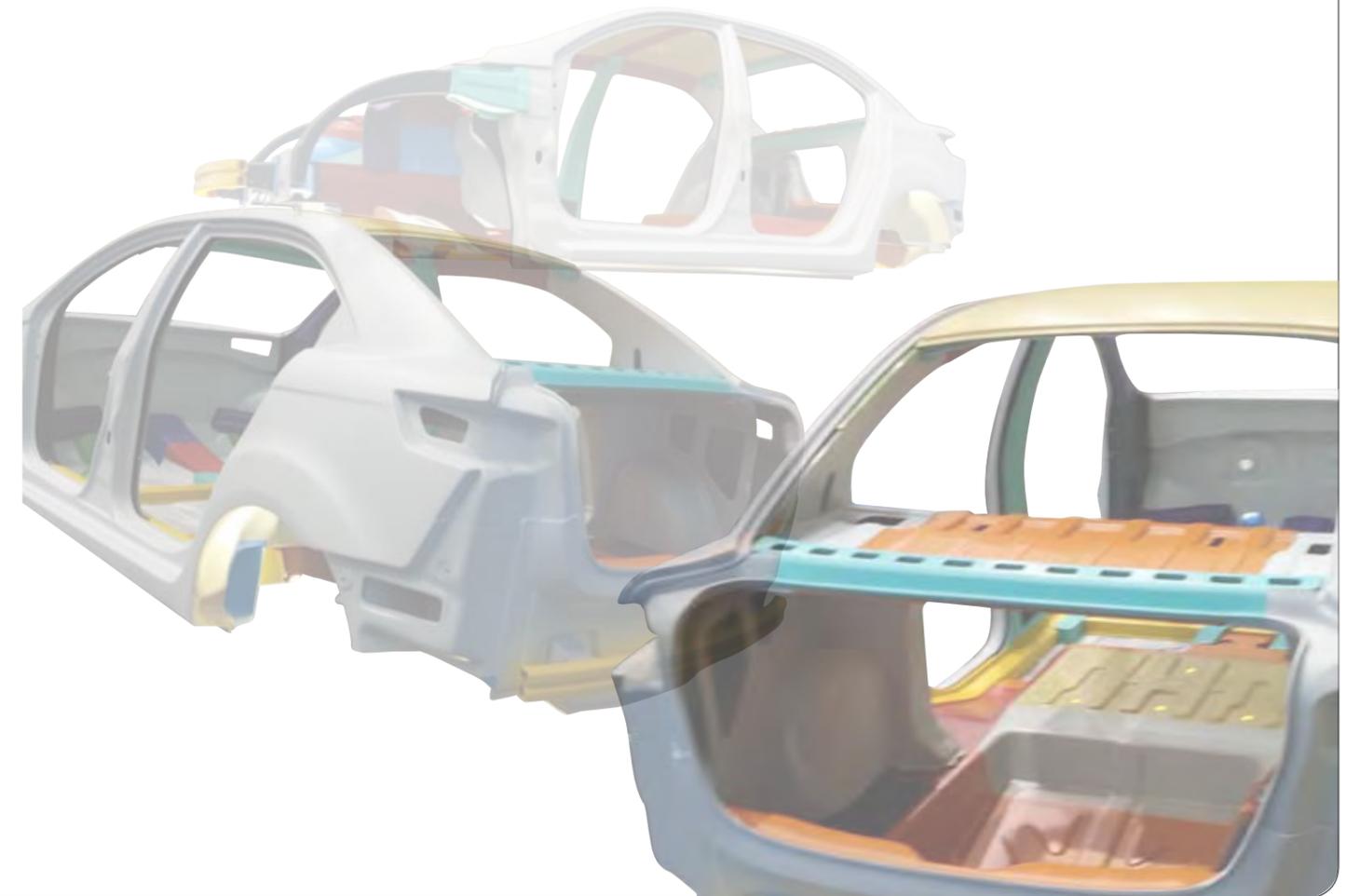
Main Components and Parts Names

Steel type used to make a particular part varies depending on the car manufacturer and the types of vehicles they produce.

Examples below reflect current application trends.



Division	Main uses	Products Characteristics	Tests required for	
Body	Interior plates	Door Inner, Floor, etc.	Strength, Machinability, Weldability, Adhesiveness	Tensile force, Formability, Weldability, Plating detachability
	Outer plates	Door OTR	Machinability, Surface quality, Corrosion resistance, Dent resistance	Tensile force, Roughness, Enameling, Corrosion resistance, Dent resistance, Image clarity
Stiffeners	Bumper	High strength, Weldability	Tensile force, Hardness	
Other parts	Oil Pan, Other parts	Machinability	-	



Mild Steel

1. General Description

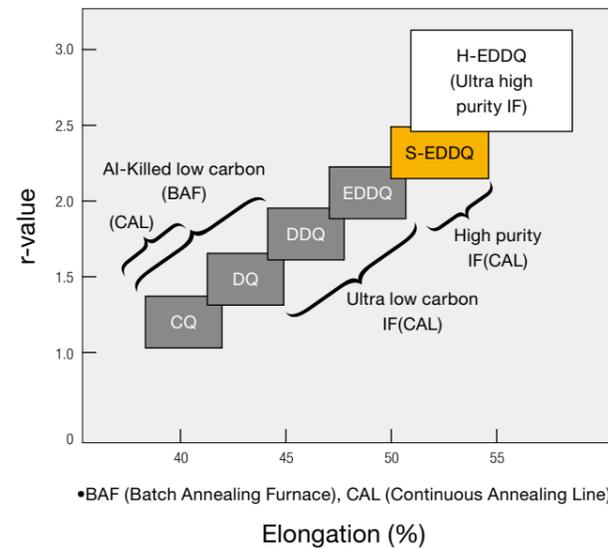
Mild steels, which include low and ultralow carbon steels, have a tensile strength of less than 340MPa and have wide drawability characteristics ranging from commercial grade to extra deep drawing quality with high elongation. They are widely used for automotive parts, especially for rear floor or side body outer panels which require high formability.

1.1 Concept of IF steel

IF steel is a type of steel whose interstitial elements (C, N) are eliminated by adding carbonitride forming elements (Ti, Nb) to prevent strain aging and improve formability through interstitial scavenging effects.

1.2 Effect of alloying elements

Interstitial elements can cause surface defects through stretcher strain or strain aging, due to their higher diffusivity at typical forming temperatures. For low anisotropic (Lankford, R) value steel, cracks can often be observed during deep drawing processes.



2. Product Characteristics

2.1 Chemical Composition

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
CQ	TS	CR/EG	0.1	0.50	0.04	0.035	0.025
		GI/GA	0.1	0.50	0.04	0.035	0.025
LQ	TS	CR/EG	0.08	0.45	0.04	0.035	0.025
		GI/GA	0.08	0.45	0.04	0.035	0.025
DQ	TS	CR/EG	0.08	0.45	0.04	0.030	0.025
		GI/GA	0.08	0.45	0.04	0.030	0.025
DDQ	TS	CR/EG	0.08	0.40	0.04	0.025	0.020
		GI/GA	0.08	0.40	0.04	0.025	0.020
EDDQ	TS	CR/EG	0.008	0.30	0.04	0.020	0.020
		GI/GA	0.008	0.30	0.04	0.020	0.020
S-EDDQ	TS	CR/EG	0.006	0.30	0.12	0.020	0.020
		GI/GA	0.006	0.30	0.12	0.020	0.020
H-EDDQ	TS	CR/EG	0.006	0.25	0.12	0.020	0.020
		GI/GA	0.006	0.25	0.12	0.020	0.020
C	TS	PO	0.15	0.60	0.06	0.010	0.025
D	TS	PO	0.10	0.45	0.06	0.03	0.025
E	TS	PO	0.08	0.40	0.04	0.25	0.020

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
CQ	TS	CR/EG	140~270	270~	33~	-
		GI/GA	140~270	270~	33~	-
LQ	TS	CR/EG	140~250	270~	34~	-
		GI/GA	140~250	270~	34~	-
DQ	TS	CR/EG	140~210	270~	36~	-
		GI/GA	140~210	270~	36~	-
DDQ	TS	CR/EG	140~180	270~	38~	-
		GI/GA	140~180	270~	38~	-
EDDQ	TS	CR/EG	130~180	270~	44~	-
		GI/GA	130~180	270~	44~	-
S-EDDQ	TS	CR/EG	120~160	260~	47~	-
		GI/GA	120~160	260~	47~	-
H-EDDQ	TS	CR/EG	110~150	260~	49~	-
		GI/GA	-	-	-	-
C	TS	PO	0.15	270~	29~	-
D	TS	PO	0.10	270~	33~	-
E	TS	PO	0.08	270~	35~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvannealed
CQ	TS	■	■	■	■
LQ	TS	■	■	■	■
DQ	TS	■	■	■	■
DDQ	TS	■	■	■	■
EDDQ	TS	■	■	■	■
S-EDDQ	TS	■	■	■	■
H-EDDQ	TS	■	■	-	-
C	TS	■	-	-	■
D	TS	■	-	-	▲
E	TS	■	-	-	-

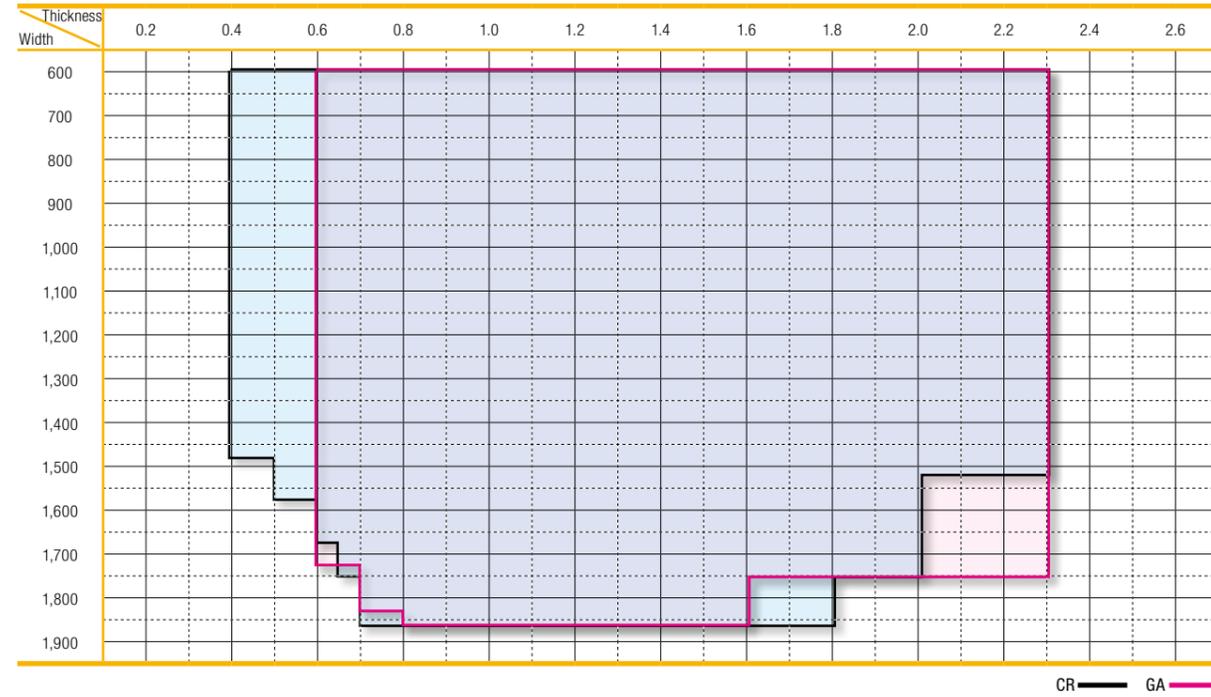
■:Cold-rolled ■:Hot-rolled

■:Commercial products ▲:Customer trial

3. Available Dimensions

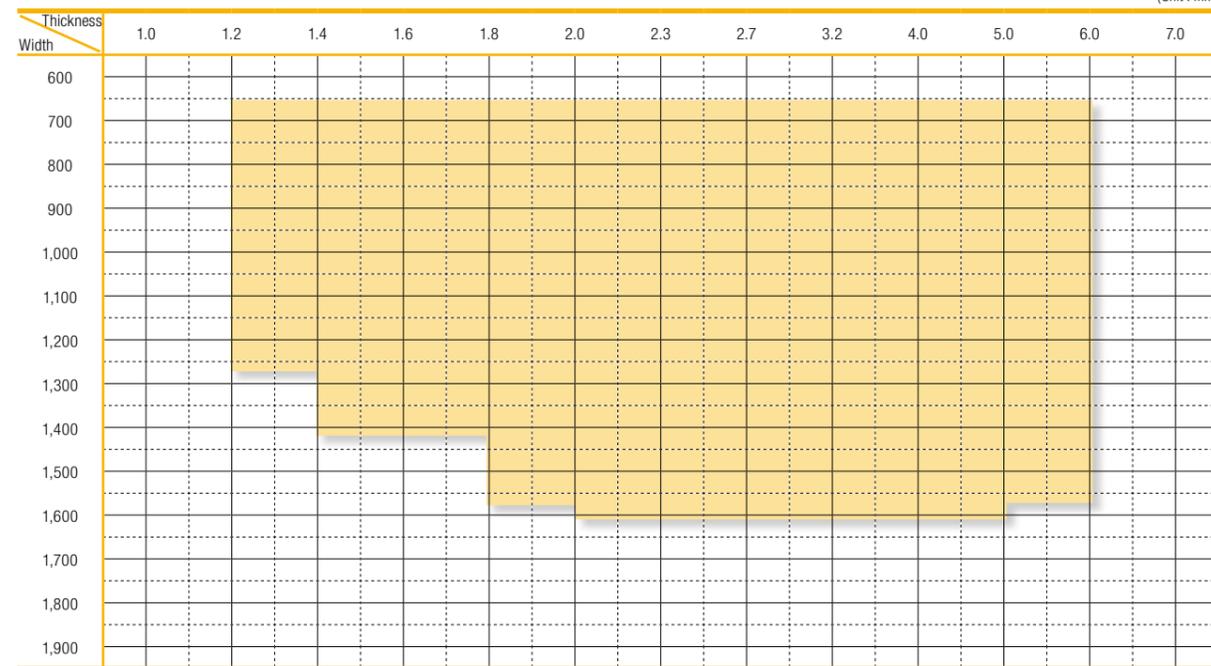
Grade : CR/GA, DDQ

(Unit : mm)



Grade : PO, C/D/E

(Unit : mm)



• The diagrams above show only a few selected steel types. Please contact your POSSCO representative for more information on our many other grades and dimensions.

4. Applications

- Cold rolled and galvanized steel sheets for inner and outer panels
- Hot rolled steel sheets for members and chassis



Hood inner



Door inner



Rear floor

High Strength Steel

• Bake Hardening Steel

1. General Description

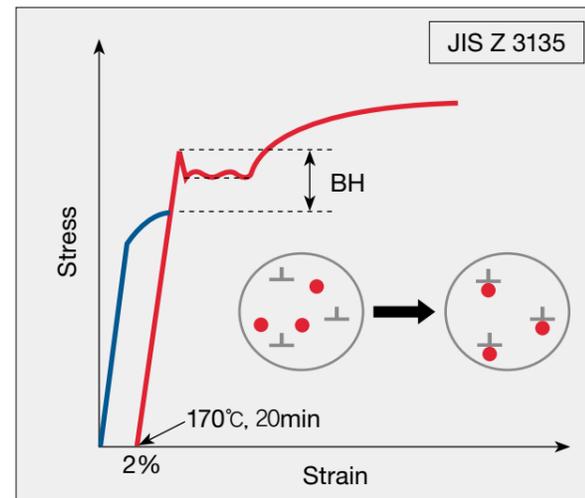
Bake-Hardening (BH) steel is designed and manufactured by introducing a precise quantity of interstitial elements into ultralow carbon steel. These elements remain in the solution, taking up their interstitial positions during a post-forming bake process. The steel can be worked easily during the initial forming stage, after which its yield strength increases by more than 30MPa due to the “bake hardening effect”. Compared to conventional steel, it delivers improved dent resistance. Therefore, thinner gauge steel can be used for similar purposes. This steel is widely used for auto body panels which require good dent resistance and high formability, such as hoods and door outer panels.

1.1 Concept of BH steel

Yield strength can be increased by more than 30MPa after paint baking, due to the Cottrell environment created by carbon diffusion to dislocation sites.

1.2 General characteristics of BH steel

Performance	Requirements
Anisotropy (R-value)	≥ 1.4
No-strain aging at normal temperature (6 months guarantee)	YP-EI ≤ 0.2%
Bake hardening amount	≥ 30MPa



2. Product Characteristics

2.1 Chemical Composition

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
340BH	TS	CR/EG	0.0020	0.65	0.03	0.06	0.015
		GI/GA	0.0020	0.65	0.03	0.06	0.015
180YB	YS	CR/EG	0.0024	0.20	0.05	0.03	0.013
		GI/GA	0.0024	0.20	0.05	0.03	0.013
210YB	YS	CR/EG	0.0030	0.20	0.09	0.07	0.015
		GI/GA	0.0030	0.20	0.09	0.07	0.015
240YB	YS	CR/EG	0.0030	0.20	0.09	0.07	0.015
		GI/GA	0.0030	0.20	0.09	0.07	0.015
270YB	YS	GI/GA	0.0030	0.20	0.09	0.07	0.015

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
340BH	TS	CR/EG	195~265	340~	32~	30~
		GI/GA	195~265	340~	32~	30~
180YB	YS	CR/EG	180~240	270~	40~	30~
		GI/GA	180~240	270~	40~	30~
210YB	YS	CR/EG	210~270	340~	38~	30~
		GI/GA	210~270	340~	38~	30~
240YB	YS	CR/EG	240~300	340~	36~	30~
		GI/GA	240~300	340~	36~	30~
270YB	YS	GI/GA	250~330	390~	35~	

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvanized
340BH	TS	■	■	■	■
180YB	YS	■	■	■	■
210YB	YS	■	■	■	■
240YB	YS	■	■	■	▲
270YB	YS	■	■	■	▲

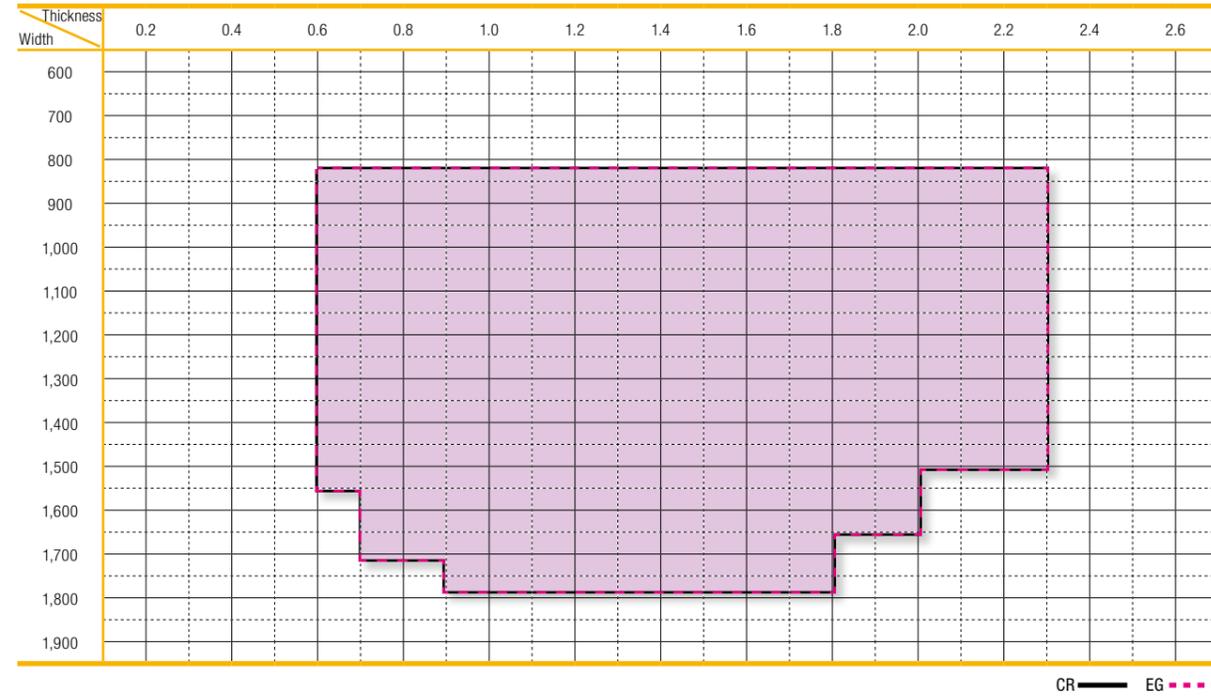
■:Cold-rolled ■:Hot-rolled

■:Commercial products ▲:Customer trial

3. Available Dimensions

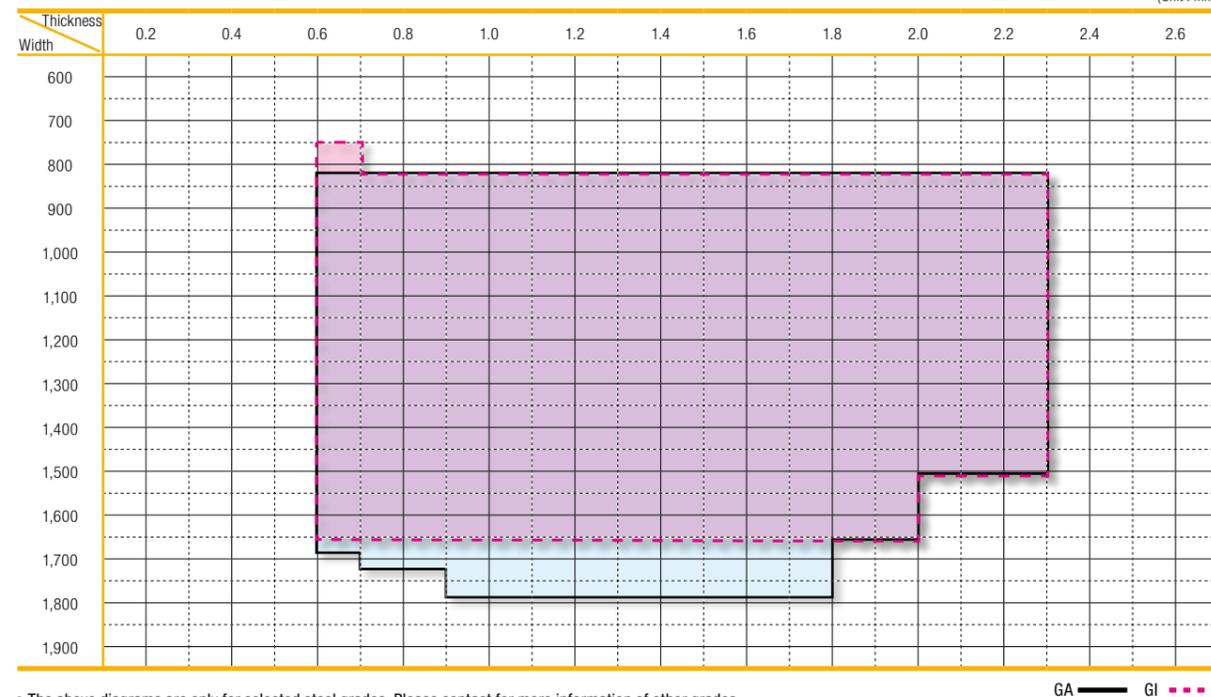
Grade : CR/EG, 340BH

(Unit : mm)



Grade : GA/GI, 340BH

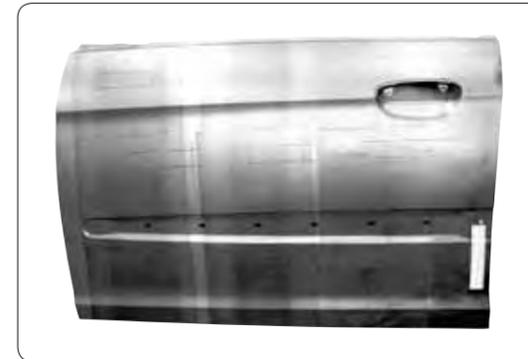
(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Cold rolled and galvanized steel sheets for inner and outer panels such as hoods, doors, fenders etc.



Door



Hood

High Strength Steel

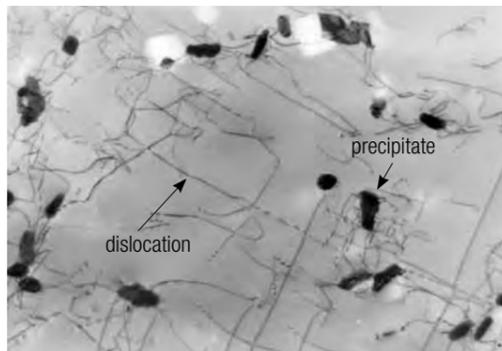
•HSLA(C-class & YS guaranteed)

1. General Description

HSLA is manufactured by adding precipitation hardening elements, such as Ti or Nb, to low carbon steel. This results in fine carbonitrides evenly dispersed throughout the steel. These precipitates increase yield strength and impact resistance due to the suppression of dislocation movement. Typically, HSLA is used for reinforcing structures, which require high strength.

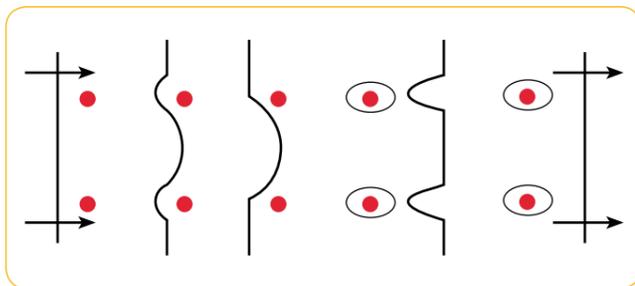
1.1 Concept

Precipitates, formed by the addition of alloying elements in excess of the solubility limit, act to prevent dislocation movement and result in increased strength. The smaller the precipitate size, the higher the material's strength. Typical precipitates used are NbC, TiC, VC, AlN.



1.2 General characteristics

Precipitation hardening results in a high yield strength to tensile strength ratio (YS/TS). It is easy to obtain high strength for a relatively low cost. It is therefore suitable for high impact resistant parts.



Interaction between dislocations and precipitates

2. Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
440C	TS	CR/EG	0.09	1.00	0.03	0.02	0.012
		GI/GA	-	-	-	-	-
590C	TS	CR	0.094	1.9	0.30	-	-
		GI/GA	-	-	-	-	-
220YC	YS	CR	0.05	0.60	0.08	0.025	0.015
		GI/GA	0.05	0.60	0.08	0.025	0.015
260YC	YS	CR	0.08	0.55	0.13	0.025	0.01
		GI/GA	0.08	0.55	0.13	0.025	0.01
300YC	YS	CR	0.08	0.65	0.13	0.025	0.01
		GI/GA	0.08	0.65	0.13	0.025	0.01
340YC	YS	CR	0.09	0.95	0.28	0.025	0.01
		GI/GA	0.09	0.95	0.28	0.025	0.01
380YC	YS	CR	0.09	1.2	0.14	0.025	0.01
		GI/GA	0.09	1.2	0.14	0.025	0.01
420YC	YS	CR	0.09	1.4	0.34	0.025	0.01
		GI/GA	0.09	1.4	0.34	0.025	0.01
440C	TS	PO	0.070	0.90	0.03	0.02	0.005
540C	TS	PO	0.100	1.50	0.20	0.03	0.003
590C	TS	PO	0.090	1.60	0.15	0.03	0.003
780C	TS	PO	0.100	1.80	0.15	0.03	0.003
340YC	YS	PO	0.07	0.90	0.03	0.02	0.005
410YC	YS	PO	0.08	0.90	0.03	0.02	0.005
480YC	YS	PO	0.09	1.30	0.05	0.02	0.005
550YC	YS	PO	0.09	1.30	0.05	0.02	0.005

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
440C	TS	CR/EG	270~	440~	22~	-
		GI/GA	-	-	-	-
590C	TS	CR	350~	588~	17~	-
		GI/GA	-	-	-	-
220YC	YS	CR	220~230	340~450	28~	-
		GI/GA	220~340	340~450	28~	-
260YC	YS	CR	260~340	350~430	28~	-
		GI/GA	260~340	350~430	28~	-
300YC	YS	CR	300~380	380~480	22~	-
		GI/GA	300~380	380~480	22~	-
340YC	YS	CR	340~440	410~530	20~	-
		GI/GA	340~440	410~530	20~	-
380YC	YS	CR	380~500	460~600	18~	-
		GI/GA	380~500	460~600	18~	-
420YC	YS	CR	420~530	490~600	16~	-
		GI/GA	420~530	490~600	16~	-
440C	TS	PO	275~	440~	30~	-
540C	TS	PO	355~	540~	23~	-
590C	TS	PO	420~	590~	21~	-
780C	TS	PO	600~	780~	16~	-
340YC	YS	PO	340~410	410~	24~	-
410YC	YS	PO	410~580	490~	20~	-
480YC	YS	PO	480~600	570~	20~	-
550YC	YS	PO	550~650	620~	18~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8t<1.0t, PO: 2t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvannealed
440C	TS	■	■	■	■
590C	TS	■	-	■	■
220YC	YS	■	■	■	■
260YC	YS	■	■	■	■
300YC	YS	■	■	■	■
340YC	YS	■	-	■	■
380YC	YS	■	-	■	■
420YC	YS	■	-	■	■
440YC	TS	■	-	-	-
540C	TS	■	-	-	-
590C	TS	■	-	-	-
780C	TS	■	-	-	-
340YC	YS	■	-	▲	-
370YC	YS	■	-	▲	-
410YC	YS	■	-	■	-
440YC	YS	■	-	-	-
480YC	YS	■	■	-	-
550YB	YS	■	■	-	-

■:Cold-rolled ■:Hot-rolled

■:Commercial products ▲:Customer trial

Product Introduction

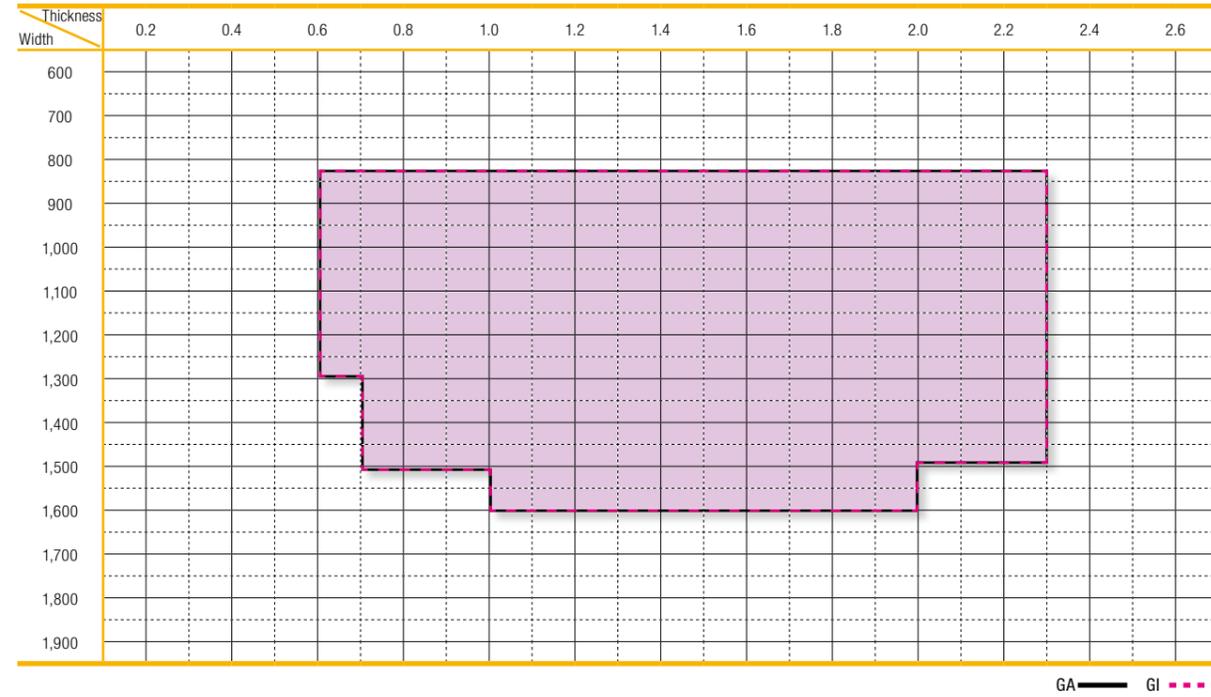
High Strength Steel

Bake-Hardening (BH) Steel / HSLA(C-class & YS guaranteed) / Rephosphorized Steel / IF HSS(E/ES-class) / ATOS

3. Available Dimensions

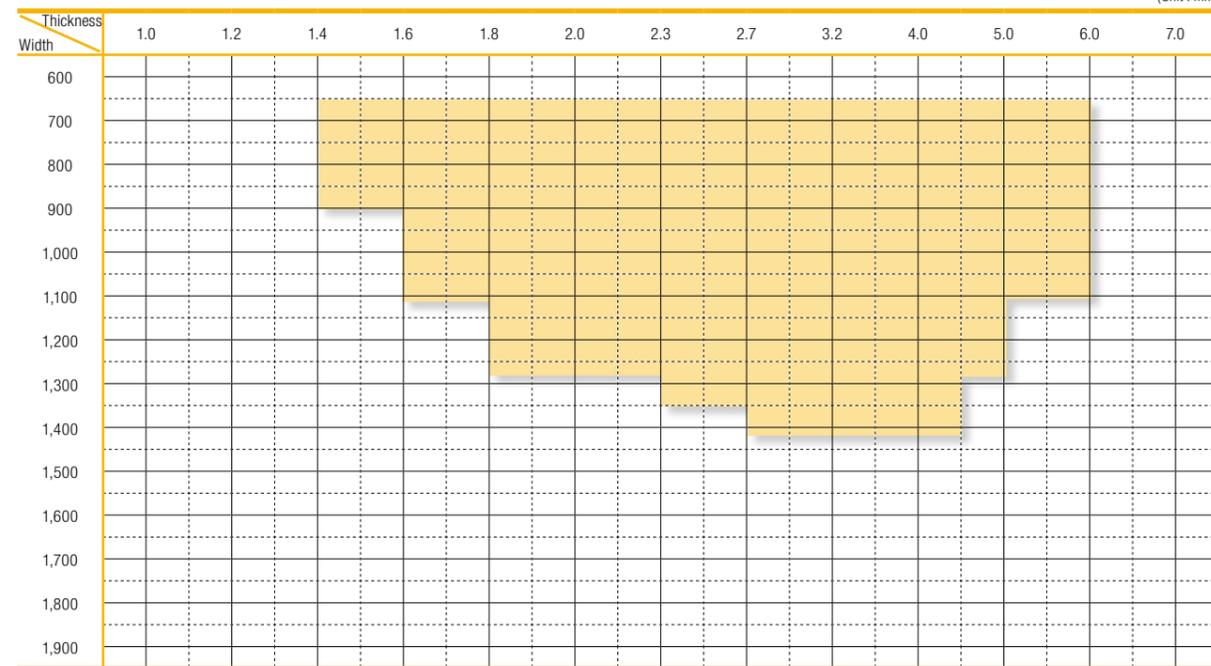
Grade : GA/GI, 440C

(Unit : mm)



Grade : PO, 590C

(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Cold rolled and galvanized steel for parts which require high crashworthiness and stiffness

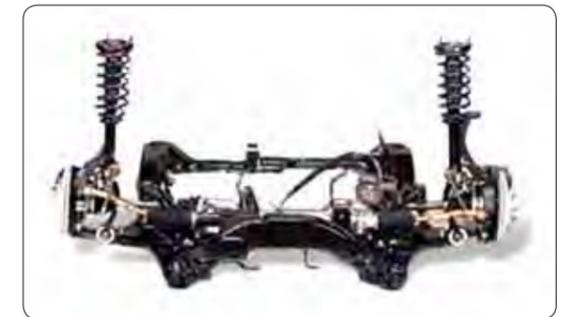
Hot rolled steel for chassis, wheel rims and disks.



Side sill



Center member



Front/Rear suspension module

High Strength Steel

•Rephosphorized Steel(R-class)

1. General Description

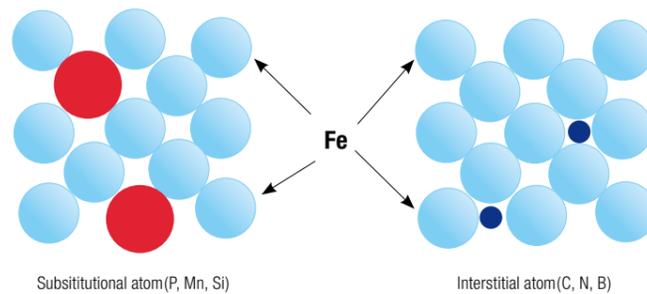
Rephosphorized Steel (R class) is manufactured by adding substitutional alloying elements such as P and Mn. Substitutional elements cause lattice distortion and induce internal stresses. In turn, this reduces the mobility of dislocations and results in higher material strength. The addition of P increases strength and maintains proper R-value.

1.1 Concept

Strength increases through lattice distortion and restriction of dislocation movement. The atomic radii difference between those in the solid solution and the native Fe atoms produces distortion of the crystal lattice.

1.2 General Characteristics

This type of steel has a relatively low strength increase and R-value decrease in the steel. In general, substitutional elements result in a lower strength increase than interstitial elements.



2. Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
340R	TS	CR/EG	0.05	0.6	0.08	0.025	0.015
		GI/GA	0.05	0.6	0.08	0.025	0.015
390R	TS	CR/EG	0.09	0.8	0.08	0.03	0.015
		GI/GA	0.09	0.8	0.08	0.03	0.015
440R	TS	CR/EG	0.09	1.4	0.14	0.017	0.003
		GI/GA	0.09	1.4	0.14	0.017	0.003
310R	TS	PO	0.060	0.350	0.030	0.020	0.010
370R	TS	PO	0.100	0.700	0.030	0.020	0.020
400R	TS	PO	0.120	0.800	0.030	0.020	0.010
440R	TS	PO	0.070	0.900	0.030	0.020	0.010

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized)

2) $C_{eq} = C + 1/6(Mn+Si) + 1/5(Cr+Mo+V) + 1/15(Ni+Cu)$ ---IIW equation

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
340R	TS	CR/EG	185~	340~	35~	-
		GI/GA	185~	340~	35~	-
390R	TS	CR/EG	215~	390~	29~	-
		GI/GA	215~	390~	29~	-
440R	TS	CR/EG	245~	440~	26~	-
		GI/GA	245~	440~	26~	-
310R	TS	PO	180~	310~	36~	-
370R	TS	PO	225~	370~	35~	-
400R	TS	PO	255~	400~	34~	-
440R	TS	PO	305~	440~	32~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvannealed
340R	TS	■	■	■	■
390R	TS	■	■	■	■
440R	TS	■	■	■	■
310R	TS	■	-	-	-
370R	TS	■	-	▲	▲
400R	TS	■	-	-	-
440R	TS	■	-	▲	▲

■:Commercial products ▲:Customer trial

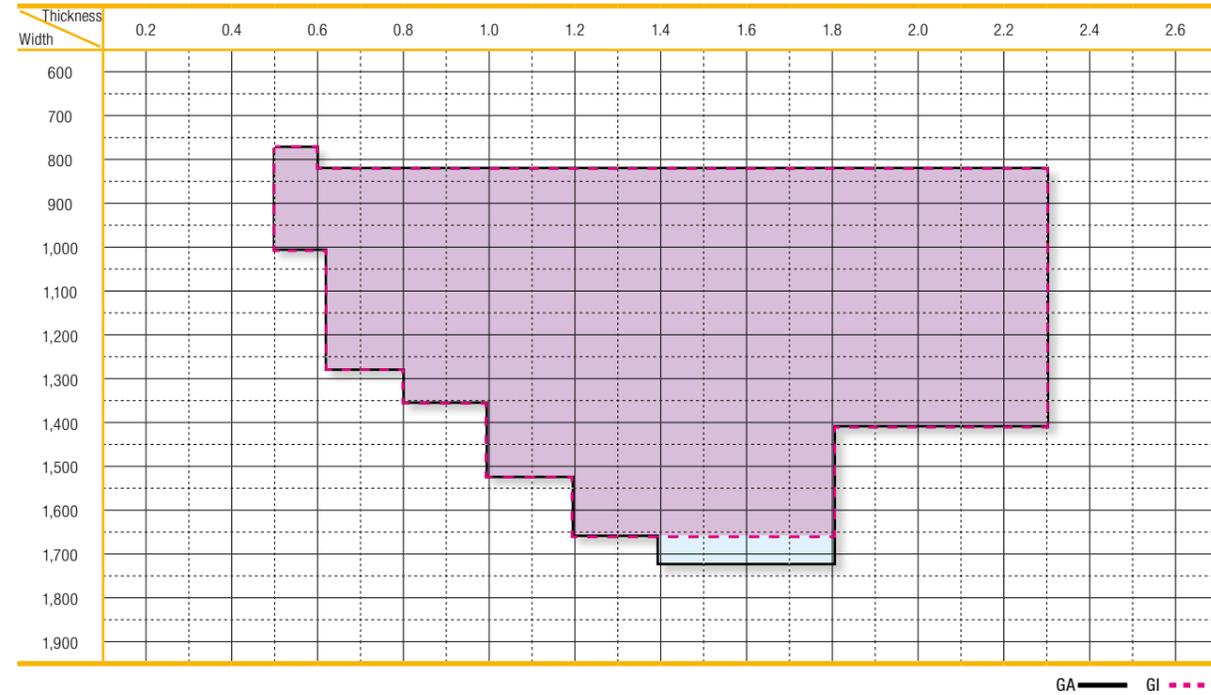
Product Introduction

Bake-Hardening (BH) Steel / HSLA(C-class & YS guaranteed) / Rephosphorized Steel / IF HSS(E/ES-class) / ATOS

3. Available Dimensions

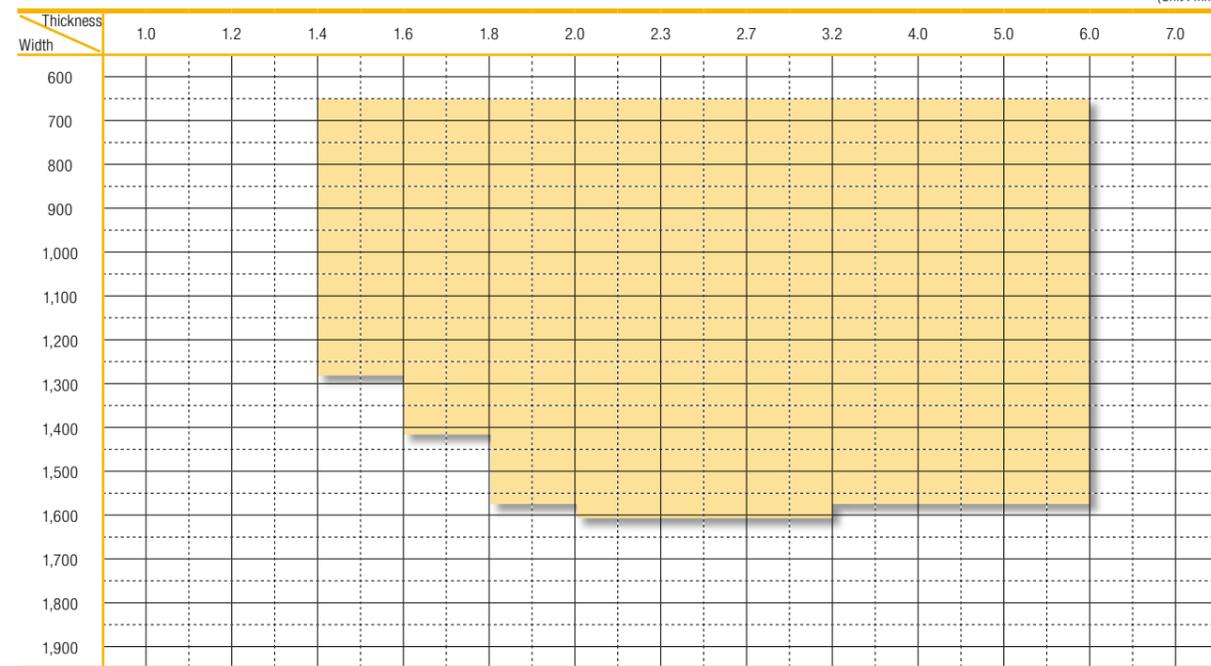
Grade : GA/GI, 440R

(Unit : mm)



Grade : PO, 440R

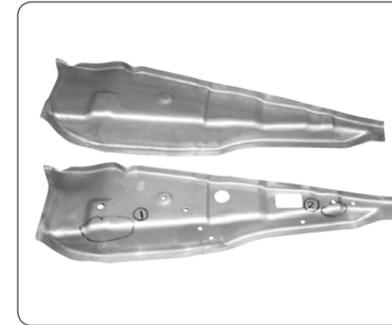
(Unit : mm)



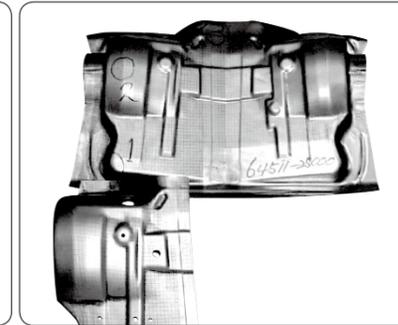
• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Cold rolled and galvanized steel for parts which require high strength such as cowls, wheel aprons, front side members, etc.



Cowl



Wheel apron



Front side member

High Strength Steel

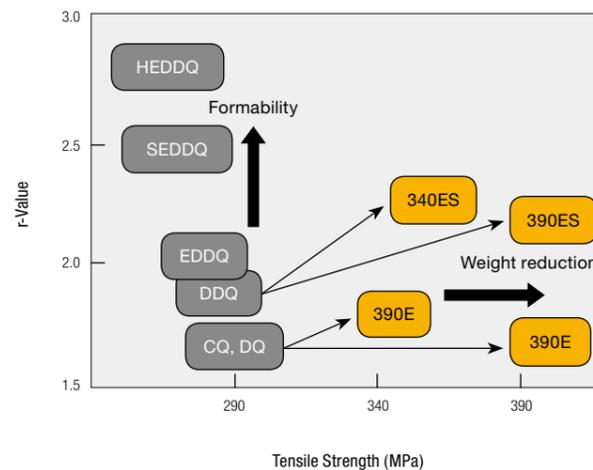
•IF HSS(E/ES-class)

1. General Description

Addition of the carbonitride forming element Ti to extra low carbon steel produces good deep drawability, and when combined with P and Mn, increases strength. Boron must be included to reduce grain boundary embrittlement caused by phosphorous segregation at grain boundaries. This steel is primarily used for parts that require both high strength and deep drawability.

1.1 Concept

The R-value increases the lower the interstitial level and the higher the intensity of {111} texture. Higher reduction during cold rolling and higher annealing temperature can develop {111} texture which improves formability.



1.2 General characteristics

The material has both high strength and high R-value.

2. Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
340E	TS	CR/EG	0.002	0.80	0.08	0.025	0.015
		GI/GA	0.002	0.80	0.08	0.025	0.015
390E	TS	CR/EG	0.005	1.0	0.03	0.10	0.015
		GI/GA	0.005	1.0	0.03	0.10	0.015
440E	TS	CR/EG	0.007	0.70	0.40	0.11	0.013
		GI/GA	0.007	0.70	0.40	0.11	0.013
340ES	TS	CR/EG	0.005	1.40	0.04	0.09	0.02
		GI/GA	0.005	1.40	0.04	0.09	0.02
180YE	YS	CR/EG	0.002	0.8	0.08	0.025	0.015
		GI/GA	0.002	0.8	0.08	0.025	0.015
210YE	YS	CR/EG	0.002	0.8	0.08	0.025	0.015
		GI/GA	0.002	0.8	0.08	0.025	0.015
260YE	YS	CR/EG	0.005	1.0	0.03	0.10	0.015
		GI/GA	0.005	1.0	0.03	0.10	0.015

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
340E	TS	CR/EG	185~	340~	34~	-
		GI/GA	185~	340~	34~	-
390E	TS	CR/EG	215~	390~	30~	-
		GI/GA	215~	390~	30~	-
440E	TS	CR/EG	235~	340~	26~	-
		GI/GA	235~	340~	26~	-
340ES	TS	CR/EG	180~	340~	35~	-
		GI/GA	180~	340~	35~	-
180YE	TS	CR/EG	180~	340~	34~	-
		GI/GA	180~	340~	34~	-
210YE	TS	CR/EG	210~	340~	34~	-
		GI/GA	210~	340~	34~	-
260YE	TS	CR/EG	260~	390~	30~	-
		GI/GA	260~	390~	30~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized)

2.3 Available coatings

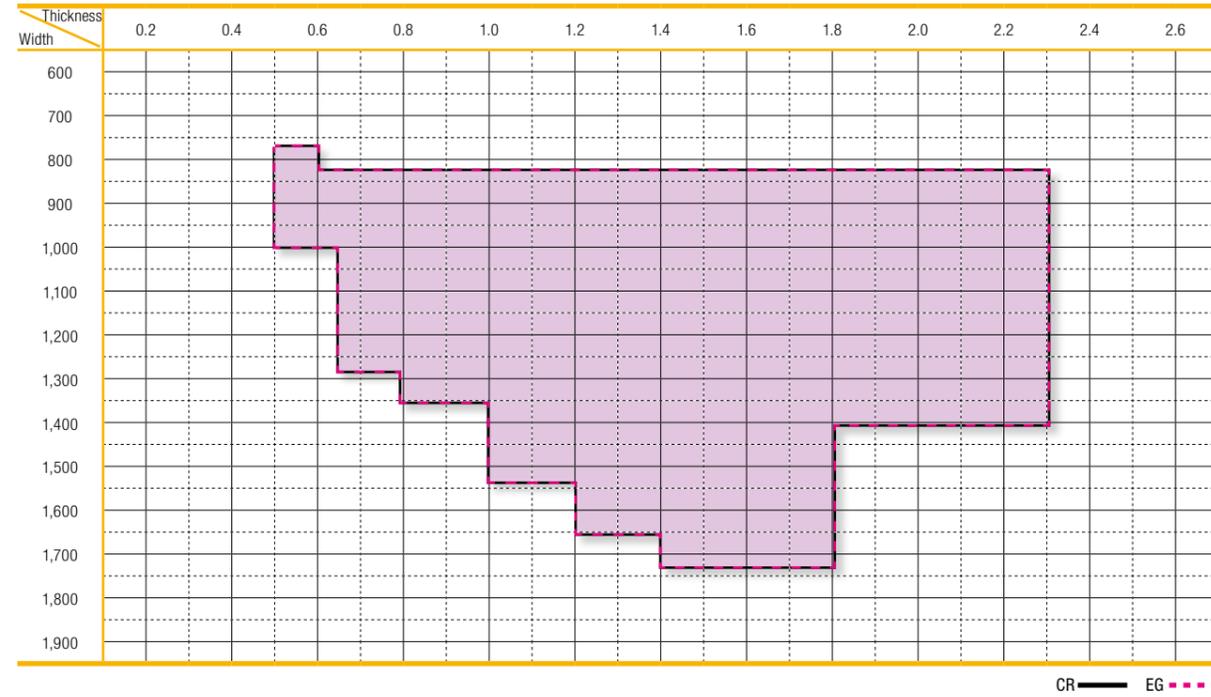
Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvanized
340E	TS	■	■	■	■
390E	TS	■	■	■	■
440E	TS	■	■	■	■
340ES	TS	■	■	■	■
180YE	YS	■	■	■	■
210YE	YS	■	■	■	■
260YE	YS	■	■	■	■

■:Commercial products ▲:Customer trial

3. Available Dimensions

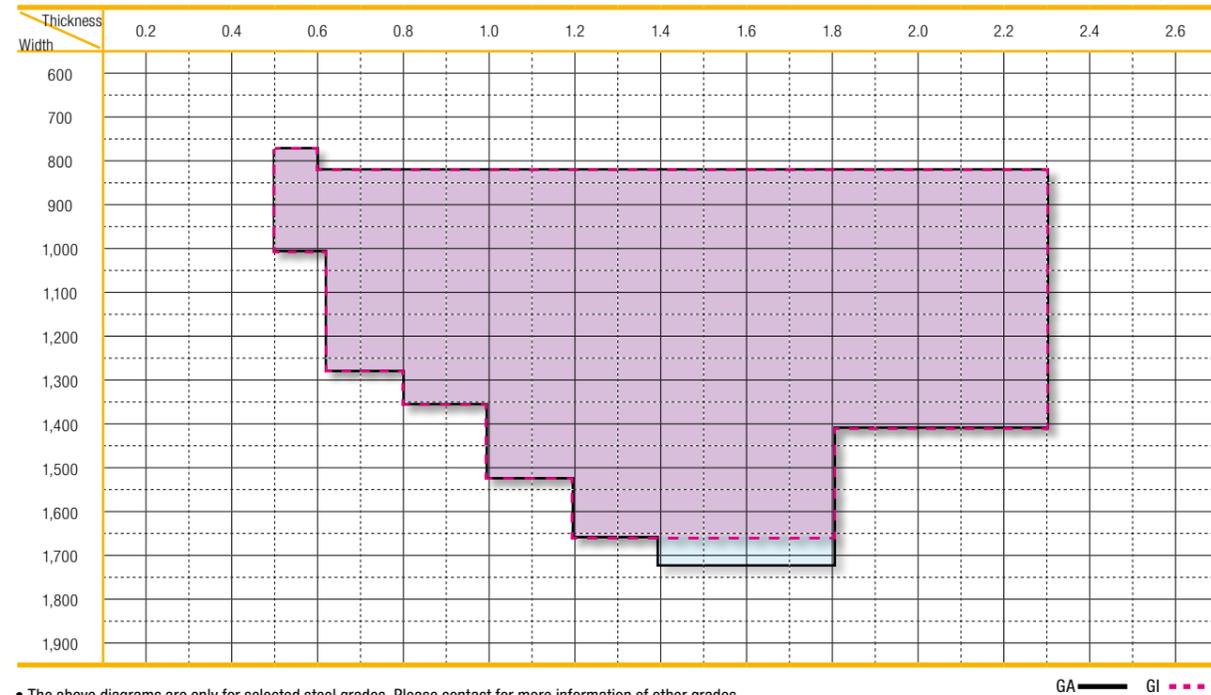
Grade : CR/EG, 440E

(Unit : mm)



Grade : GA/GI, 440E

(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

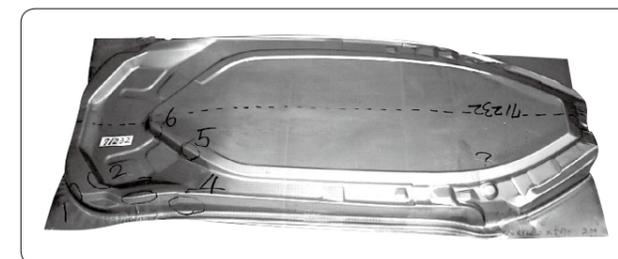
Cold rolled and galvanized steel sheets for parts which require high formability such as members, floors, Reinf. A-pillar outers, etc.



Rear floor side member



Rear floor



Reinf. A-pillar outer



Reinf. floor side rear upper

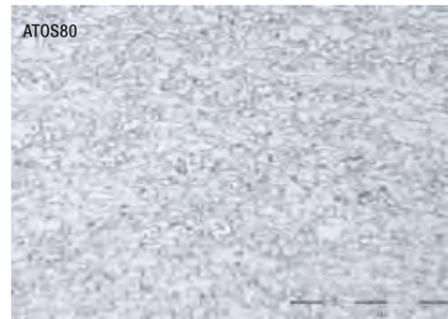
High Strength Steel

•ATOS(AuTOMobile Structural Steel)

1. General Description

ATOS (AuTOMobile Structural) steel is a high strength hot-rolled sheet steel composed of nano-size precipitates and tiny particles with a diameter of 1~3µm. ATOS has high tensile strength, resulting from precipitation hardening, and excellent impact resistance and stability under fatigue loading due to tiny ferrite grains formed by the recrystallization controlled rolling process. Thus, this product is suitable for automobile structural parts and commercial truck frames, as well as boom arms of heavy equipment, etc.

- Designed as a low carbon steel to enhance formability and weldability
- Containing a small quantity of alloying elements (Nb, Ti, Mo) to achieve high strength
- Controlling the formation of non-metallic inclusions and sulfides to enhance the internal quality of the material
- Uses: commercial truck frames, crane booms, wheel disks, etc.



Microstructure



Bendability

2. Product Characteristics

2.1 Mechanical properties

Grade	Guaranteed value	Class.	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
ATOS55	TS	HR	344~	540~	20~	-
ATOS60	TS	HR	419~	616~	19~	-
ATOS80	TS	HR	675~	785~	14~	-

□: Cold-rolled ■: Hot-rolled

2.2 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Galvanized	Galvannealed
ATOS55	TS	■	-	-	-
ATOS60	TS	■	-	-	-
ATOS80	TS	■	-	-	-

□: Cold-rolled ■: Hot-rolled ■: Commercial products ▲: Customer trial

3. Available Dimensions

Grade : ATOS80

(Unit : mm)

Thickness \ Width	2.0	2.3	2.7	3.2	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
600													
700													
800													
900													
1,000													
1,100													
1,200													
1,300													
1,400													
1,500													
1,600													
1,700													
1,800													
1,900													

4. Applications

Fabrication



Example (Web mounting frame)

	Conventional	Developed Frame		Start of mass production
	Web type Double channel	Web type Single channel	Weight reduction (%)	
15 Ton Dump	ATOS55 8.0t/7.0t	ATOS80 8.0t	40.0	2004
24 Ton Cargo	ATOS55 8.0t/7.0t	ATOS80 8.0t	42.0	2004

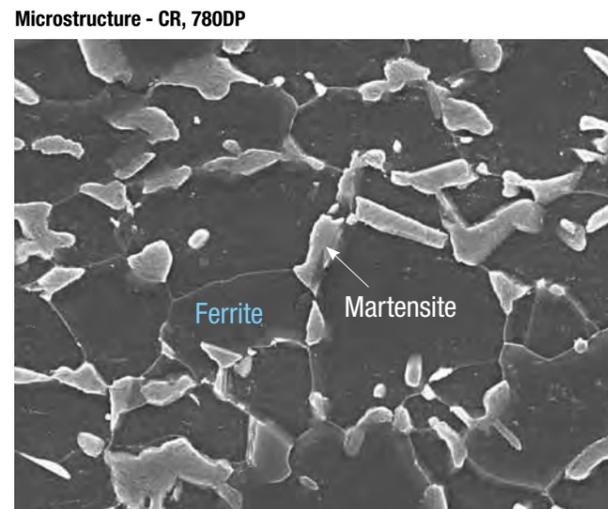
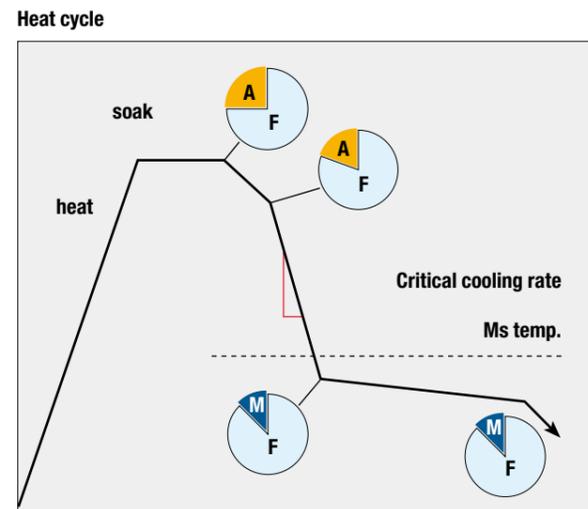


Advanced High Strength Steel

•Dual Phase Steel

1. General Description

DP steel has a ferrite matrix containing martensite as a second phase. DP steel can easily be deformed since it has low yield ratio of around 0.50~0.60, and shows a high level of total elongation close to that of TRIP steel. It features good bake hardenability because it is cooled rapidly after annealing and is processed in an Over Aging Section below martensite start temperature (Ms) temperature. Available products are 440, 590, 690, 780, and 980MPa, classified by tensile strength. In most cases, galvanized steels (GI/GA) are available in addition to CR and HR products.



YS 480MPa, TS 795MPa, El 22%

2. Product Characteristics

2.1 Chemical Composition

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
490DP	TS	CR/EG	0.08	1.6	0.08	0.02	0.003
		GI/GA	0.08	1.6	0.08	0.02	0.003
590DP	TS	CR/EG	0.1	2	0.2	0.03	0.003
		GI/GA	0.1	2	0.2	0.03	0.003
780DP	TS	CR	0.12	2.6	0.6	0.03	0.003
		GI/GA	0.12	2.6	0.6	0.03	0.003
980DP-M	TS	CR/GA/GI	0.1	2.4	0.5	0.03	0.003
980DP-EL		CR	0.1	2.8	1.2	0.03	0.003
980DP-H		CR/GA/GI	0.1	2.6	0.3	0.03	0.003
590DP	TS	PO	0.08	1.5	0.8	0.1	0.08
780DP	TS	PO	0.12	1.6	1.6	0.1	0.08

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
490DP	TS	CR/EG	270~360	490~	28~	-
		GI/GA	270~360	490~	28~	-
590DP	TS	CR/EG	~450	590~	24~	-
		GI/GA	~450	590~	24~	-
780DP	TS	CR	~625	780~	14~	-
		GI/GA	400~625	780~	16~	-
980DP-M	TS	CR/GA/GI	580~700	980~	11~	-
980DP-EL		CR	580~700	980~	15~	-
980DP-H		CR/GA/GI	700~850	980~	8~	-
590DP	TS	PO	305~	590~	20~	-
780DP	TS	PO	440~	780~	16~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Hot-dip galvanized	Hot-dip galvanized
490DP	TS	■	■	■	■
590DP	TS	■	■	■	■
780DP	TS	■	-	■	■
980DP-L	TS	■	-	■	■
980DP-H	TS	■	-	■	■
980DP-EL	TS	■	-	▲	■
590DP	TS	■	-	-	-

■:Cold-rolled ■:Hot-rolled

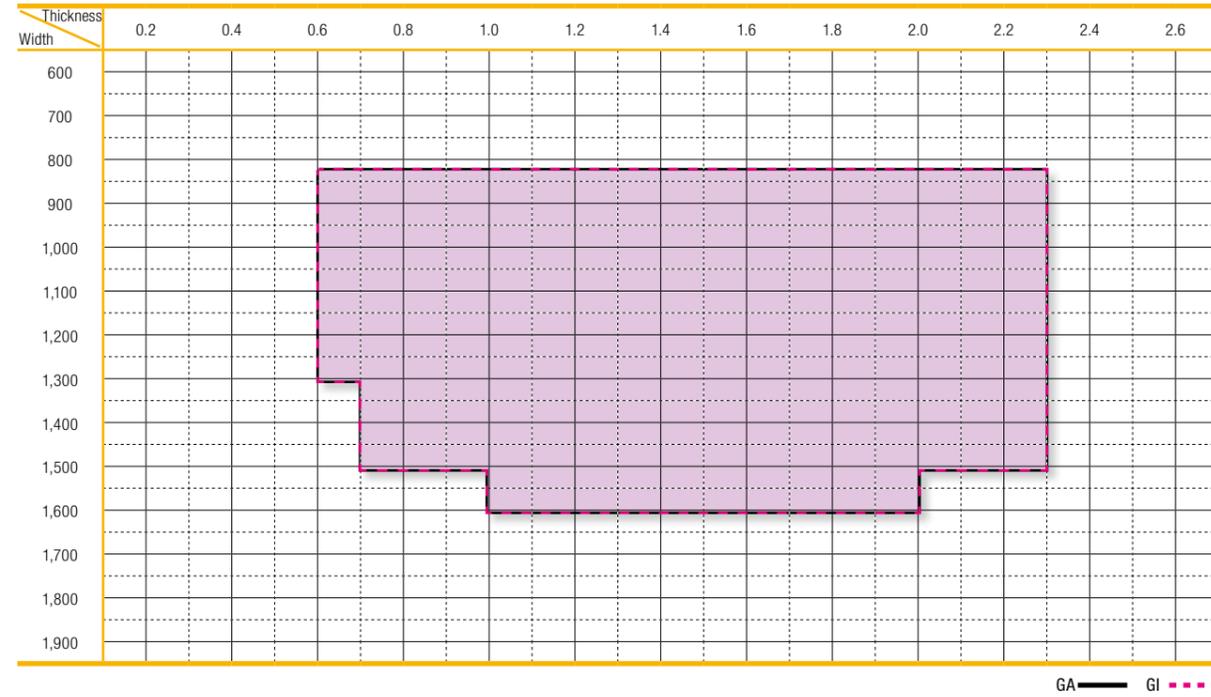
■:Commercial products ▲:Customer trial

Product Introduction

3. Available Dimensions

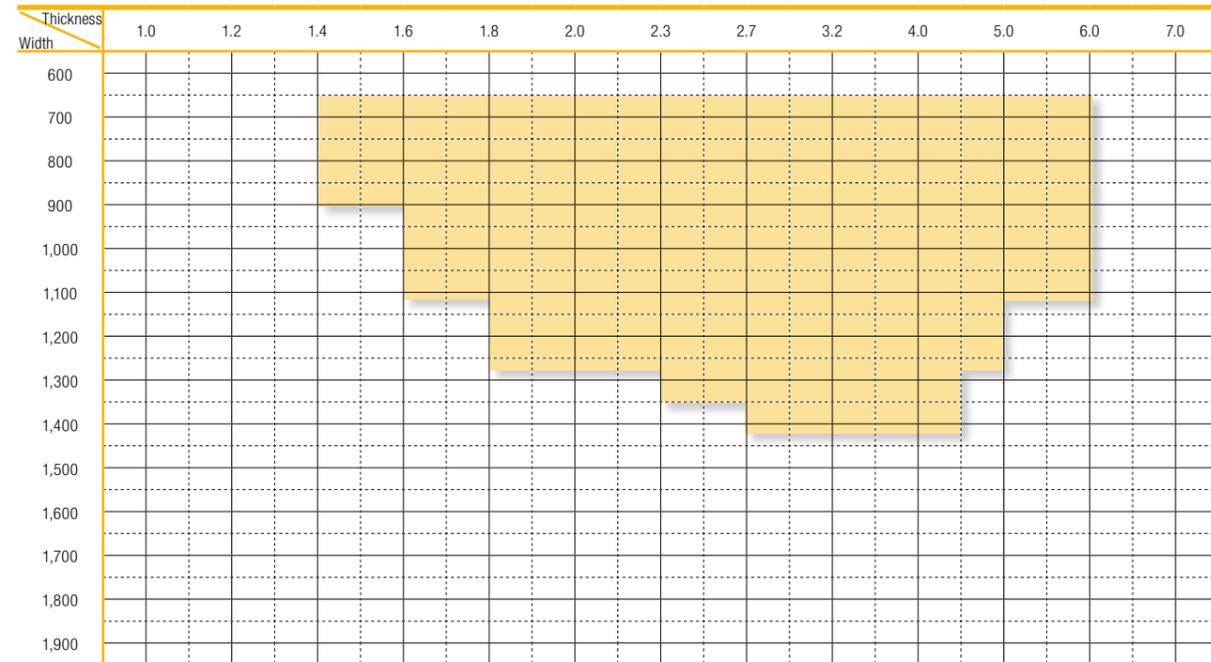
Grade : GA/GI, 590DP

(Unit : mm)



Grade : PO, 590DP

(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

Advanced High Strength Steel

DP Steel / TRIP Steel / CP Steel / FB Steel / TWIP Steel

4. Applications

Cold rolled and galvanized steel sheets for outer panels (door outer-490dp), structural parts (sill side members, Reinf. roof S/OTRs, Reinf. seat belts, seat belts, seat rails) and crashworthiness parts (sill side panels, underbody reinforcement parts, etc.)

Hot rolled steel for suspension, arms, and wheel discs



Door outer (GA, 490DP)



Seat rail (CR, 980DP)



Suspension (PO, 590DP)

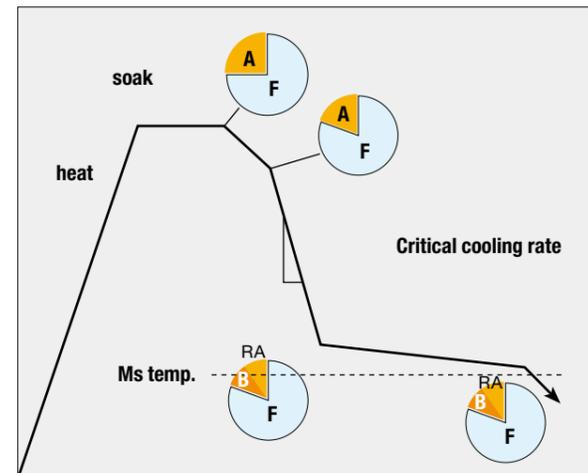
Advanced High Strength Steel

Transformation Induced Plasticity Steel

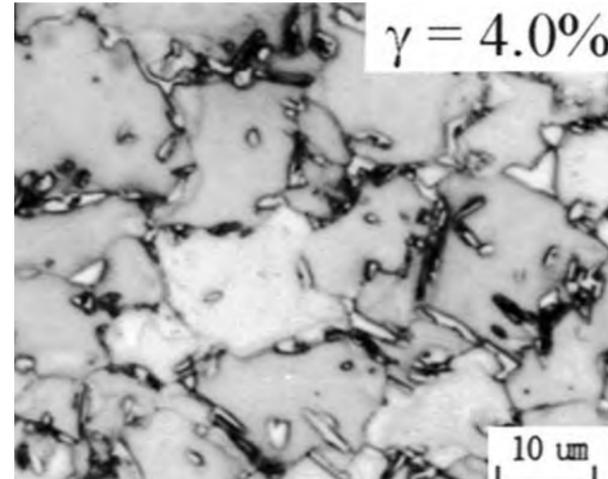
1. General Description

TRIP (Transformation Induced Plasticity) steel is a multi-phase steel composed of a ferrite matrix, bainite with retained austenite phases, and a small portion of martensite. TRIP steel delivers high formability (elongation) with a yield ratio of 0.57~0.67. This steel is suitable for manufacturing parts which require high formability. Available products are 590, 690, 780, and 980 MPa classified by their tensile strength. High strength level TRIP steels are difficult to manufacture in galvanized steel sheets because of their high Si content and other elements which compromise coating quality.

Heat cycle - CR



Microstructure



CR, 590TRIP

2. Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
590TR	TS	CR/EG	0.170	2.80	0.25	0.02	0.005
690TR	TS	GI/GA	0.220	1.55	0.55	0.06	0.003
780TR	TS	CR	0.160	2.00	1.60	0.02	0.010
980TR	TS	CR	0.260	1.90	1.70	0.035	0.003

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized),

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
590TR	TS	CR/EG	350~	590~	30~	-
690TR	TS	GI/GA	380~	690~	26~	-
780TR	TS	CR	410~	780~	14~	-
980TR	TS	CR	440~	980~	8~	-

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

2) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Hot-dip galvanized	Hot-dip galvanized
590TR	TS	■	■	-	■
690TR	TS	-	-	-	▲
780TR	TS	■	-	-	▲
980TR	TS	▲	-	-	▲
1180TR	TS	▲	-	-	▲

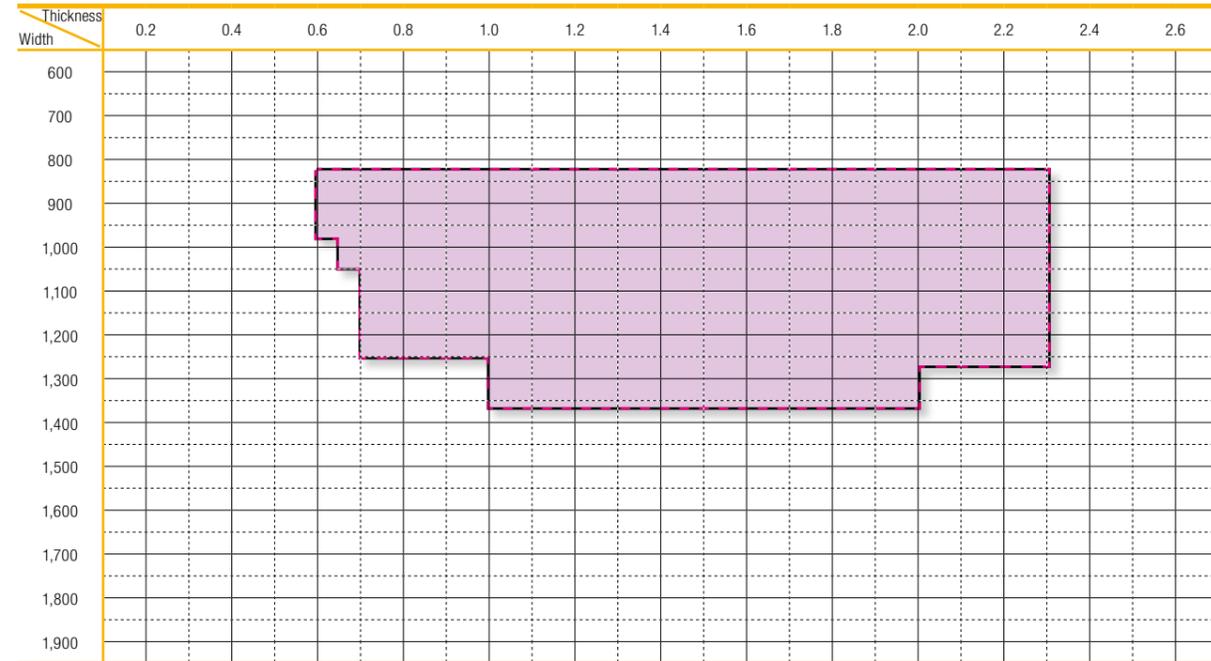
■:Cold-rolled ■:Hot-rolled

■:Commercial products ▲:Customer trial

3. Available Dimensions

Grade : CR/EG, 590TR

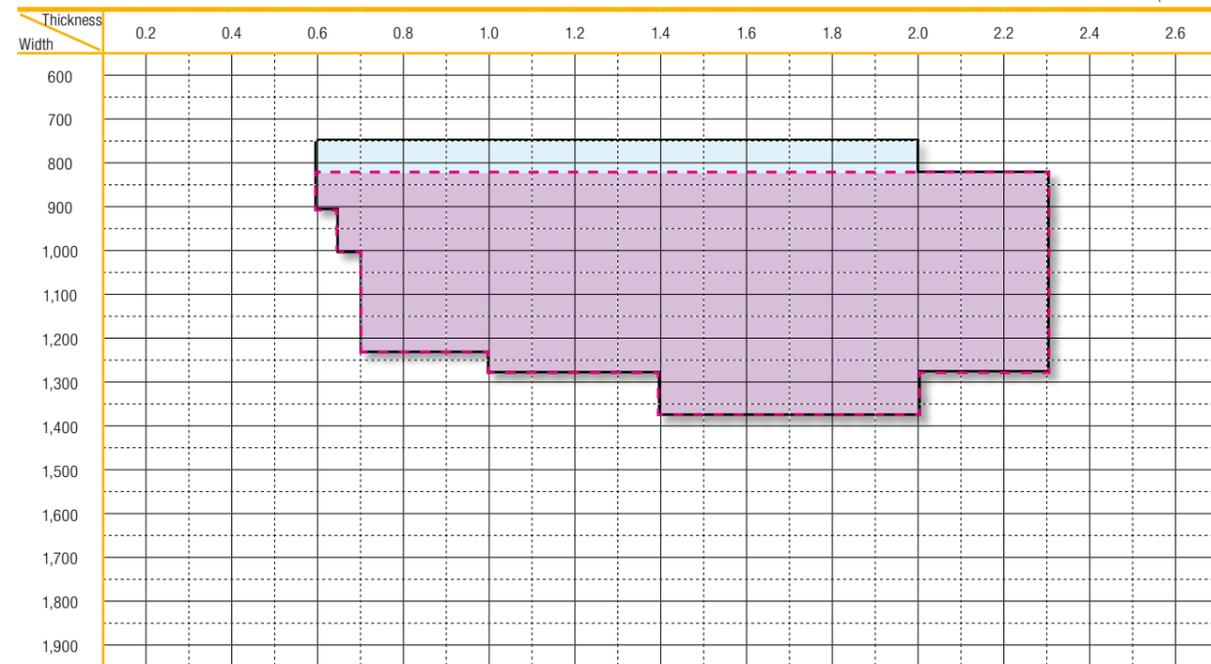
(Unit : mm)



CR — EG - - - -

Grade : CR/EG, 780TR

(Unit : mm)



CR — EG - - - -

• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Cold rolled and galvanized steel for structural parts such as members, Reinf. roof, Reinf. seat belts, bumper rails, and etc.



Floor side panel (CR, 780TR)



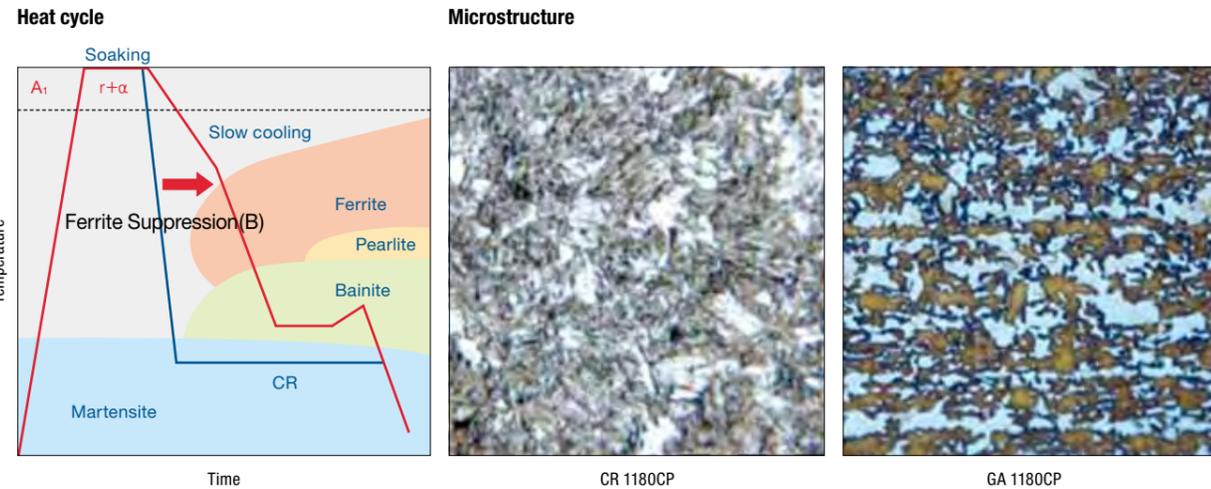
Floor side panel (CR, 780TR)

Advanced High Strength Steel

•Complex Phase Steel

1. General Description

CP steel is a complex-phase steel based on ferrite, where bainite and martensite co-exist together with Ti and/or Nb precipitates. POSCO produces CR and GA/GI steel sheets of 1180MPa tensile strength grade. Their Microstructures are all somewhat different. Intercritically reheated GA 1180CP steel is produced using a slower cooling rate so that it will consist of martensite and ferrite afterwards. CR 1180CP steel is produced using a rapid cooling rate after being soaked in the austenite region (or single-phase region) during a reheating process; therefore, its final microstructure consists of mainly of martensite. According to their microstructural features, GA steel is characterized by its low yield value and high ductility, whereas CP steel is characterized by its high yield value and good bendability.



2. Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
1180CP	TS	CR	0.17	2.8	0.25	0.02	0.005
		GI/GA	0.17	2.8	0.25	0.02	0.005

■:Cold-rolled ■:Hot-rolled
 1) CR (uncoated cold-rolled), EG (electroalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized),

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
1180CP	TS	CR	~850	1180~	6~	-
		GI/GA	~850	1180~	6~	-

■:Cold-rolled ■:Hot-rolled
 1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8t<1.0t, PO: 2t<2.5)

2.3 Available coatings

Grade	Guaranteed value	Uncoated	Electroalvanized	Hot-dip galvanized	Hot-dip galvanized
1180CP	TS	■	-	■	■

■:Commercial products ▲:Customer trial

3. Available Dimensions

Please contact for detail information.

4. Applications

Cold rolled and galvanized steel for parts which require crashworthiness such as sill side panels, underbody reinforcement parts, etc.



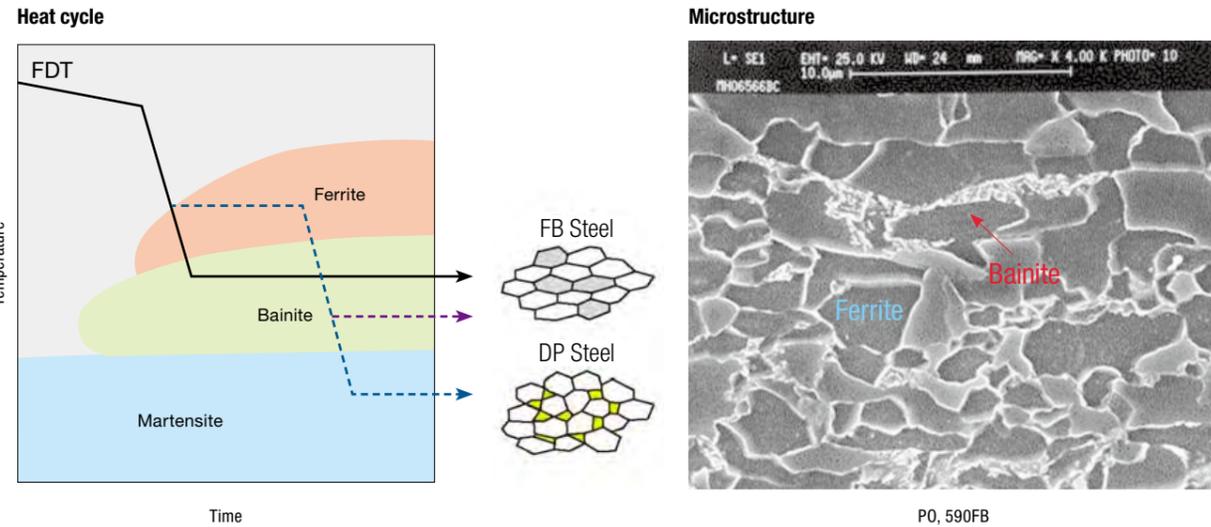
Sill side panel (GA, 1180CP)

Advanced High Strength Steel

• Ferrite-Bainite Steel

1. General Description

FB steel is a dual-phase steel composed of ferrite and bainite which can be manufactured using, 3-step cooling control in the run out table section of the mill. Soft ferrite features high elongation and bainite displays high stretch-flangeability. Combined, FB steel demonstrates a high Hole Expansion Ratio (HER). During cooling after hot rolling, the intermediate holding temperature and coiling temperature are the main variables which determine the final microstructure. To obtain good FB steel properties, it is essential to have an appropriate holding period in the ferrite region in order to produce high purity ferrite and to concentrate solute atoms in untransformed austenite, followed by a rapid cool down to coiling temperature where the austenite converts into bainite.



2. Product Characteristics

2.1 Chemical Composition

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
440FB	TS	PO	0.110	1.200	0.150	0.020	0.003
540FB	TS	PO	0.100	1.500	0.200	0.030	0.003
590FB	TS	PO	0.090	1.550	0.150	0.030	0.003
780FB	TS	PO	0.050	1.800	1.250	0.015	0.003

■:Cold-rolled ■:Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling)

2.2 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.
440FB	TS	PO	305~445	440~	32~
540FB	TS	PO	410~550	540~	24~
590FB	TS	PO	430~580	590~	22~
780FB	TS	PO	600~800	780~	14~

■:Cold-rolled ■:Hot-rolled

1) Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens (CR: 0.8≤t<1.0t, PO: 2≤t<2.5)

3. Available Dimensions

Grade : PO, 590FB (Unit : mm)

Thickness / Width	1.0	1.2	1.4	1.6	1.8	2.0	2.3	2.7	3.2	4.0	5.0	6.0	7.0
600													
700													
800													
900													
1,000													
1,100													
1,200													
1,300													
1,400													
1,500													
1,600													
1,700													
1,800													
1,900													

• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Hot rolled steel for suspensions, wheel discs, and etc.



Lower arm



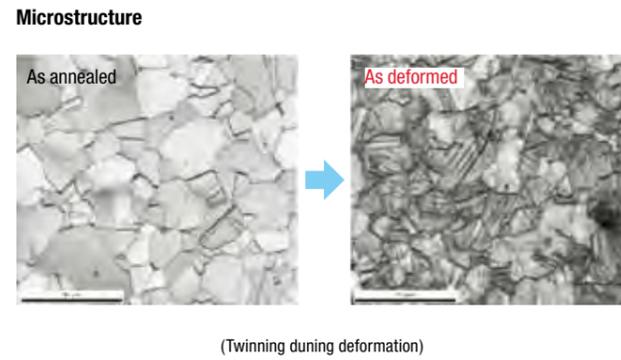
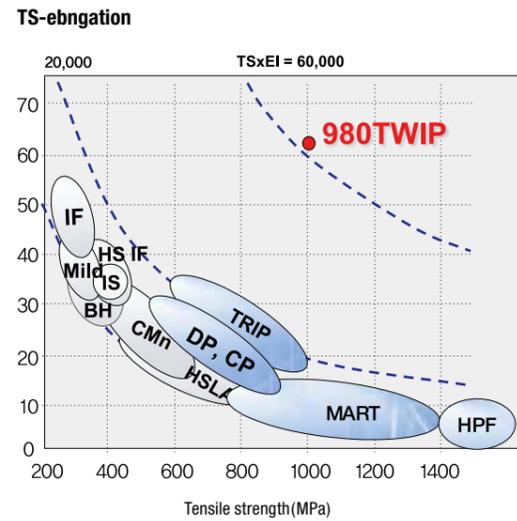
Wheel disc

Advanced High Strength Steel

• TWinning Induced Plasticity Steel

1. General Description

TWIP steel is an austenitic steel with a high C, Mn content which is work hardened through deformation twinning. TWIP steel features an excellent combination of strength and elongation which arises from the presence of deformation twins. Tensile strength is 980MPa and elongation is 65%, which are very difficult to obtain with ordinary steel materials. Deformation twins which are formed during tensile testing are shown in the picture. The number of deformation twins increases with increasing strain.



2. Product Characteristics

2.1 Mechanical properties ¹⁾

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
980TWIP	TS	CR	450~600	950~1050	45~	-

■: Cold-rolled □: Hot-rolled

¹⁾ Guaranteed value for tensile test, uncoated sheet, rolling direction, JIS5 specimens

2.2 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Hot-dip galvanized	Hot-dip galvanized
980TWIP	TS	■	▲	▲	▲

■: Commercial products ▲: Customer trial

3. Available Dimensions

Please contact for detail information.

4. Applications

Part integration. to reduce the stamping steps of complex parts (high formability) and to absorb the crash energy (high n value)



A-Fillar



Wheel Housing



Front Side Member



Wheel Disk



Bumper Beam

Post Heat Treatment Steel

• Hot Press Forming

1. General Description

The Hot Press Forming (HPF) process is also known as hot stamping, press hardening, die quenching and so on. In this process the steel is heated before press forming. At high deformation temperatures, steel sheets are very soft so that difficult shapes can be obtained easily. During forming, the heated steel sheet cools down rapidly in the die block, so that resulting pressed parts have a very high strength level. Boron is commonly added to increase the hardenability of the steel sheet. Aluminum coating is usually applied to prevent high temperature oxidation during heating. POSCO has developed a new coating method, second generation nano-coating, which provides excellent surface quality and weldability. CR and PO also can be used as HPF materials. However, shot blasting is necessary after press forming to remove the surface oxidation layer.

2. Product Characteristics

2.1 Mechanical properties

• Pre-Heat Treatment

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
PCT1470H	composition	CR	~550	~750	16~	-
	composition	Al-Si	~550	~750	16~	-
	composition	GI	~550	~750	16~	-
PHT1470H	composition	PO	~550	~650	16~	-

■: Cold-rolled ■: Hot-rolled

• Post-Heat Treatment

Grade	Guaranteed value	Class. ²⁾	0.2%YS, MPa Spec.	TS, MPa Spec.	El., % Spec.	BH, MPa Spec.
PCT1470H	composition	CR	950~1250	1300~1700	6~	-
	composition	Al-Si	950~1250	1300~1700	6~	-
	composition	GI	950~1250	1300~1700	6~	-
PHT1470H	composition	PO	950~1250	1300~1700	6~	-

■: Cold-rolled ■: Hot-rolled

2.2 Available coatings

Grade	Guaranteed value	Uncoated	Electrogalvanized	Hot-dip galvanized	Hot-dip galvanized
PCT1470H	composition	■	—	■ (Al)	—
PHT1470H	composition	■	—	—	—

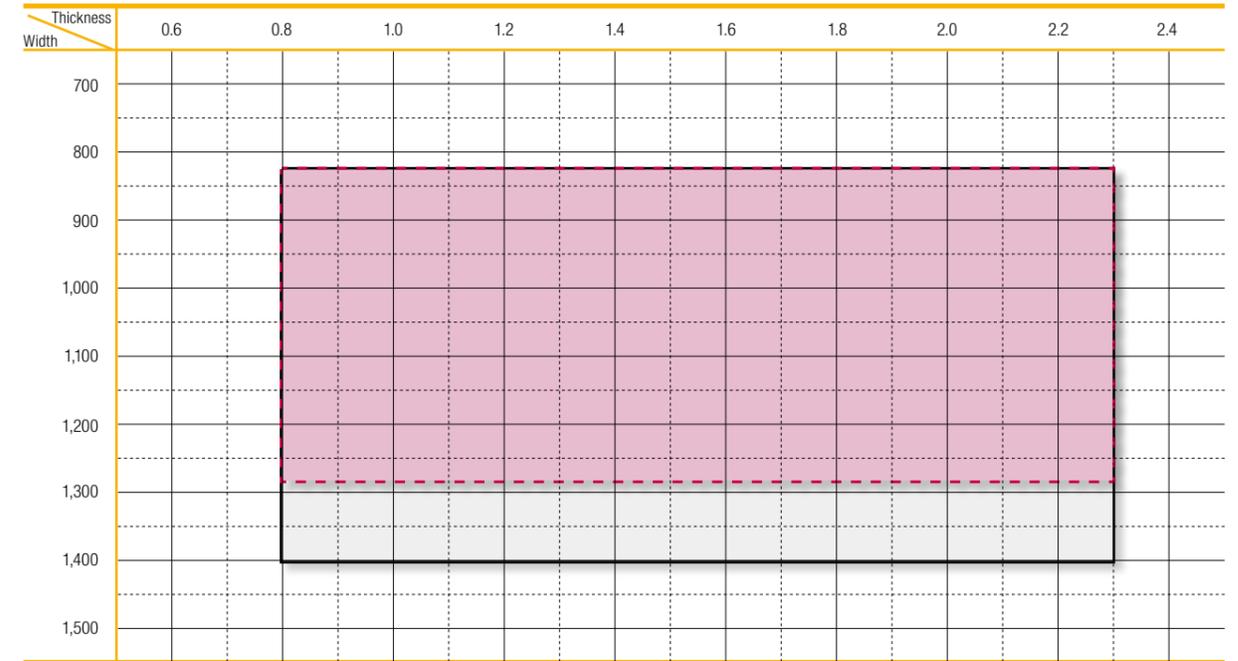
■: Cold-rolled ■: Hot-rolled ■: Commercial products ▲: Customer trial

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling), Al (hot-dip Al coated)

3. Available Dimensions

Grade : CR/Al-coating, PCT1470

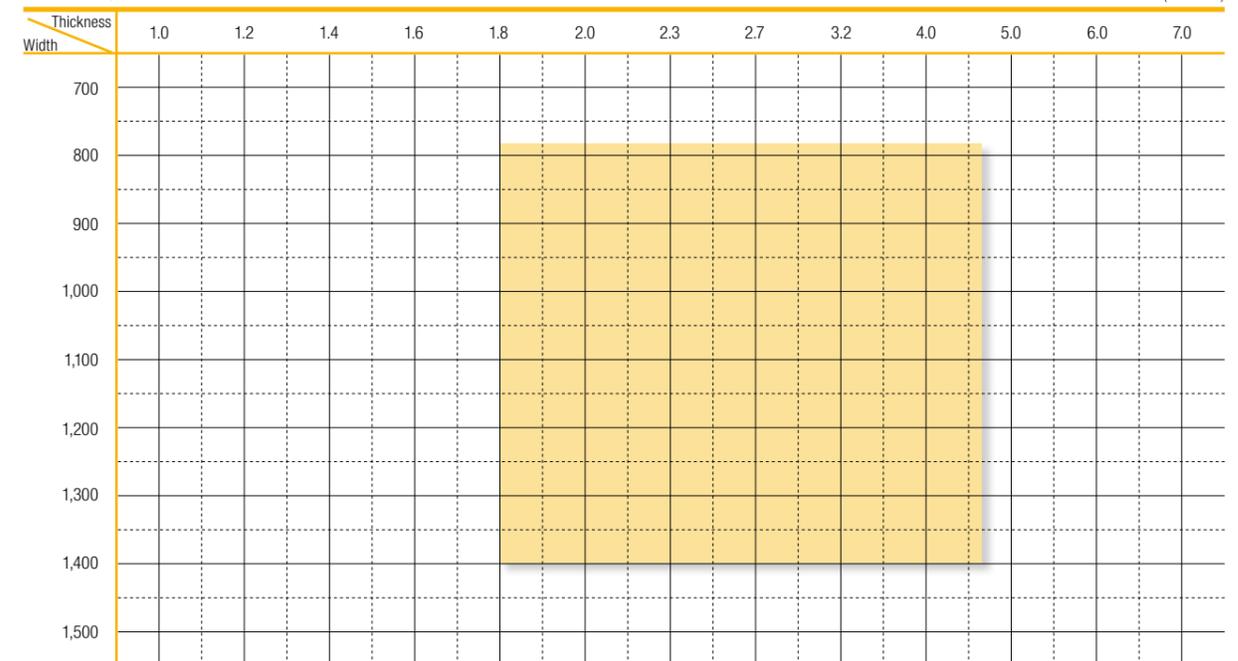
(Unit : mm)



CR — Al-coating - - -

Grade : PO, PHT1470

(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Cold rolled and galvanized steel for structural parts such as members, Reinf. roof, Reinf. seat belts, bumper rails, and etc.



Post Heat Treatment Steel

•AUTOBEAM / STAB

1.General Description

POSCO Autobeam and Stab brand steels are formulated specifically for door impact beams and stabilizers. They are subjected to post-process heat treatment to obtain the desired martensite phase content. Thus, quench hardening elements such as B and/or Cr are added in these steels. High tensile strengths over 1500MPa can be easily achieved by this process.

2.Product Characteristics

2.1 Chemical Composition

(Unit : wt%)

Grade	Guaranteed value	Class. ¹⁾	C Max.	Mn Max.	Si Max.	P Max.	S Max.
STAB	Composition	HR	0.25	0.60	0.25	0.40	-
AUTOBEAM	Composition	HR	0.30	1.5	-	0.30	-

■: Cold-rolled ■: Hot-rolled

1) CR (uncoated cold-rolled), EG (electrogalvanized), GI (hot-dip galvanized), GA (hot-dip galvanized), PO (pickling and oiling), HR (Hot-rolled)

2) $C_{eq} = C + 1/6(Mn+Si) + 1/5(Cr+Mo+V) + 1/15(Ni+Cu)$ ---IIW equation

3. Available Dimensions

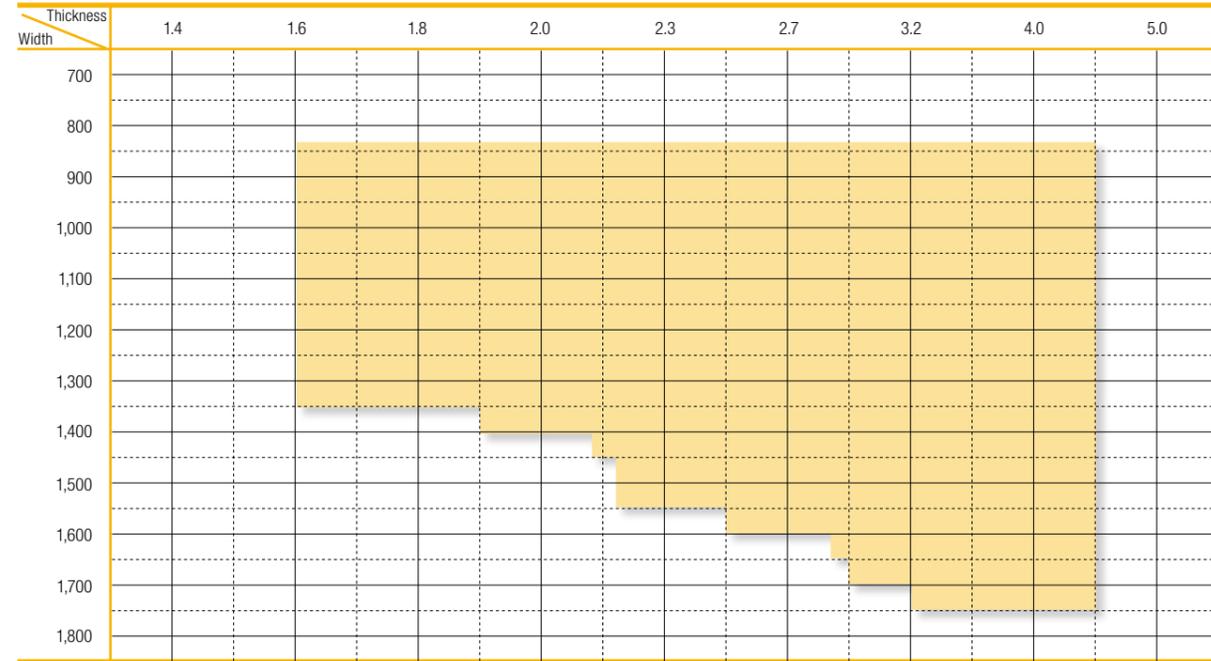
Grade : HR, Autobeam

(Unit : mm)

Thickness \ Width	1.4	1.6	1.8	2.0	2.3	2.7	3.2	4.0	5.0	6.0	7.0
800											
900											
1,000											
1,100											
1,200											
1,300											
1,400											
1,500											
1,600											
1,700											
1,800											
1,900											

Grade : HR, Stab

(Unit : mm)



• The above diagrams are only for selected steel grades. Please contact for more information of other grades.

4. Applications

Hot rolled steel for parts which require high crashworthiness and impact resistance such as door impact beams, stabilizers

Stab is used for CTBA of the rear suspension without heat treatment.



High-functional Treated Steel

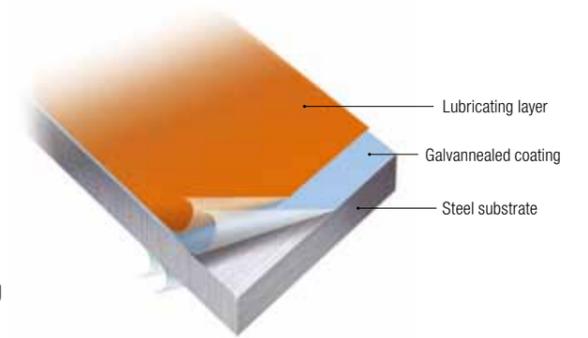
• Lubricant Steel

1. General Description

POSCO produces galvanized steel sheets (GA) with inorganic and metallic lubricant coatings to improve press formability for automobile panels. The inorganic coating is a rolled-on phosphate treatment and the metallic coating is produced by electroplating. In addition to the lubricant effect, other properties such as weldability, corrosion resistance, degreasability, and paintability are also improved. Lubricant coated steel sheets are strongly recommended for use in automobile parts requiring high formability.

2. Manufacturing Process

A cross sectional schematic view of lubricant coated steel sheets is shown in the figure below and two types of lubricant coating materials are shown in the table. Phosphate solution is applied to the GA using a roll coater followed by a drying process. An electrical potential is applied across the GA which submerged in a Ni-X bath to produce a metallic coating layer. The roll coating process is environmentally friendly as there is no waste water. Metallic coating provides better weldability and corrosion resistance than inorganic coating.

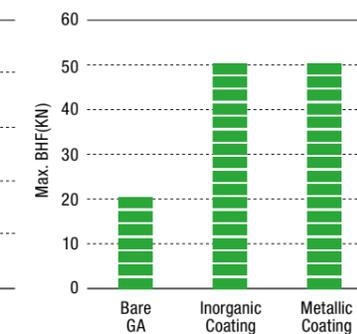
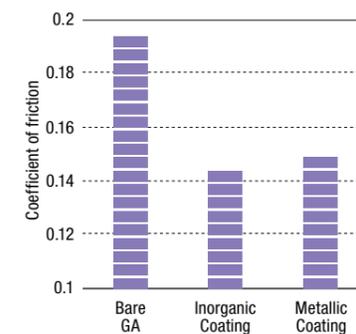


Class.	Coating composition	Coating weight (mg/m ²)	Coating type	Application
LP	Inorganic coating	Phosphate	Roll coating	Inner & outer
LM	Metallic coating	Ni-X	Electroplating	Outer

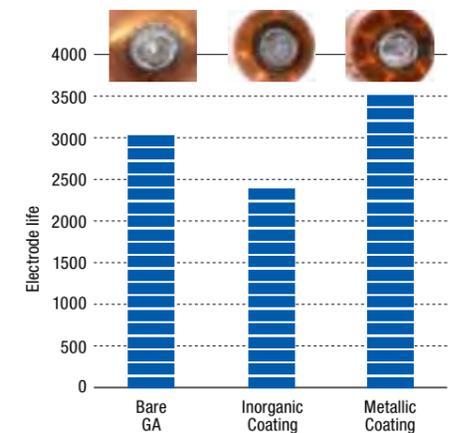
3. Product Characteristics

3.1 Formability

The friction coefficient is reduced and the blank hold force (BHF) is enhanced by the formation of lubricant coating layers. The lubricant coating material reduces friction resistance between the sheets and the pressing die. It can increase the lifetime of dies used in the automobile industry.



Results of formability test



Electrode life continuous spot welding (2.5KN, 15cycle, Cu-Cr dome type electrode)

Product Introduction

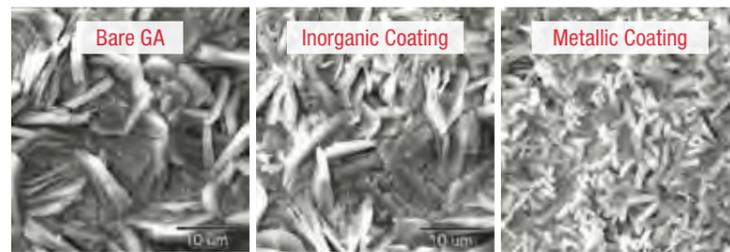
Lubricant Steel / Fuel Tank Steel / Pre-sealed Steel / Plastic Coated Steel for Automotive Parts

3.2 Weldability

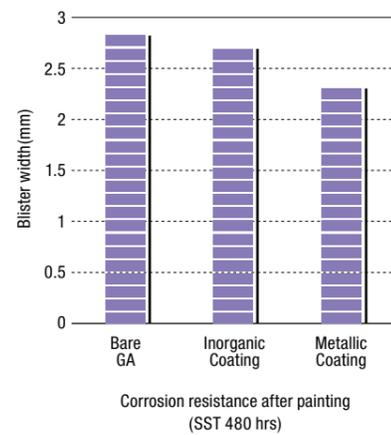
In comparison to bare GA, as high melting point materials are coated on the surface, the lifetime of spot welding electrodes is extended. The inorganic coated lubricant steel sheet has the same current range as bare GA but electrode lifetime is slightly decreased.

3.3 Phosphate Treatment and Corrosion Resistance

Pressed steel sheets are dipped into a phosphate solution in automobile factory painting lines. The inorganic lubricant coated layer on GA is completely removed by a degreasing process before the phosphate treatment. The micro structure of inorganic coated steel sheets remains unchanged by the phosphate process. Metallic coated samples acquire a dense phosphate morphology because the metallic coating layer does not dissolve in the phosphate solution. Metallic coating provides better corrosion resistance than inorganic coating due to the formation of a dense phosphate microstructure.



SEM images of phosphate layer



4. Applications

Both POSCO products are commonly specified for outer or inner panels which need high formability.



Inorganic coated lubricant steel



Metallic coated lubricant steel

Side outer

High-functional Treated Steel

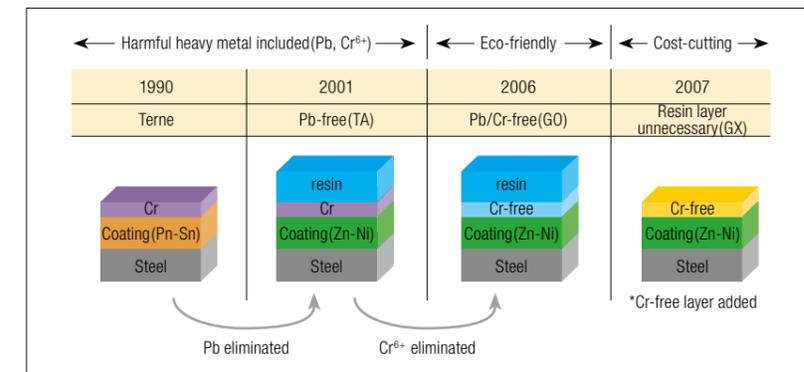
Lubricant Steel / Fuel Tank Steel / Pre-sealed Steel / Plastic Coated Steel for Automotive Parts

High-functional Treated Steel

• Fuel Tank Steel

1. General Description

Due to safety considerations, fuel tank steels are subject to very strict material requirements.. Excellent long term corrosion resistance against fuel is essential. The complex shape of fuel tanks requires good formability and excellent weldability. Due to stricter environmental regulation of harmful materials, elements such as Pb or Cr are no longer permitted to be used as surface treatments for steel fuel tanks. Therefore, POSCO has developed a special eco-friendly steel for fuel tanks, which is not coated with resin, which achieves excellent cost-effectiveness compared to fuel tanks made of plastic or tin-galvanized steel.



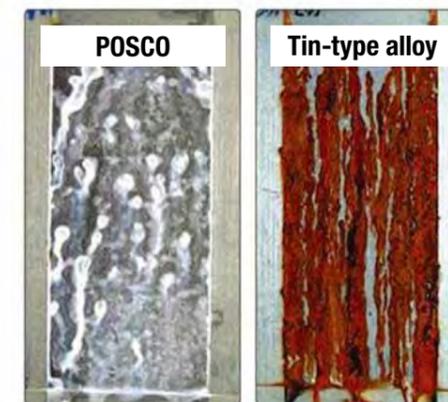
2. Product Characteristics

2.1 Formability

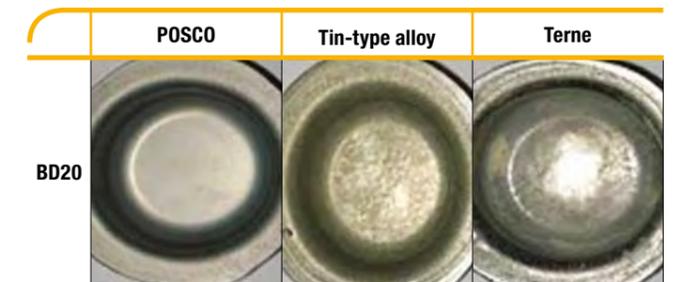
Samples (t=0.8mm)	Mechanical properties			Mn Max.	Si Max.	Friction coeff.	
	YP, MPa	TS, MPa	El., %			Single side	Draw bead
GX	160	298	46	2.12	36.6	0.122	0.121
TA	159	297	46	2.11	35.4	0.120	0.123

2.2 Corrosion resistance and fuel resistance

POSCO fuel tank steel provides excellent corrosion resistance (over 800 hours in case of SST) and resistance against additives found in diverse demonstrated better than 800 hours corrosion resistance to a salt fog test environment.



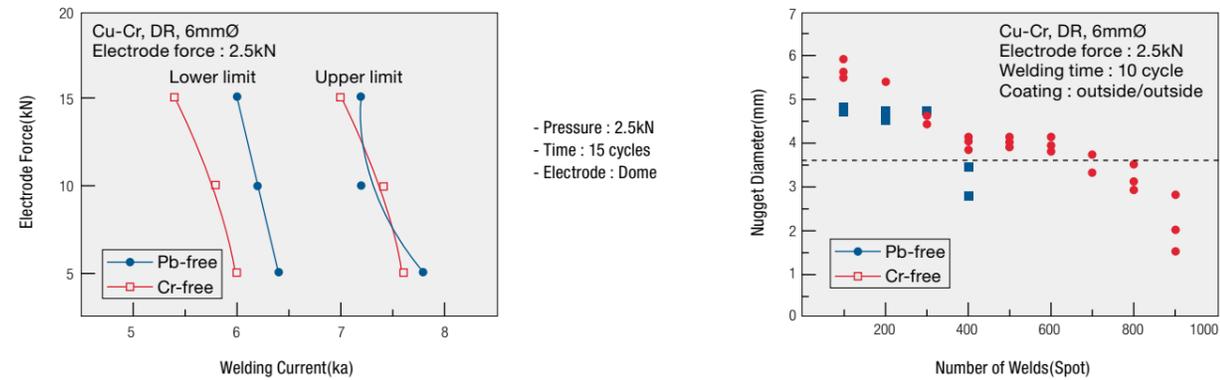
Corrosion resistance (SST, 1000hrs)



Fuel resistance : Bio-Diesle 20% + H₂O 10% (8hrs [80°C, Shaking 60rpm] + 16hrs(RT), 56day, Once / 2 weeks fuel replacement)

2.3 Spot weldability

When Cr-free GX steel is treated with a thin layer of resin, it results in a wider spot-welding range and longer electrode life than relatively thick, Pb-free TA steel.



3.Applications

Fuel tank steel produced by POSCO is well-suited for today's manufacturing needs in terms of environmental considerations, cost effectiveness, easy formability and consistent quality.



High-functional Treated Steel

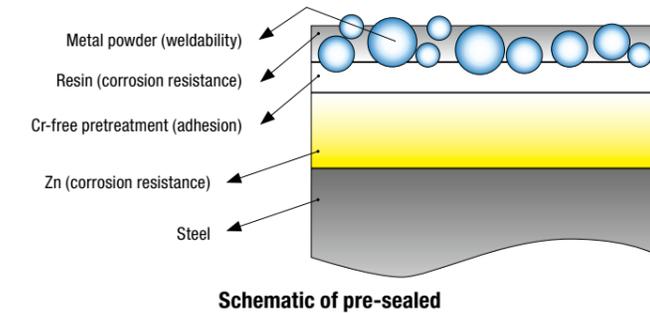
•Pre-sealed Steel

1. General Description

Pre-sealed steel sheets are environmentally friendly thin organic coated weldable primer steel sheets with good corrosion resistance properties. They deliver reliable corrosion protection for automotive flange or hemming parts of door, side outers, and many other components which are vulnerable to corrosion. 'POS-sealed' steel sheets incorporate POSCO's unique chromium-free pretreatment and paint resin systems which provide excellent corrosion resistance properties with electrogalvanised and galvanized steels.

2. Process

POS-Sealed Steel is produced using a conventional coil coating process. The figure below is a schematic description of pre-sealed steel sheet.



3. Product Characteristics

3.1 Formability

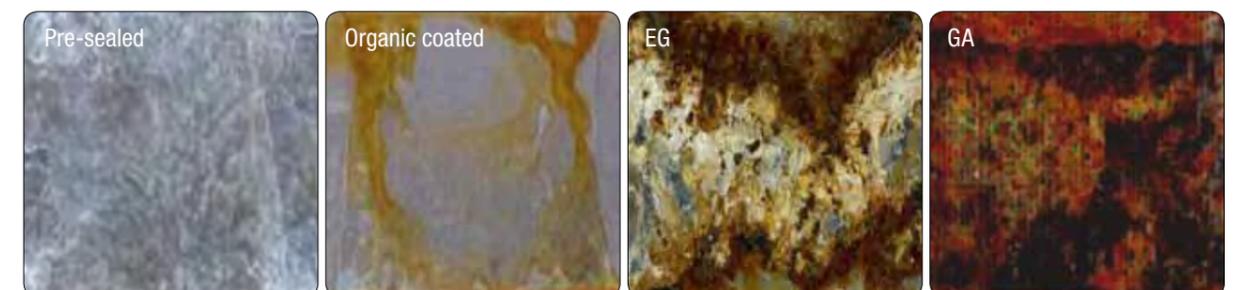
Because pre-sealed steel sheets have organic resin coatings topped with metal powders, which act as a lubricant, their formability is better than conventional uncoated steel sheets. The typical forming processes do not result in galling or delamination of the coating layer.

3.2 Weldability

Service life of spot welding tips is extended when used with pre-sealed steel sheet. Lifetime depends on the thickness of the organic coating layer and coating characteristics (single or double side coat), however, it usually exceeds 1,000 spot weld points.

3.3 Corrosion resistance

The main reason for using pre-sealed steel sheets is that it improves car body corrosion resistance properties. This has been well proven in salt spray corrosion resistance and cyclic corrosion testing.



Corrosion resistance properties of hem flange simulated panels (Cyclic Corrosion Test, 10 cycles)

Product Introduction

Lubricant Steel / Fuel Tank Steel / Pre-sealed Steel / Plastic Coated Steel for Automotive Parts

3.4 Electrodeposition (ED) coating

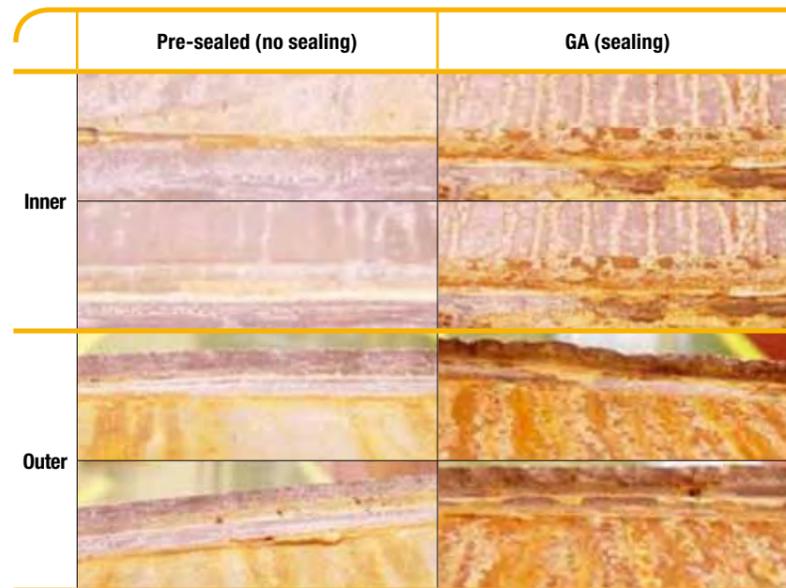
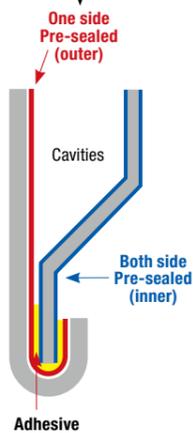
As pre-sealed steel sheets have metal powders on the exposed surface, they can be phosphated and ED coated using conventional plating processes.

3.5 Sealer adhesion

Hem sealers are often applied between structural components made from pre-sealed sheet steel. Owing to excellent adhesion between POS-Seal resin and the steel substrate, any shearing failure which may occur between components will typically involve the hem sealant only, leaving the steel unaffected.

4. Applications

Adoption of POS-sealed steel in auto bodies can protect against perforation corrosion in hem and flange areas without the need for secondary corrosion protection such as sealing and cavity waxing.



Corrosion resistance for door hemming parts(CCT 10 cycles)

High-functional Treated Steel

Lubricant Steel / Fuel Tank Steel / Pre-sealed Steel / Plastic Coated Steel for Automotive Parts

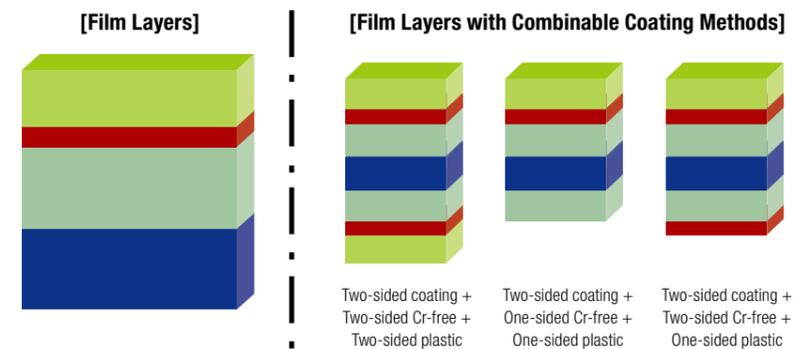
High-functional Treated Steel

• Plastic Coated Steel for Automotive Parts

1. General Description

Compared to pre-existing pre-coated metal (PCM), our plastic coated steel for automotive parts offers improved resin film adhesion and heat resistance, resulting in better surface quality by suppressing film detachment from processed areas. Also, corrosion resistance is enhanced thanks to a special rust-preventative ingredient, enabling the oiling process to be skipped.

2. Product Characteristics



***Plastic layer:** when coatings are applied as a barrier to corrosive elements, this layer provides a lubricant effect (improved machinability) and allows heat from processing to be tolerated (improved heat resistance).
***Lower plastic layer:** improves corrosion resistance by improving adhesion between steel and resin.

Coated layer: applicable to all EG, GI, and GA products (currently, only EG products have been developed)

Materials: applicable to all available POSCO-manufactured materials and sizes

2.1 Corrosion Resistance

With the addition of nano-clay (Montmorillonite phyllosilicate), its corrosion resistance is substantially improved compared to ordinary PCM steel.



Corrosion resistance comparison between plates

nano-clay not added

nano-clay added

SST 480hrs

2.2 Machinability



EG untreated product

Nano-clay not added product

Nano-clay added product

- Blank size : 120mm ø
- BHF : 0.5 ton
- R6, 81mm height processing
- P340 cleaning oil sprayed

GI-ACE(Aerosols charged with electrostatic) Steel

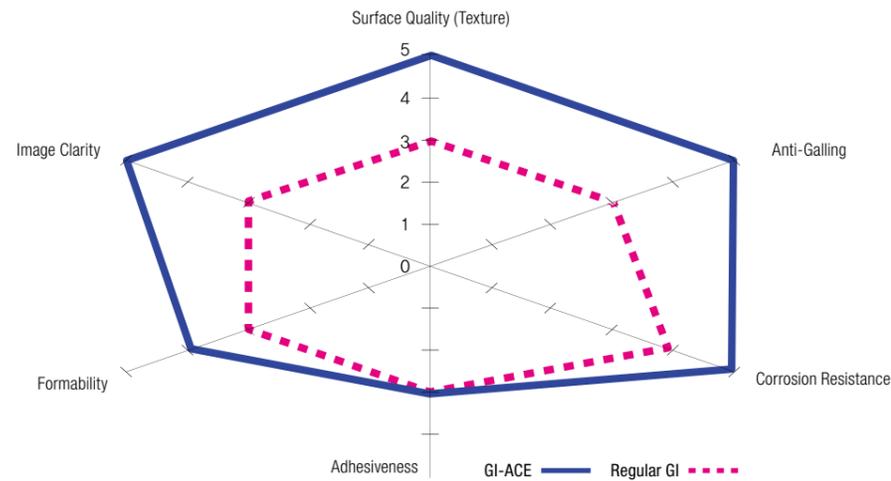
1. General Description

Spangle sizes in this steel product are miniaturized through an atomized coating process using electrostatic charges.

Surface quality, corrosion resistance, and weldability of this product are outstanding.

* Specify "Surface Finalization Designation Code" on your order form.

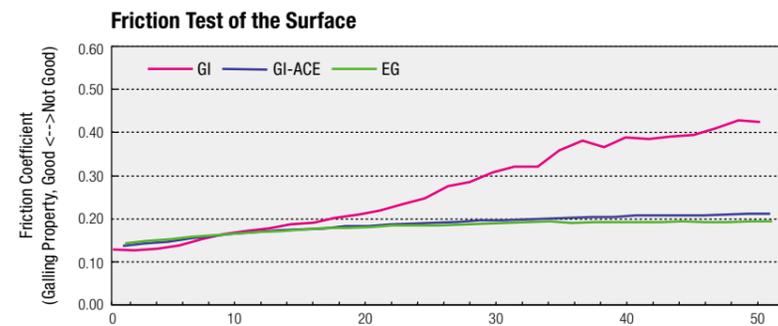
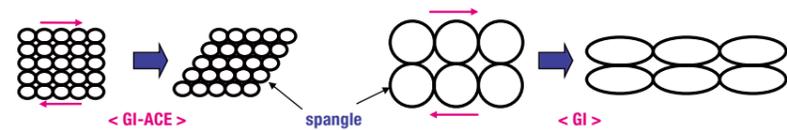
2. Product Characteristics



2.1 Anti-Galling

Compared to regular GI steel, this product exhibits better resistance to galling. The spangle size of this steel is very small.

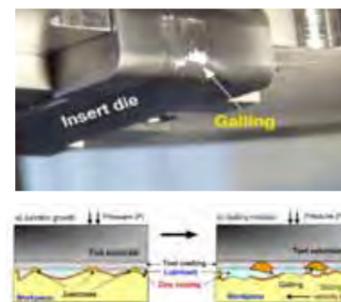
As a result, fewer Zn particles erupt on the coated surface after pressing operations.



Measurement of coefficient of friction across a continuous surface is an indicator of its propensity for galling. Compared to regular GI, and EG, GI-ACE's surface coefficient of friction is consistently maintained at a lower level than ordinary products. In other words, GI-ACE exhibits more favorable galling resistance.

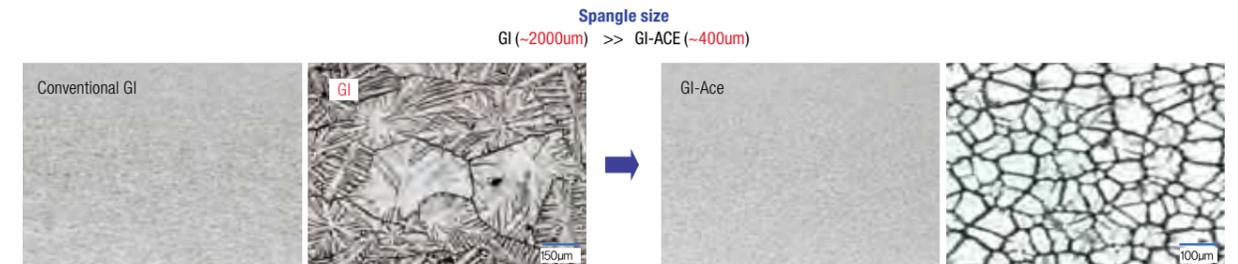
What Is Galling?

Galling is a damaging phenomenon caused by Zn particles on coated steel surfaces which adhere to the mold during continuous pressing operations.



2.2 Surface Quality (Texture)

Surface texture and general appearance is improved thanks to reduced roughness contrast and inconsistency.



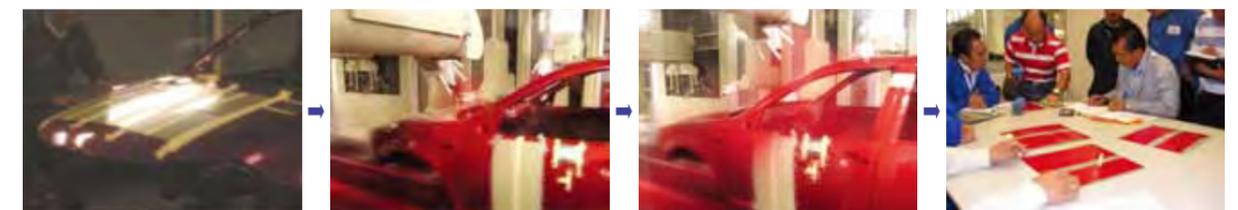
2.3 Corrosion Resistance

The spangle miniaturization effect associated with GI-ACE coated surface layers promote preferred grain orientation. Also, precipitation of Al from grain boundaries improves corrosion resistance along with resistance to oil stain and black stain.



• CCT : Cyclic corrosion test / 1 Cycle (24 hrs.)

2.4 Image Clarity



Item	Sample test result	
	Spangle Size	LW (Long wave)
GI-ACE	400 µm Max	3.5~4.5
Conventional GI	2,000 µm Max	6.0~7.0
EG	About 10 µm	3.5~4.5

Dimensional Tolerances

Size Tolerances - Cold Steel

1. Thickness

(Unit : mm)

Thickness	Width					
	205~400	400~630	630~1,000	1,000~1,250	1250~1,600	1600~
~0.25	±0.030	±0.030	±0.030	±0.030	-	-
0.25~0.40	±0.035	±0.035	±0.040	±0.040	-	-
0.40~0.60	±0.040	±0.040	±0.050	±0.050	±0.060	-
0.60~0.80	±0.045	±0.045	±0.060	±0.060	±0.060	±0.070
0.80~1.00	±0.050	±0.050	±0.060	±0.070	±0.080	±0.090
1.00~1.25	±0.050	±0.060	±0.070	±0.080	±0.090	±0.110
1.25~1.60	±0.060	±0.060	±0.090	±0.100	±0.110	±0.130
1.60~2.00	±0.080	±0.080	±0.110	±0.120	±0.130	±0.150
2.00~2.50	±0.080	±0.090	±0.130	±0.140	±0.150	±0.170
2.50~3.00	±0.090	±0.100	±0.150	±0.160	±0.170	±0.200

2. Width

(Unit : mm)

EDGE TYPE	Width	Tolerance(KS, JIS)	POSCO
MILL EDGE	~1250 1250~	-0, +7 -0, +10	-0, +5
SLIT EDGE	~1250 1250~	-0, +3 -0, +4	-0, +3

3. Length

(A) (Unit : mm)

Length	Tolerance
~2,000	+10, 0
2,000~4,000	+15, 0
4,000~6,000	+3, 0

(B) (Unit : mm)

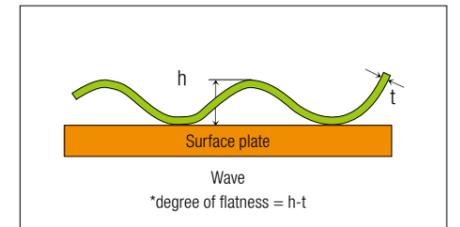
Length	Tolerance
~1,000	+3, 0
1,000~2,000	+4, 0
2,000~3,000	+6, 0
3,000~4,000	+8, 0

Remarks) Length tolerances will be subject to Chart A or Chart B depending on instruction from the customer. If there is no specific instruction, Chart A will be used.

4. Maximum Degree of Flatness

(Unit : mm)

Classification	Sheet steel		
	WAVE	EDGE	CENTER
~1,000	12(2)	8(2)	6(2)
1,000~1,250	15(3)	10(2)	8(2)
1,250~1,600	15(4)	12(3)	9(2)
1,600~	20(5)	14(4)	10(2)



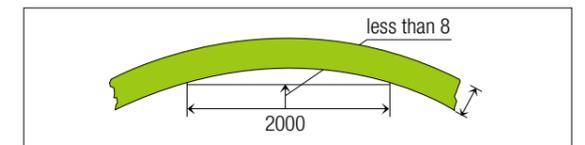
Remarks) 1. Each number in parentheses is, in principle, applied to stretcher leveler processed steel.
2. Degree of flatness is measured on a surface plate as shown in the figure. DoF equals maximum thickness minus specified thickness divided by specified thickness.

5. Maximum Degree of Straightness

(Unit : mm)

Classification	Sheet steel		Steel coil
	Length less than 2,000	Length less than 2,000	
~600	4	4 out of arbitrary length of 2,000	
600~	2	2 out of arbitrary length of 2,000	

Remarks) It is not applied to the irregular part of a steel coil.



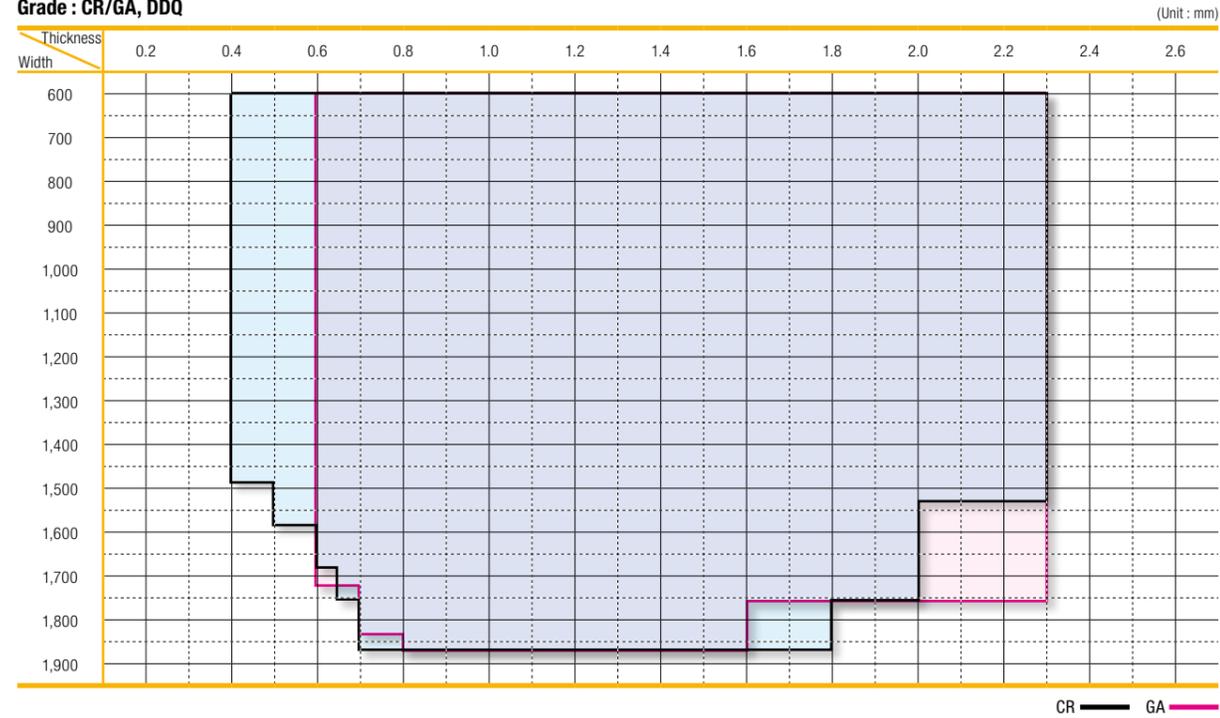
Available Dimensions

Available Dimensions

The range of available product dimensions constantly changes depending on equipment and manufacturing conditions.
Please consult with your POSCO technical representative before ordering.

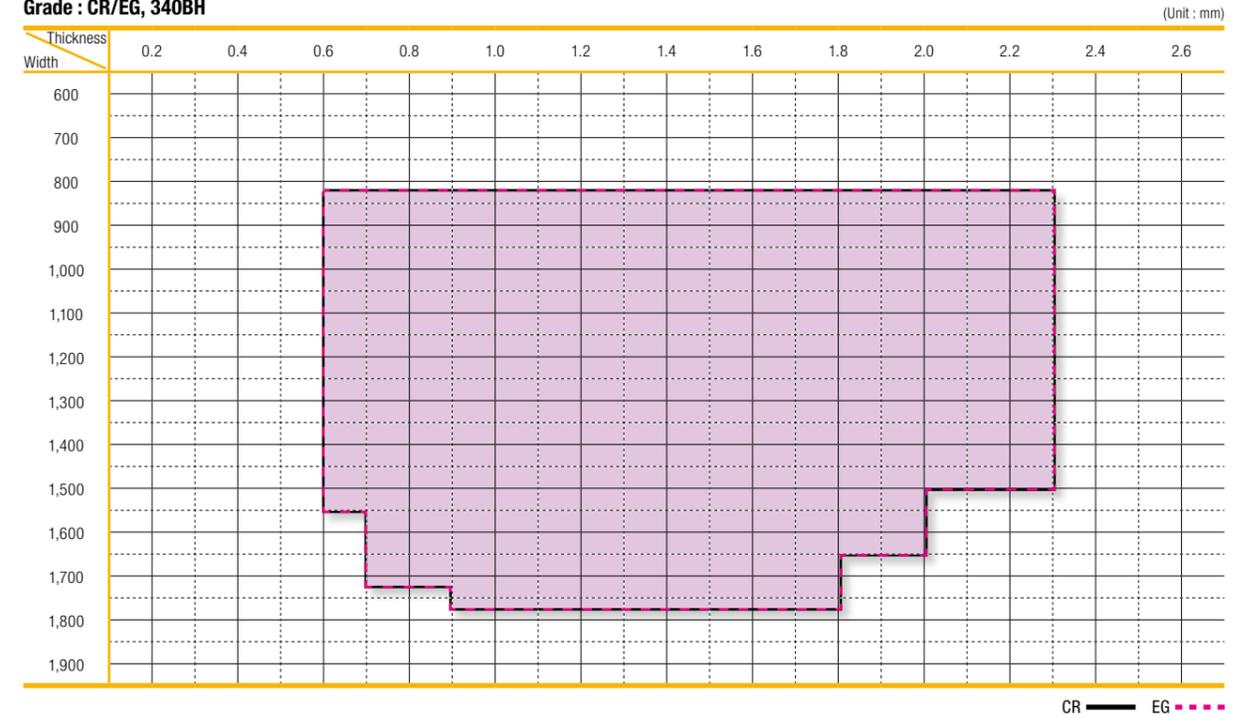
Mild Steel

Grade : CR/GA, DDQ

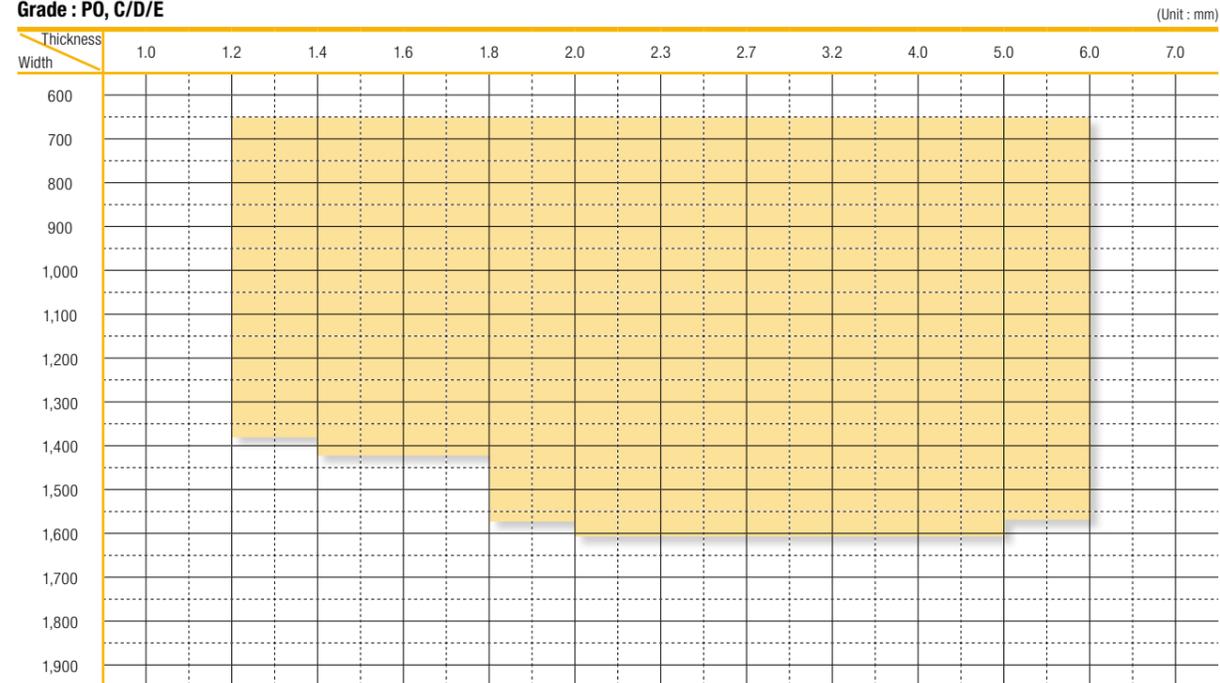


BH Steel

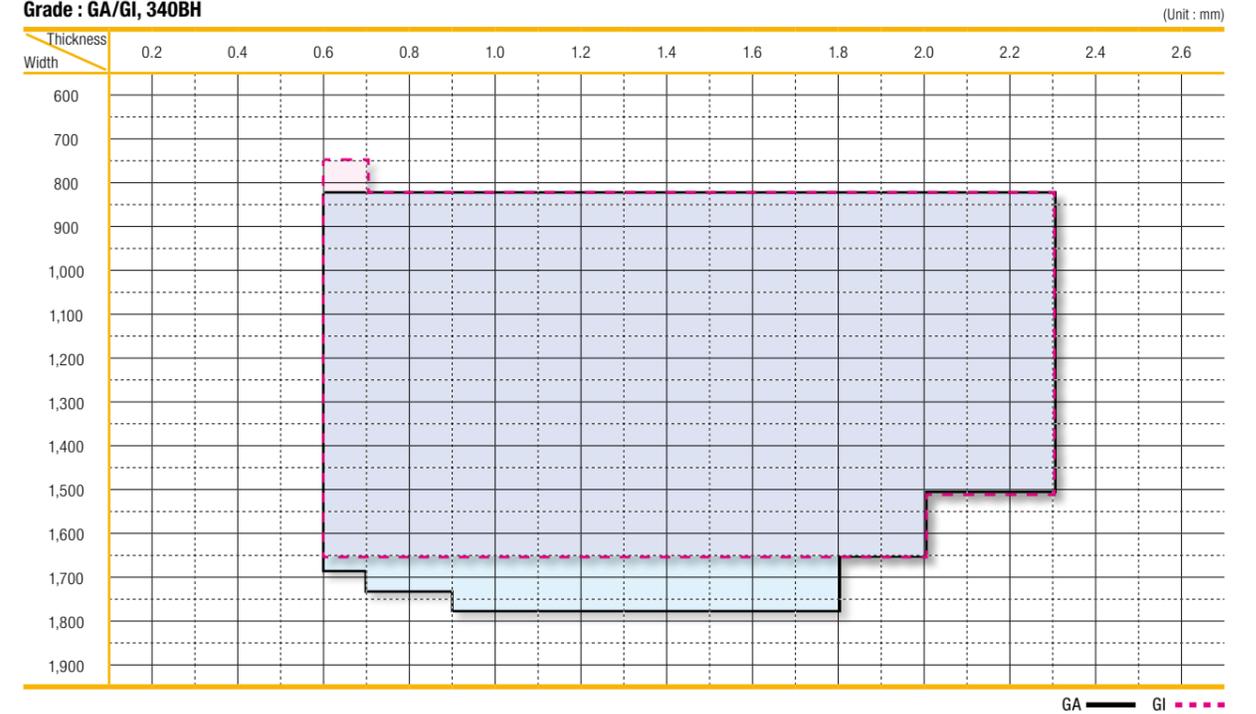
Grade : CR/EG, 340BH



Grade : PO, C/D/E



Grade : GA/GI, 340BH

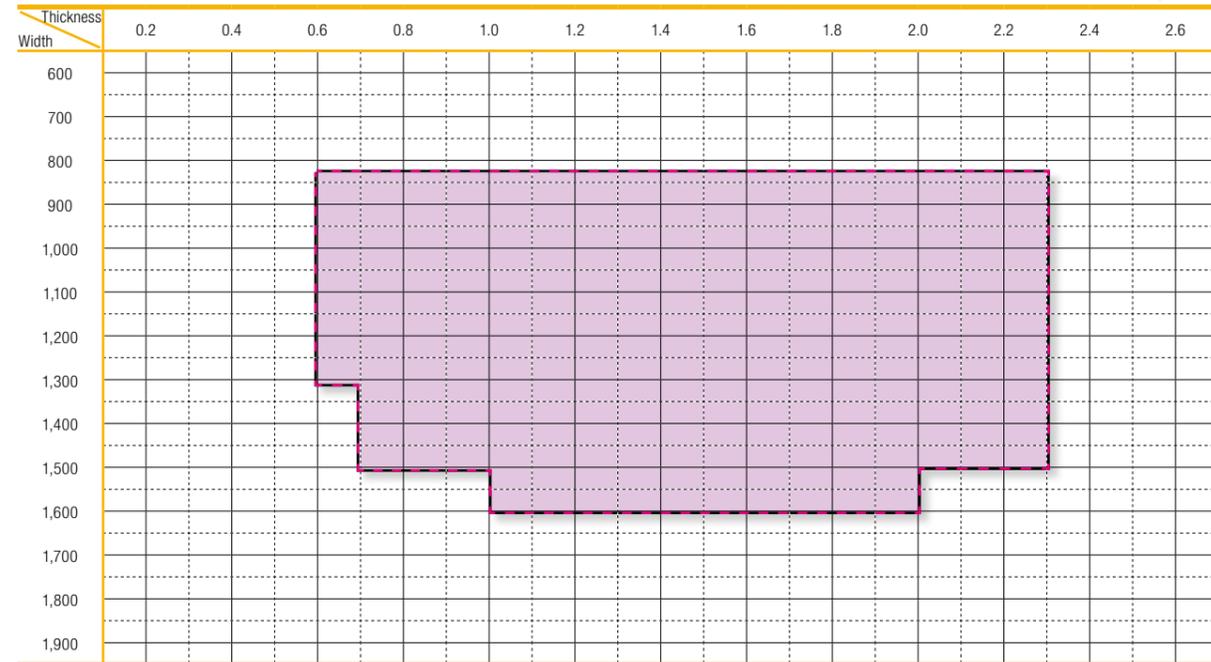


Available Dimensions

HSLA(C-class & YS-guaranteed)

Grade : GA/GI, 440C

(Unit : mm)

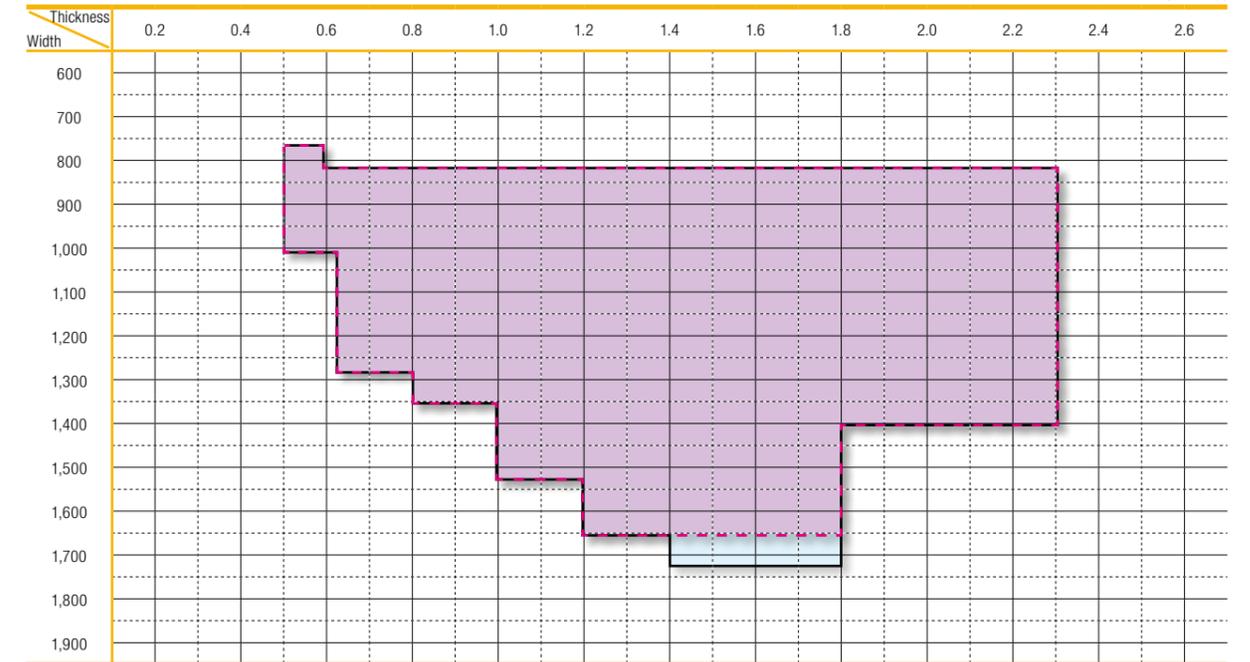


GA — GI - - -

Rephosphorised Steel(R-class)

Grade : GA/GI, 440R

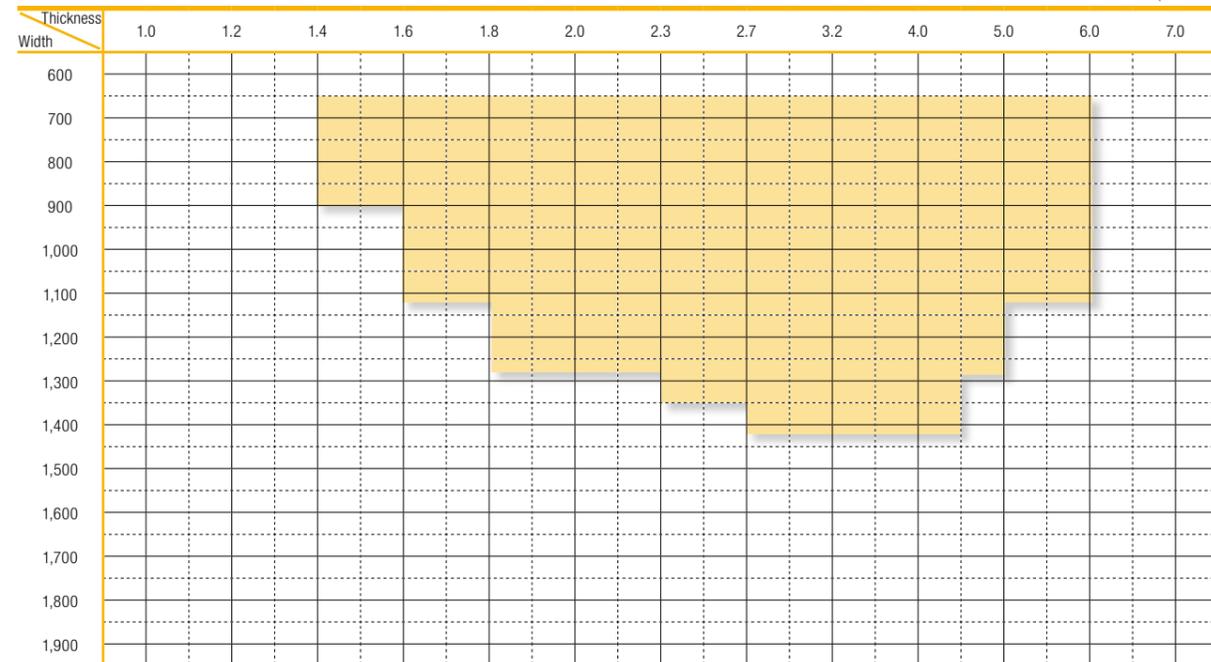
(Unit : mm)



GA — GI - - -

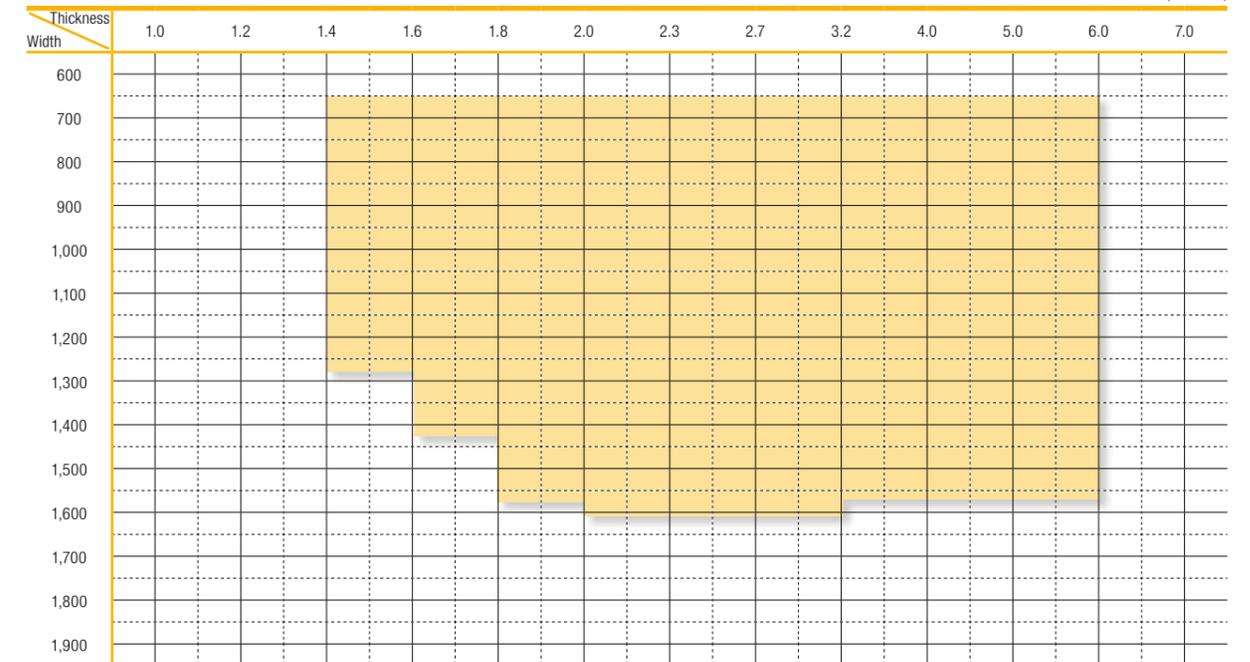
Grade : GA/GI, 440R

(Unit : mm)



Grade : PO, 440R

(Unit : mm)

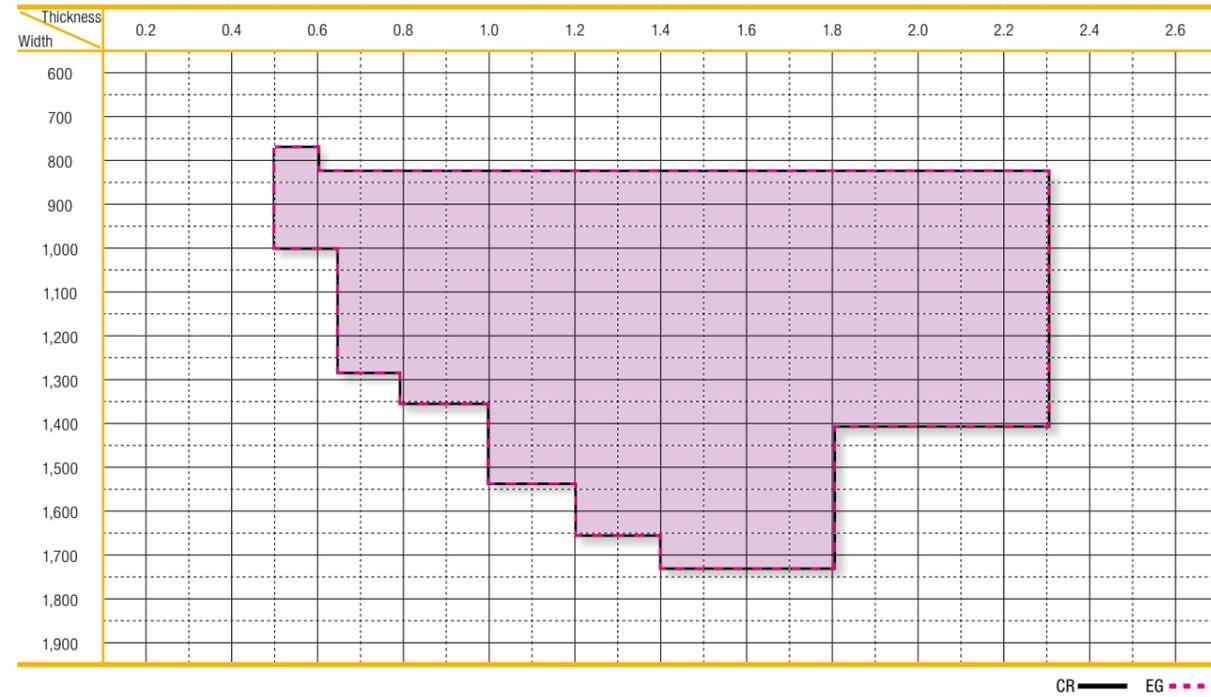


Available Dimensions

IF HSS(E/ES-class)

Grade : CR/EG, 440E

(Unit : mm)



DP Steel

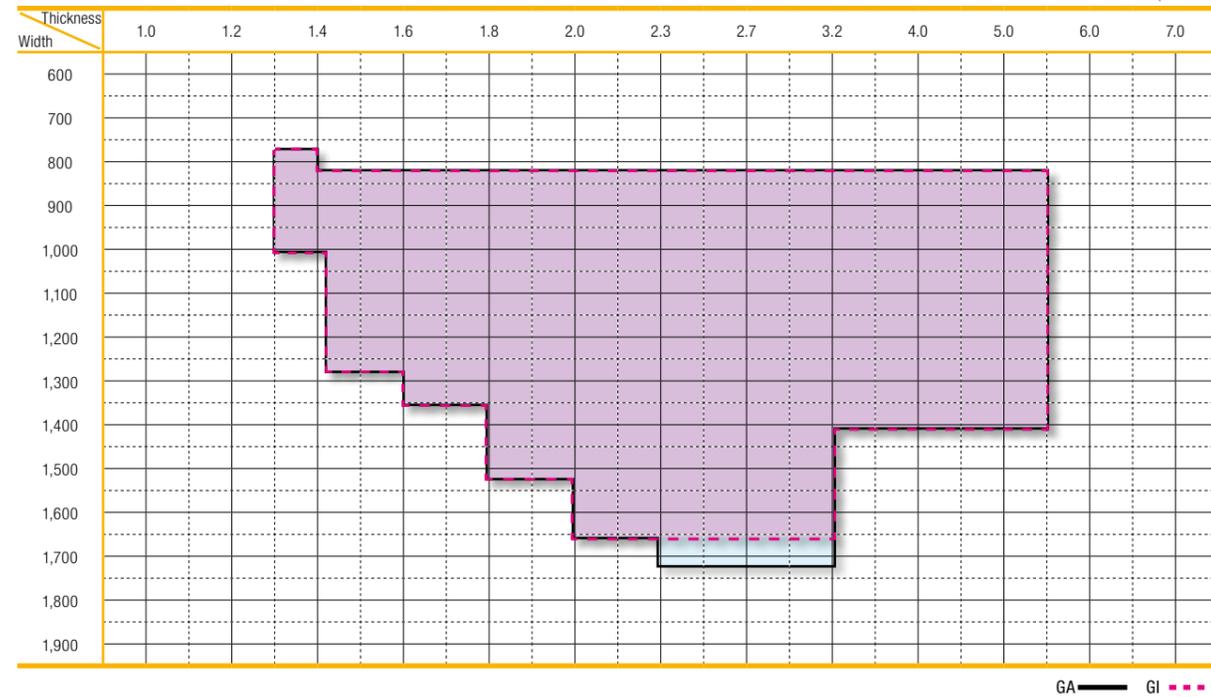
Grade : GA/GI, 590DP

(Unit : mm)



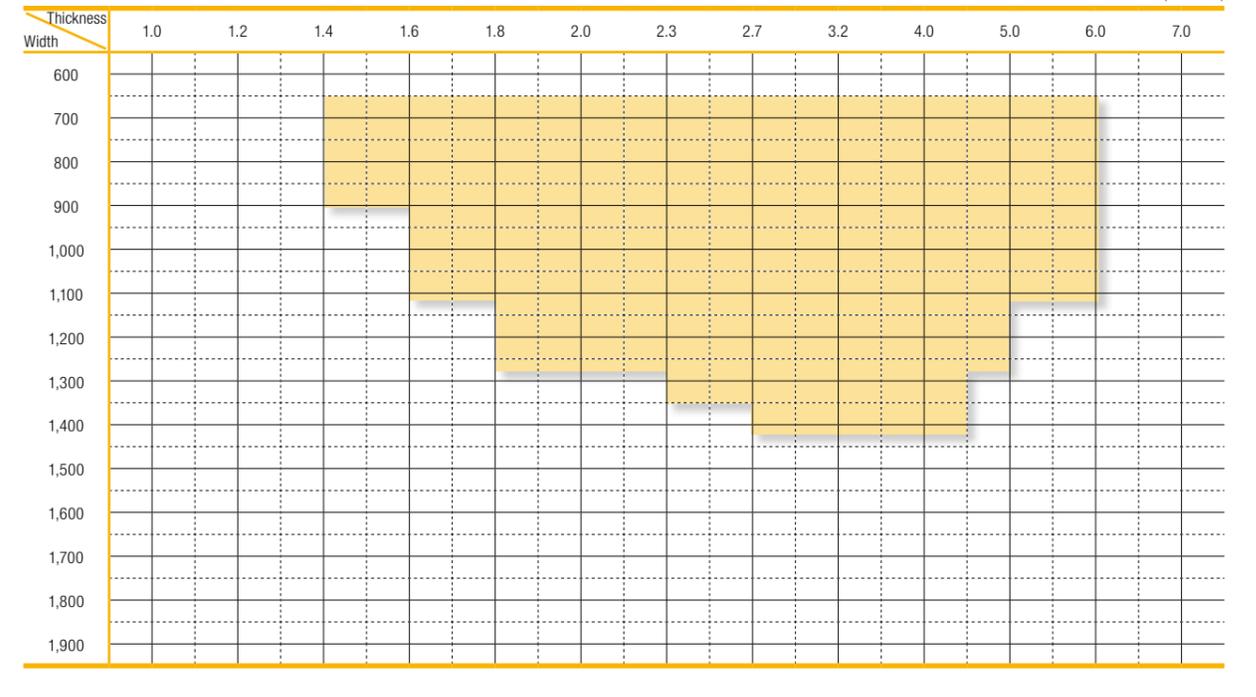
Grade : GA/GI, 440E

(Unit : mm)



Grade : PO, 590DP

(Unit : mm)

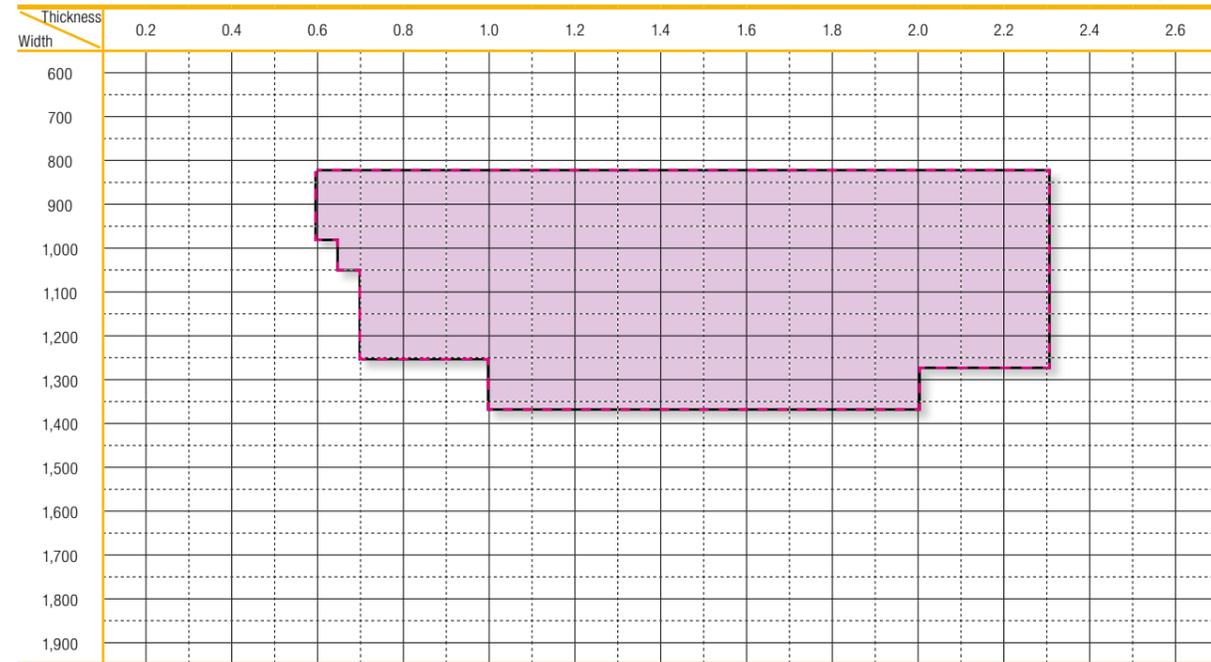


Available Dimensions

TRIP Steel

Grade : CR/EG, 590TR

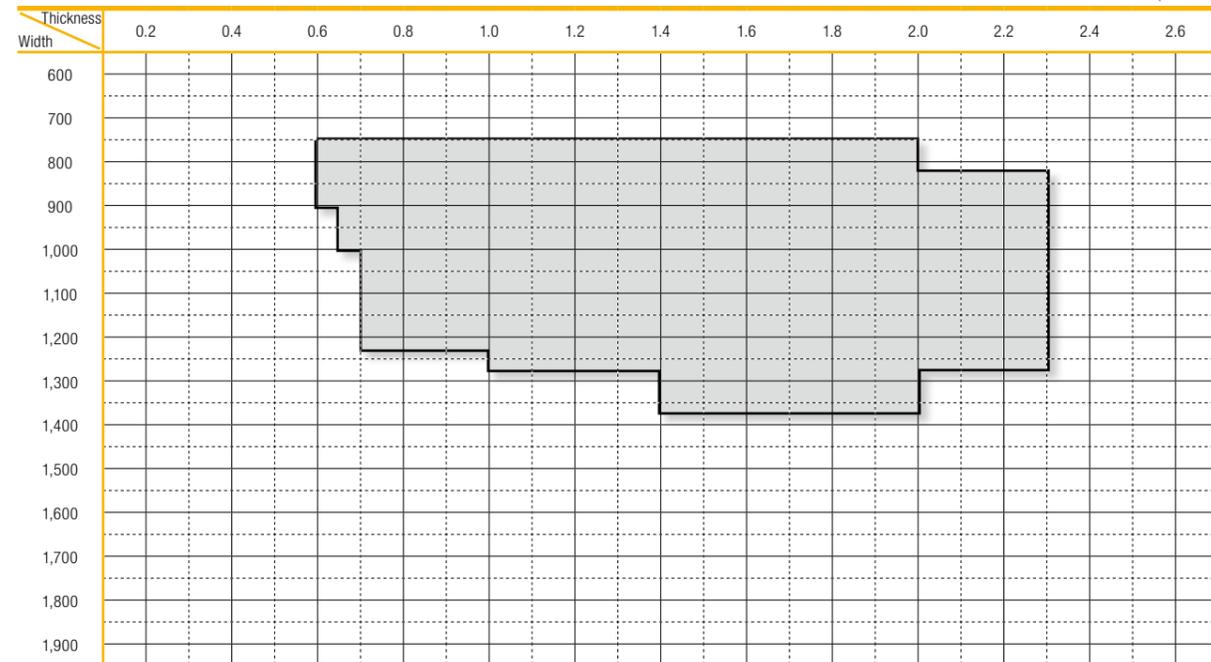
(Unit : mm)



CR — EG - - - -

Grade : CR/EG, 780TR

(Unit : mm)

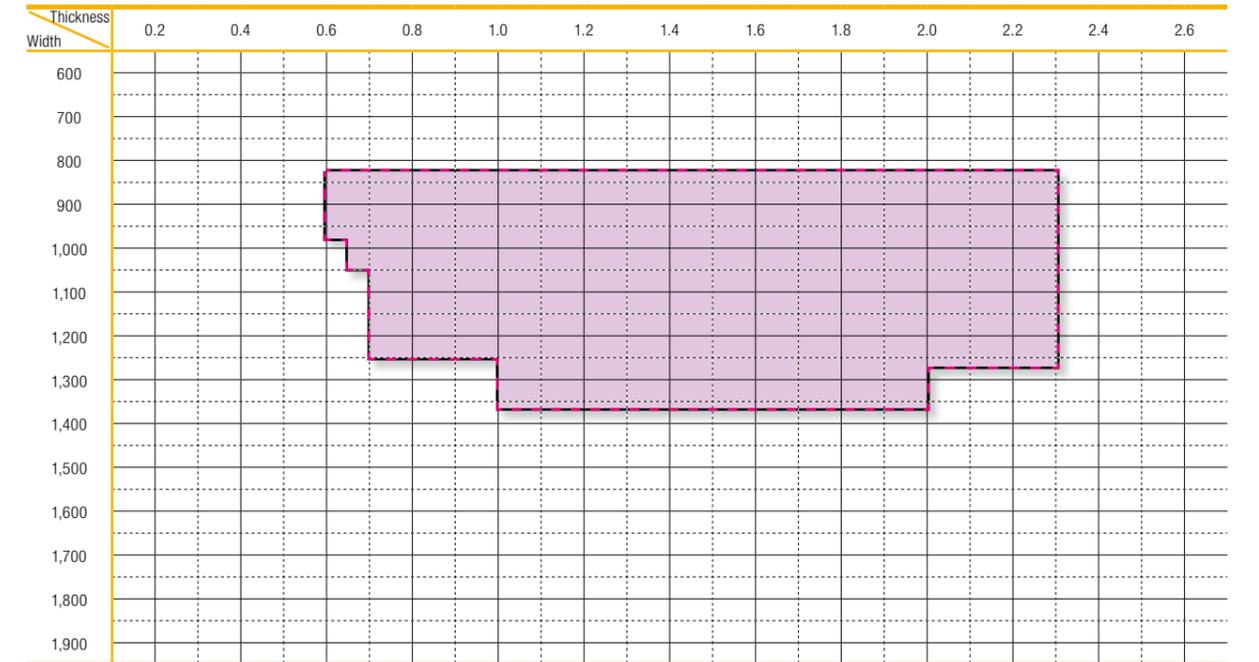


CR —

TRIP Steel

Grade : GA/GI, 690TR

(Unit : mm)

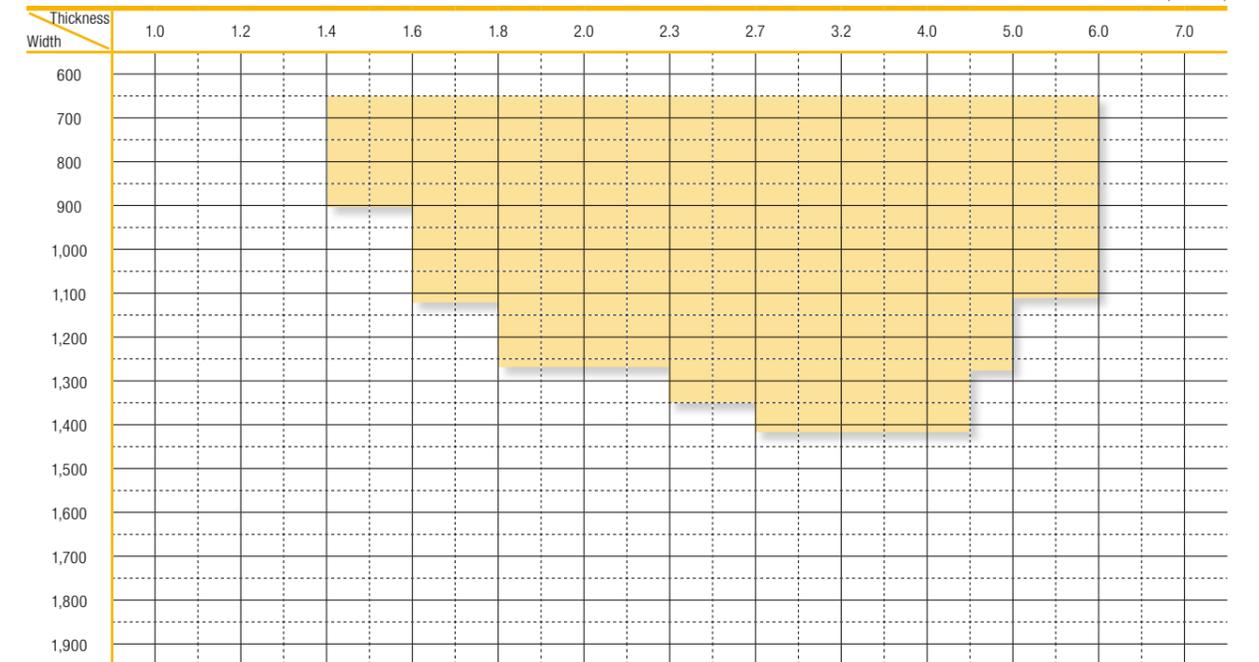


GA — GI - - - -

FB Steel

Grade : PO, 590FB

(Unit : mm)

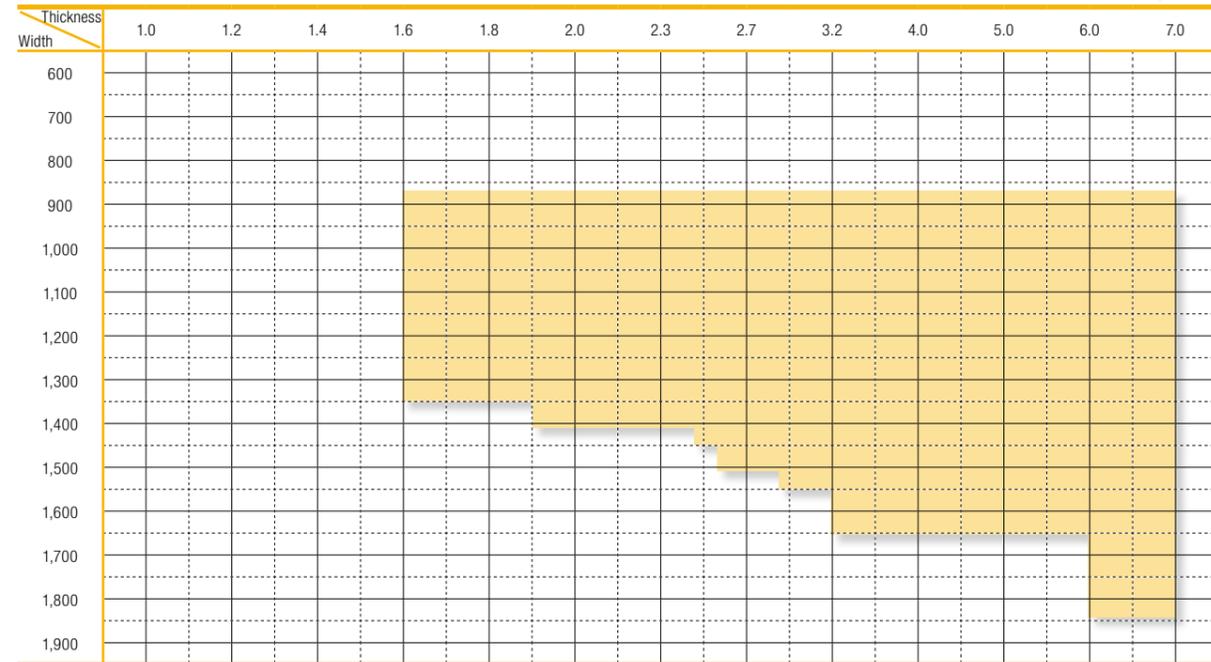


Available Dimensions

Autobeam / Stab

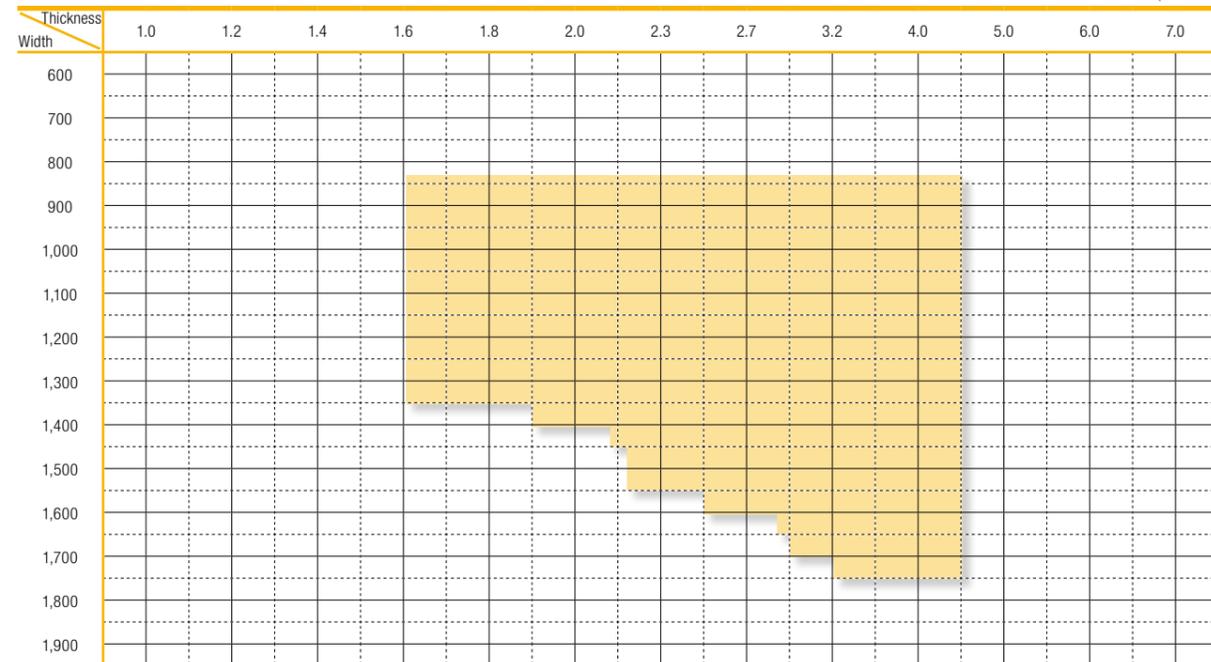
Grade : HR, Autobeam

(Unit : mm)



Grade : HR, Stab

(Unit : mm)



HF Steel

Grade : PO, 290HF/ 370HF/ 440HF

(Unit : mm)



GA — GI

Surface Finishes and Oiling

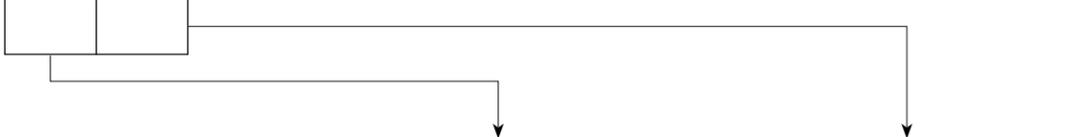
Surface Finishes and Oiling

Surface Finish Designation Code and Oiling

Surface Finish Designation Code

The table lists codes for various surface finishes, roughness and spangles (crystalline zinc protrusions).

There are individual codes for each product type.



Division		1 Column	2 Column
CR, EG		Different Surface Finishes	Varied Roughness
GI, GA	Roughness controlled group		
	Roughness not-controlled group	Different spangles	

Different Surface Finishes

Code	Detail	Code	Detail
B	Bright Finishing	B	EDT Dull Finishing
T	POSTEX Finishing	T	GI Ace Finishing

Varied Roughness

Code	Detail	Code	Detail
2	$0.30 \leq Ra \leq 0.50$	7	$0.70 \leq Ra \leq 1.30$
4	$0.15 \leq Ra \leq 0.30$	9	$0.40 \leq Ra \leq 0.80$
5	$1.00 \leq Ra \leq 1.80$		

Varied Roughness

Code	Detail	Code	Detail
SJ	GI Zero Spangle	SG	GA Galvannealing
SF	GI ACE		

Oiling Code



Code	Detail	Code	Detail
D	Improved grease removal rust-preventing oil	H	3,000 ~ 4,500mg/m ²
H	High-level lubricant rust-preventing oil	G	1,800 ~ 3,000mg/m ²
S	Fuchs RP4107 S Rust-preventing oil	L	800 ~ 1,800mg/m ²
R	Fuchs RP4107 A Rust-preventing oil	T	200 ~ 800mg/m ²
P	PreLube Rust-preventing oil	X	No oiling
X	No oiling		

Post Treatment Method Code

This code specifies post-treatment processes to improve the corrosion resistance and appearance of coated steel.

Code	Detail	Code	Detail
XX	None Post treatment	PA	One side Presealed
AC	Cr-Free Anti-fingerprint	PB	Both side Presealed
AF	Cr-Free Anti-fingerprint	PC	One side Presealed
CA	Cr-Free Automotive	PD	Both side Presealed
CF	Cr-Free Coating	PL	Phosphate
CN	Cr-Free High	PM	Phosphate
CP	Cr-Free Anti-fingerprint	PN	POSCO Nanocoating
FD	Pre-primer	SA	One side Resin Coating
FP	Steel-PCB	SB	Both side Resin Coating
FS	Pre-primer	SP	Slidable Pre-phosphate
GX	Pos Green Excellent		
NC	Cr-Free Coating		
NW	Cr-Free Coating		

Packing Methods

Packing Methods

1. Packing Methods

Applied Area

Our packing methods are applicable to all regular cold rolled steel, galvanized steel, tin-coated steel, and P/O products.

Packing Code Explanation

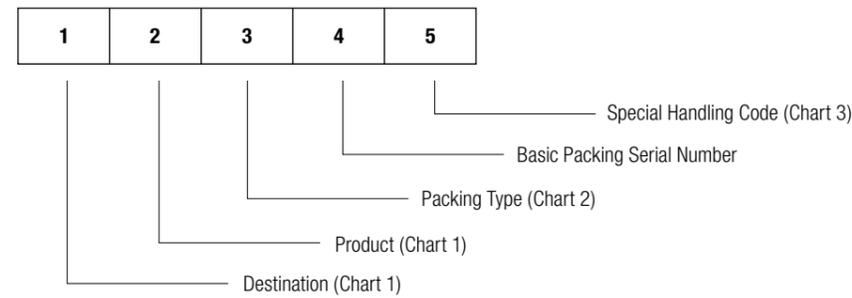


Chart 1

Destination		Product	
Code	Detail	Code	Detail
D	Domestic	C	Coil products
E	Export	S	Sheet products
T	Improved packing for exported coils		

Chart 2

Packing type		
Code	Skid type	Packing type
A	N/A	Naked packing
B	N/A	Paper packing
C	N/A	Metal packing
D	Single wooden skid	Naked packing
E	Single wooden skid	Paper packing
F	Single wooden skid	Metal packing
G	Single wooden skid	Paper packing
H	Single wooden skid	Metal packing
V	N/A	Wrap & plastic packing

Chart 3

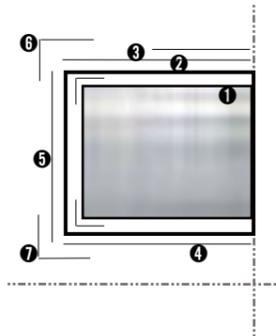
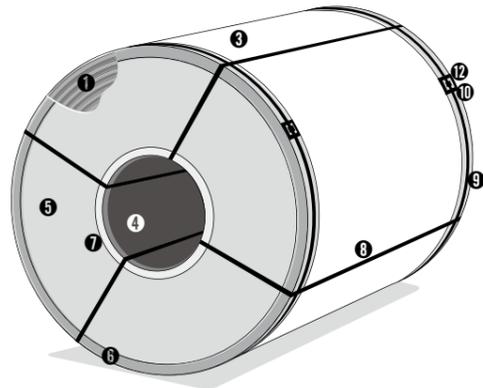
Packing Type	
Code	Special Handling Detail
A	Basic Packing Code
B	① Protecting Panel (Outside): Steel added
C	① Protecting Panel (Outside): Steel added ② Center Vertical Band eliminated (Filament tape added on the seam of outer protecting panels)
D	① While the rest is unpacked, only the center of coil is double-banded (Two bands)
H	① Center vertical bend removed
J	① Regardless of unit weight, packed with 6 horizontal bands
K	① All vertical bands are removed
L	① Rubber pads are added to protect the product
M	① Inner ring replaced with of 3.0mmt-sized one
N	① Corner boards are added on inner and outer rings (inner protective panels and side panels removed)
S	① Hard board is added on cross-section panel (pre-existing cross-section board removed) ② Utilized as Special Code to ECC9A (Upon ordering, inquire with quality technique departments of both steelworks)
T	① Protective panel (outer): Waterproof board (1.0mmt) and Center band (for export Steel) added
V	Basic packing and inner coil steel band combined
W	Two additional outer protective board (2.0mmt) (pre-existing outer protective board removed)
X	① On the side, 2.0mmt board added (pre-existing cross-section board removed)
Y	① To inner protective panel, 2.0mmt board is added
Z	① Center vertical bend removed (in case of steel products less than 5 feet wide)
2	Corner boards added (for external diameter) after packing (improved packing for export items)
3	One additional board added to outer protective panel(improved packing for export items)
4	Protective pad added (improved packing for export items)
5	Outer protective board added (0.1mmt) + Protective pad added (improved packing for export items)
6	Outer protective board added + Corner board (for external diameter) added + Pad added (improved packing for export items)
Applied to all packing types	<ul style="list-style-type: none"> · When center vertical band is removed, filament tapes must be added. · When outer protective panel is added, center vertical band must be added. · If steel sleeve is inserted into packing, inner protective board is removed. · If 2.3mmt welding-style inner ring is applied, inner corner board is removed.

Packing Methods

Coil products packing comparison

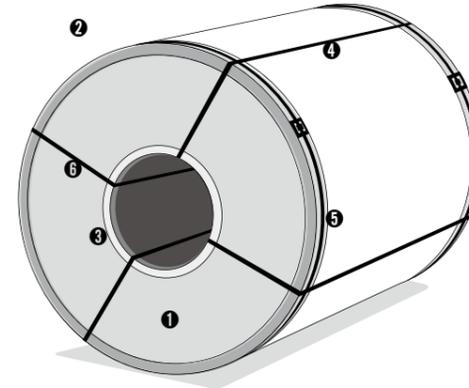
Division	Strict Group				Non-strict Group				
	Metal Packing Group		Metalloid Packing Group		Paper Packing Group				Naked Packing Group
	Export	Domestic	Export	Domestic	Strict		General		
				Export	Domestic	Export	Domestic	Domestic	
Automotive Steel Products (CR, GA, GI, EG, PO)	ECC1A TCC3A	DCC1A	ECB1B	DCB3C	ECB1T TCV1A	DCB3T	ECB1A	DCB1A	DCA1A
For the details of strict packing, please consult with the POSCO representative for the export region of interest.									

Packing Code	Packing type	Metal packing
ECC2A	Metal packing	Enhance rust-preventing steel for export (excluding BP)



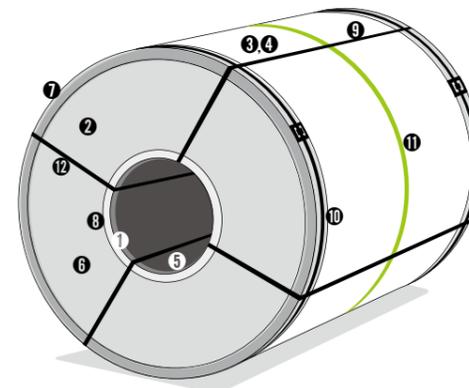
No.	Name	Material	Specification	Amount
1	Wrapping paper	PP Vinyl		1
3	Outer protection board	Steel		1
4	Inner protection board	Steel		1
5	Side board	Hard Board		2
6	Outer ring	Steel		2
7	Inner ring	Steel		2
8	Horizontal band	Steel		4
9	Vertical band	Steel		2
10	Clamp	Steel		4, 6, 8
12	Adhesive tape	Paper, cotton tape	Paper(Width 40mm), cotton(Width 60mm)	-
12	Seal Pad	Paper, plastic	Products from Pohang Steelworks' 2 nd Cold Rolling Mill and Gwangyang Steelworks excluded	0.2

Packing Code	Packing type	Products applied
TCV1A ← (ECB1A, ECC1A, ECB1U)	Plastic packing	Products for export



No.	Name	Materials
1	PP VCI Wrap	PP Vinyl
2	Outer-Edge Protection Ring	Steel
3	Inner-Edge Protection Ring	Steel
4	Horizontal Band	Steel
5	Vertical Band	Steel
6	Seal	Steel

Packing Code	Packing type	Products applied
TCV4A ← (ECC3A, ECC6A, ECC7A, ECC7A, ECC7A)	Metal packing	Products for export



No.	Name	Materials
1	Corner Protection Paper	PP Vinyl
2	PP VCI Wrap	PP Vinyl
3	Outer Protection Cover	Paper
4	Outer Protection Cover	Steel
5	Inner Protection Cover	Plastic
6	Side Protection Cover	Plastic
7	Outer-Edge Protection Ring	Steel
8	Inner-Edge Protection Ring	Steel
9	Horizontal Band	Steel
10	Vertical Band	PET
11	Center Band	Steel
12	Seal	Steel

Packing Methods

2. Marking

Application

Marking is done when cold rolled steel products (such as cold rolled sheet steel, pickled products, black plates, and galvanized steel) are packaged.

Marking Types

Division	Marked content	Number of marking
Label	Product sticker	Information on main properties of the product 2 copies
	Marking sticker	Marking item specifically requested by customer 1 copy, in principle, when customer specifies
	Inspection sticker	Information on main properties of the product 1 copy
Marking for caution in handling	Coil's rolled direction, Humidity warning, Upward loading, and Impact warning mark (stickers are attached)	2 copies
Color Stroke	Color sticker attached as requested by customer	2 copies
Marking for Surface strict steel	For automotive exposed panel For automotive steel	3 copies (on both sides and outer surface)
Information on defects	Information on one-time occurring defects (per coil, three defects or less are acceptable)	1 copy (provided only when customer requests)

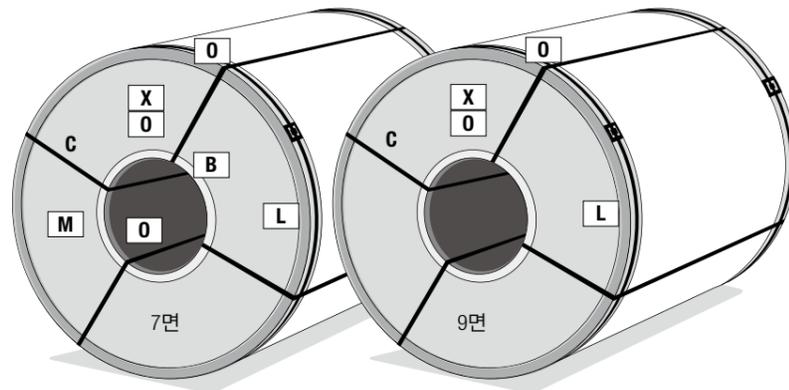
Color Stroke

The color stroke for cold rolled products refers to attaching customer-specified stickers. Following are the location of such stickers.

- Coil : stickers are attached lengthwise in eleven-o'clock direction.
- Sheet : stickers are attached lengthwise at the center of side 3 and side 5 toward the height.

Cold Rolled Products Marking Standards (Example)

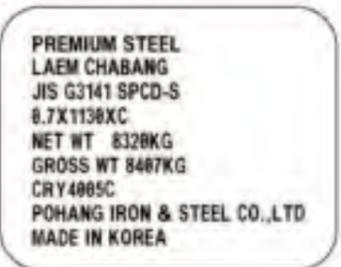
Division	Name
L	Product sticker
M	Marking sticker
I	Inspection sticker, Defects information sticker
X	Cautions in handling sticker
O	for exposed panel/automotive, for HGI LCD
C	Color Stroke
B	Bar Code



Label



Marking Label



Inspection Card



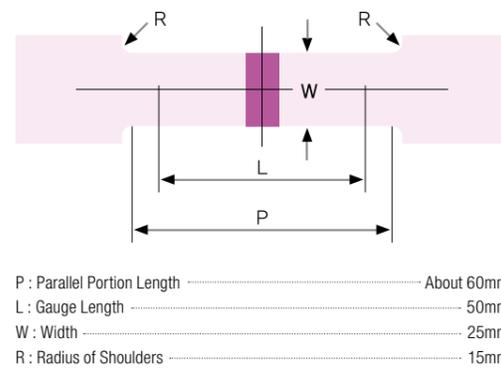
Testing Methods

Tensile Test

Tensile testing is a fundamental method to measure the yield point, tensile strength, and ductility of steel. In a normal tensile test, an ever increasing, precisely measured load is applied to a test specimen until the material fails.

Test Specimens

POSCO conducts tensile testing in accordance with guidelines published by KS, JIS, ASTM, etc.. In these guides, types and sizes of specimens are well documented. In the case of cold rolled steel, the specimen preparation method stated in KS B 0801 No.5 volume is generally used.



Tensile Test Result

POSCO conducts tensile testing in accordance with guidelines published by KS, JIS, ASTM, etc.. In these guides, types and sizes of specimens are well documented. In the case of cold rolled steel, the specimen preparation method stated in KS B 0801 No.5 volume is generally used.

Ductility

The higher the ductility is, the better the machinability gets.

Yield Point

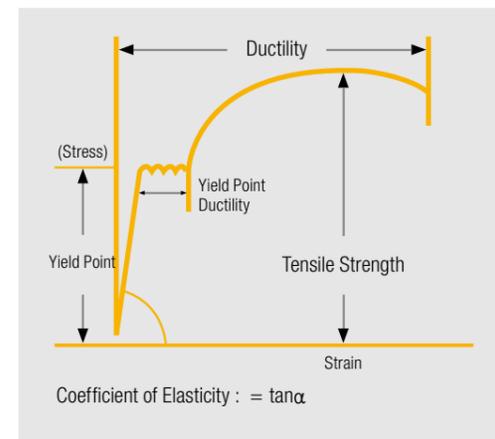
The lower the yield point is, the better the shape of a final product becomes.

Yield Ratio = (Yield Point) / (Ultimate Tensile Strength)

The lower yield ratio is, the wider the gap between yield point and ultimate strength. As this gap widens, a steel's processing formability improves.

Coefficient of Elasticity

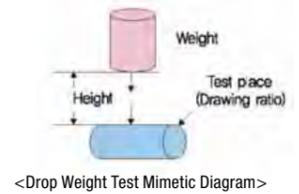
Coefficient of elasticity is inversely proportionate to steel anti-elasticity. The less the anti-elasticity is, the better the shape of a final product becomes. Coefficient of elasticity, or Young's Modulus, is a measure of a material's deflection in response to an applied load. It is analogous to spring constant, where force equals the constant multiplied by deflection.



DBTT Testing Method

Flow of Test

Cup forming (Blanking, Punching) → Testing temperature change → Drop Weight Test → Observation to see if brittle failure occurs (transition temperature is the lowest temperature where brittle failure does not occur)



DBTT Evaluation Test Conditions (no-trimming after cup forming)

Division	Details	Testing Condition	Division	Details	Testing Condition
Forming Conditions	Blank Dia.(mm)	96	Drop Weight Test	Load(kgf)	4.44
	Punch Dia.(mm)	50		Drop Height(m)	0.9
	Punch Type	Flat Cup		Weight Type	Cylindrical
	Drawing Ratio	1.92		Test Specimen Positioning Method	Laying it on its side

Flexibility Test

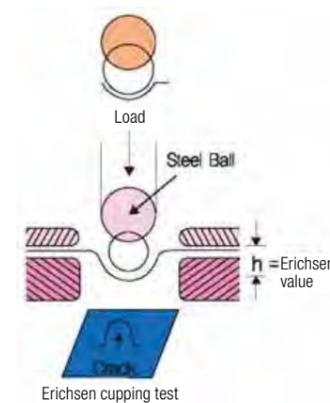
Flexibility testing is normally conducted using the following method. A specimen prepared as described in KS B 0801 Volume 3 is normally used for cold rolled steel flexibility testing, which involves bending the specimen along a given axis at a specified radius and angle. The material's rating depends on whether cracks occur on the surface around the bent area or not. A typical cold rolled steel specimen is bent at 180°C.

Machinability Level Test

The machinability of cold rolled steel can be measured in various ways. It is hard to gauge by using one simple testing method because machinability is acquired through complex manufacturing processes. Therefore, the following two testing methods are generally used.

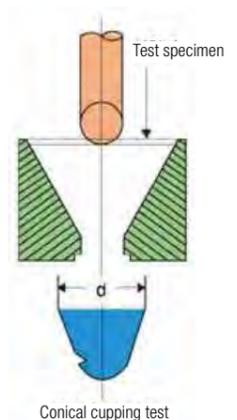
Erichsen Cupping Test

The Erichsen cupping test is used to test a steel's suitability for deep drawing. As seen in the figure, a test specimen is deformed through impingement of a hard spherical object. Load is increased until material failure occurs, at which point deflection is recorded. The value h, measured when the specimen breaks, is the Erichsen measured value.



Conical cupping test

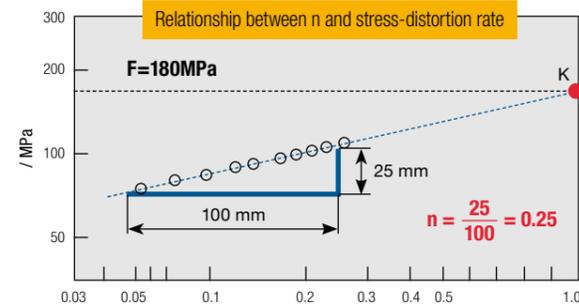
Recently, this testing method has become widely used to evaluate the formability of steel. As seen in the figure, the conical cupping test involves loading the specimen either flatly or roundly. The test value is gained from the measuring the diameter of the cup through which the specimen is sucked into. As this test value is similar to that acquired from real time steel processing, it has become popular among automobile manufacturers.



Testing Methods

Work Hardening Quotient

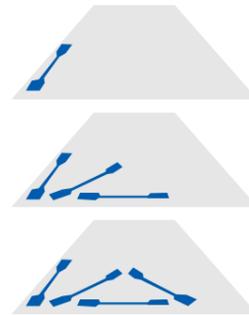
If plastic deformation is forced upon a material, the degree of distortion increases along with the load it bears. As a result, more work hardening takes place in the yielded material than in the elastically loaded region.



Average Plasticity Strain Ratio (R-bar)

By applying uniaxial tensile stress to a plate-shaped tensile test specimen in each direction, both width-direction real strain and thickness-direction real strain occur. The ratio is the directional average value between the two above strains.

$$R\text{-bar} = [X0 + X90 + (2 * X45)] / 4$$



Bake Hardening Test (BH₂)

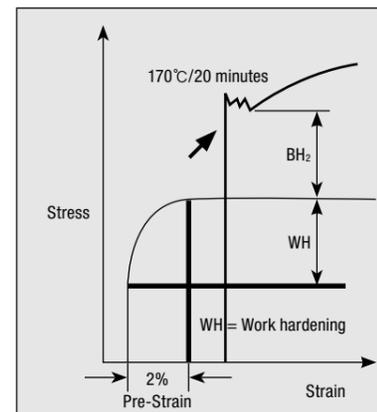
1. Bake Hardening Test BH₂

In this test, after 2% Pre-Strain, the original test specimen is baked for 20 minutes at 170°C. Then, the increased amount of YP strength (based on lower yield point) is measured. The value of BH₂ is the one measured after bake hardening. (at 170°C, low YS after 20 minutes, flow strength after 2% Pre-Strain)

2. Bake Hardening Test BH₂

Low yield strength after baking treatment – original specimen's 0.2% offset value

3. Bake Hardening Test Measuring Process



Bake Hardening Test (BH₀)

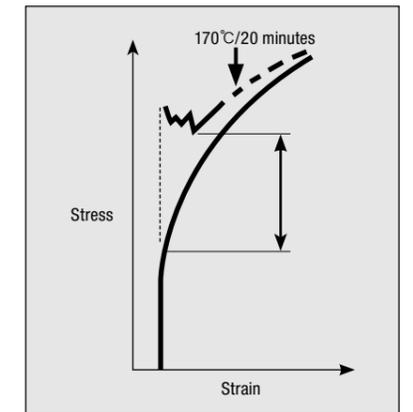
1. Bake Hardening Test (BH₀)

The result of this test is the difference between a reduced yield strength measurement obtained after baking the specimen with no-pre-strain and a 0.2% offset yield strength measurement of the original specimen.

2. Bake Hardening Test (BH₀)

Low yield strength after baking treatment – original specimen's 0.2% offset value

3. Bake Hardening Test Measuring Process



Age Hardening Test

1. Artificial Age Hardening Test (Aging Index, AI)

As time goes by, interstitial elements in steel such as carbon and nitrogen interact with potential dislocations and fix them, which result in an increased yield point. This testing attempts to measure how much the yield point rises, and establish an aging index.

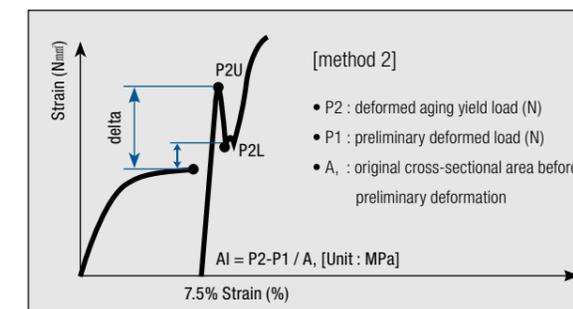
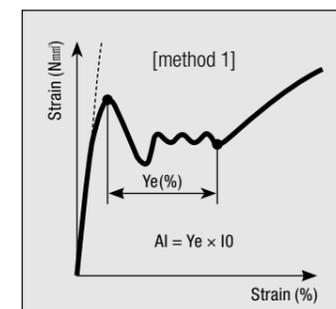
2. Artificial Age Hardening Test

Method 1) Condition the specimen at 100°C for one hour, test it for tensile strength, calculate Ye value from it, multiply the number by 10 and the result is the AI value.

Method 2) Distort the specimen by 7.5% by applying pre-strain, condition the specimen at 100°C for one hour, test it for tensile strength.

Subtract preliminary deformation load from yield load, divide the value by the original cross-sectional area and that is the value (in N/mm²) of AI.

3. Artificial Age Hardening Test Measuring Process



POSCO Standard System for Automotive Steel

PCT340B - JE

Usage Example) CR MAFE 340BH outer plate products.
Quality guaranteed with JIS specimen.

• Outer panel marking => "E"

• Tensile specimen marking: "J" for JS specimen, "A" for ASTM specimen, and "D" for DIN specimen

• Grade marking: For details, refer to the attachment

• Guaranteed quality marking: Minimum number of Tensile/Yield Strength (MPa)

• Guarantee method marking: TS => "T", YP => "Y"

• Product types

Classification	CR	Gi	GA	EG	HR	PO	HGi	HGA
Code	C	G	A	Z	H	D	L	N

• P : POSCO

Grade Types

Classification	POSCO			
	Cold Rolled	Hot Rolled		
Mild Steel	CQ1	C	C	
	CQ2(for Processing)	L	L	
	DQ	D	D	
	DDQ	N	N	
	EDDQ	E	E	
	S-EDDQ	S	S	
	H-EDDQ	H	H	
High Strength Low Alloyed Steel	Bake-Hardening Steel	B	B	
	Deep Drawing	E	E	
	Initial Drawing	S	S	
	Solid Solution Strengthening	for Light Processing	R	R
		for General Uses	J	J
	Precipitation Strengthening (high YR)	C	C	
	for Guaranteeing Ingredients (for Post Heat Treatment)	-	HA	
HF	-	HF		
Advanced High Strength Steel	Low YR	D	D	
	High Ductility	T	T	
	Dual Phase	P	P	
	Hole-enlarging Type	F	F	
	HF	HP	HP	

Appendix

*HR&PO

Division		POSCO Specification	KS	JIS	ASTM	EN	RENAULT	
Mild Steel	CQ		KS-SPHC	JS-SPHC		DD11	HC	
	DQ		KS-SPHD	JS-SPHD		DD12		
	DDQ		KS-SPHE	JS-SPHE		DD13		
Automotive Structural			KS-SAPH310	JS-SAPH310		DD14	HES	
			KS-SAPH370	JS-SAPH370				
			KS-SAPH400	JS-SAPH400				
			KS-SAPH440	JS-SAPH440				
Automotive frame		ATOS55						
		ATOS60						
HSS	YS guarantee				A715-40			
					A715-45			
					A715-50	S 355 MC	HE 360 D	
					A715-55			
					A715-60	S 420 MC		
					A715-70	S 500 MC		
	TS guarantee		PHT540C	KS-SPFH540	JS-SPFH540			HE 450 M
			PHT590C	KS-SPFH590	JS-SPFH590			
	High ductility		ATOS80(HR)					
	HF		POS-HF290					
		POS-HF370						
		POS-HF440						
AHSS	Dual Phase		PHA540Y					
			PHT590D					
			PHA690Y					
			PHT780D					
	High burring		PHT440F					
			PHT540F					
			PHT590F					
			ATOS70F					
			PHT780F					
	TRIP		ATOS80TR				HE 450 M	
	HPF		PHT1180H					
			PHT1470H					
	TWIP		PHA780TW					

GMW	FORD	DCX	JFS	NISSAN	HONDA	TOYOTA	MAZDA	MITSUBISHI
GMW2M-ST-S HR0 GMW2M-ST-S HR1	WSD-M1A333-A1	MS-67 CS	JSH270C	SP221	JSH270C	SPH270C	SPHN1	MJSH270C
GMW2M-ST-S HR2	WSD-M1A333-A1	MS-67 DS	JSH270D	SP222	JSH270D	SPH270D	SPHN2	MJSH270D
GMW2M-ST-S HR3	WSD-M1A333-A1	MS-67 DDS	JSH270E	SP223	JSH270E	SPH270E	SPHN3	MJSH270E
GMW2M-ST-S HR2	WSD-M1A333-A1	MS264<S> -030 SK	JSH310W					MJSH310W
GMW2M-ST-S HR1	WSD-M1A333-A2	MS264<S> -035 SK	JSH370W	SP231-370	JSH370W	SPH370	SPHN370W	MJSH370W
GMW2M-ST-S HR0	WSD-M1A333-A3	MS264<S> -040 SK	JSH400W		JSH390W		SPHN400W	MJSH400W
	WSD-M1A333-A4	MS264<S> -045 SK MS264<S> -050 SK	JSH370W JSH370J JSH370R	SP231-440	JSH440W JSH440J	SPH440	SPHN400W SPHN440R	MJSH400W MJSH400J MJSH400R
GMW3032M-ST-S HR 340		MS264<S> -030 XK						
GMW3032M-ST-S HR 420	WSD-M1A346-A5	MS264<S> -060 XK						
GMW3032M-ST-S HR 500	WSB-M1A215-E1-500	MS264<S> -070 XK						
GMW3032M-ST-S HR 550	WSB-M1A215-E1-550	MS264<S> -080 XK						
			JSH540R	SP251-540F SP252-540F	JSH540R	SPH540	SPHN540R	MJSH540R
			JSH590R		JSH590R	SPH590	SPHN590R	MJSH590R
			JSH540Y		JSH540Y			
HR 580T/330Y DP			JSH590Y	SP253-590	JSH590Y	SPH590DU	SPHN590Y	MJSH590Y
HR 780T/450Y DP			JSH780Y		JSH780Y	SPH780DU		MJSH780Y
HR 450T/300Y FB				SP231-440F		SPH440SF SPH440HY		MJSH440B
				SP252-540F				
HR 580T/440Y FB						SPH590SF	SPHN590B	
HR 780T/600Y FB								
HR 780T/450Y TR								

Appendix

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Division	POSCO Specification	KS	JIS	ASTM	EN	RENAULT	
Mild Steel	CQ(LQ)	CSP1-S	KS-SCP1-S KS-SPCC-S	JS-SPCC-S	A1008-CS	EN-DC01 (Z/X) E	
		CSP1D-S/-E	KS-SCP1-S KS-SPCC-S	JS-SPCC-S		EN-DC03	
	DQ	CSP2-S/-E	KS-SCP2-S KS-SPCD-S	JS-SPCD-S	A1008-DS	EN-DC04 (Z/X) ES	
	DDQ	CSP3(N)-S/-E	KS-SCP3N-S KS-SPCE-S	JS-SPCE(N)-S	A1008-DDS	EN-DC05	
	EDDQ	CSP3E-S/-E		JS-SPCF	A1008-EDDS	EN-DC06 (Z/X) SES	
	S-EDDQ	CSP3X-S/-E		JS-SPCG		EN-DC07	
HSS	IF grade	PCY180E(-E)					
		PCY220E(-E) CHSP35E(-E)	KS-SPFC340	JS-SPFC340		HC 180Y	
		CHSP38E(-E)	KS-SPFC370	JS-SPFC370			
		CHSP40E(-E)	KS-SPFC390	JS-SPFC390			
		-	KS-SPFC390	JS-SPFC390		HC 260Y ZE 260P	
		CHSP45E	KS-SPFC440	JS-SPFC440			
		CHSP35ES(-E) CHSP40ES	KS-SPFC340	JS-SPFC340			
	Microalloyed grade	CHSP220Y			A1008-33		
		CHSP260Y			A1008-40	HC 260LA XE 280D	
		CHSP300Y	KS-SPFC390	JS-SPFC390	A1008-45 class2	HC 300LA XE 320D	
		CHSP340Y	KS-SPFC440	JS-SPFC440	A1008-50 class2	HC 340LA XE 360D	
		CHSP380Y			A1008-55 class2	HC 380LA	
		CHSP420Y	KS-SPFC490	JS-SPFC490	A1008-60 class2	HC 420LA	
		CHSP45C CHSP60C	KS-SPFC440 KS-SPFC590	JS-SPFC440 JS-SPFC590	A1008-50 class1 A1008-70 class1		
	Rephosphorized grade	CHSP35R	KS-SPFC340	JS-SPFC340	A1008-33	HC 220P XE 235P	
		-	KS-SPFC370				
		CHSP40R CHSP45R	KS-SPFC390 KS-SPFC440	JS-SPFC390 JS-SPFC440	A1008-40 A1008-45 class1	HC 260P HC 300P	
	Baked Hardening	PCY180B CHSP28BH-E				HC 180B (Z/X)E BH	
		CHSP35EB(-E) CHSP40EB	KS-SPFC340H	JS-SPFC340H		HC 220B (Z/X)E 220BH XE 260BH	
		CHSP40B(-E) CHSP45BH-E					
		Dual Phase	CHSP45DP(-E)				
			CHSP50DP(-E)	KS-SPFC490Y	JS-SPFC490Y		HCT 500X (Z/X)E 300B
	CHSP60DP		KS-SPFC590Y	JS-SPFC590Y		HCT 600X XE 360 B	
	CHSP80DP		KS-SPFC780Y	JS-SPFC780Y		HCT 780X XE 450 B	
	CHSP100DP PCT980D-H		KS-SPFC980Y	JS-SPFC980Y		HCT 980X XE 550 M	
	TRIP		CHSP60TR CHSP80TR				HCT 780T XE 450 T
		PCT980T					
		TWIP	CHSP780TW PCT980W				
	Complex Phase		CHSP120CP CHSP1470CP				
		HPF	PCT1470H				

GMW	FORD	DCX	JFS	NISSAN	HONDA	TOYOTA	MAZDA	MITSUBISHI	BAOGANG
GMW2M-ST-S CR1	WSS-M1A345-A1	MS-67CS	JSC270C	SP129	JSC270C	SPC270C	SPCN1	MJSC270C-C	DC01(S12) BLC
GMW2M-ST-S CR2/-E								MJSC270C	DC03(S13) BLD
GMW2M-ST-S CR3/-E	WSS-M1A345-A2	MS-67DS	JSC270D	SP121	JSC270D JSC270D-E	SPC270D	SPCN2	MJSC270D	DC04(S14/15) BUSD
GMW2M-ST-S CR4/-E	WSS-M1A345-A3	MS-67DDS	JSC270E	SP122	JSC270E	SPC270E	SPCN3	MJSC270E	DC05(BSC2) BUFD
GMW2M-ST-S CR5/-E	WSS-M1A345-A4		JSC270F	SP123	JSC270F	SPC270F	SPCN4	MJSC270F	EN-DC07
GMW3032M-ST-S CR180IF/-E			JSC260G	SP124	JSC270G		SPCN5	MJSC270G	B170P1
GMW3032M-ST-S CR180IF/-E			JSC340P	SP132-340	JSC340P	SPC340HR	SPCN340P	MJSC340P	
GMW3032M-ST-S CR240IF/-E	WSS-M1A347-A1		JSC390P	SP131-370	JSC390P	SPC390HR	SPCN390P	MJSC390P	B210P1
GMW3032M-ST-S CR240IF/-E	WSS-M1A347-A2		JSC440P		JSC440P	SPC440HR	SPCN440P	MJSC440P	B250P1
	WSS-M1A347-A1			SP132-340	JSC340P				
GMW3032M-ST-S CR240LA	WSS-M1A347-A2			SP131-370	JSC370W				
GMW3032M-ST-S CR300LA	WSS-M1A347-A3	MS264<S> -045XK							
GMW3032M-ST-S CR340LA	WSS-M1A347-A4	MS264<S> -050XK							
GMW3032M-ST-S CR380LA	WSS-M1A347-A4	MS264<S> -055XK							
GMW3032M-ST-S CR420LA	WSS-M1A347-A5	MS264<S> -060XK							
	WSS-M1A347-A3	MS264<S> -050XK	JSC440R	SP152-440	JSC440W				
	WSS-M1A347-A4	MS264<S> -070XK	JSC590R	SP151-590	JSC590R	SPC590	SPCN-590R	MJSC590R	
GMW3032M-ST-S CR180P	WSS-M1A347-A1		JSC340W	SP132-340	JSC340W	SPC340	SPCN-340W	MJSC340W	
			JSC370W	SP131-370	JSC370W	SPC370	SPCN-370W	MJSC370W	
GMW3032M-ST-S CR240P	WSS-M1A347-A1 WSS-M1A347-A2		JSC390W		JSC390W	SPC390	SPCN-390W	MJSC390W	
GMW3032M-ST-S CR270P	WSS-M1A347-A2 WSS-M1A347-A3		JSC440W	SP152-440	JSC440W	SPC440	SPCN-440W	MJSC440W	
GMW3032M-ST-S CR180B2/-E	WSS-M1A341-A3	MS264<S> (E)-025HK	JSC270H	SP125					
GMW3032M-ST-S CR210B2/-E	WSS-M1A341-A4	MS264<S> (E)-035HK	JSC340H	SP135-340	JSC340H	SPC340BH	SPCN-340H	MJSC340H	
GMW3032M-ST-S CR240B2/-E	WSS-M1A341-A1	MS264<S> (E)-040HK							
	WSS-M1A341-A9	MS264<S> (E)-045HK							
GMW3399M-ST-S CR450T DP	WSS-M1A348-A1								
GMW3399M-ST-S CR250T DP									
GMW3399M-ST-S CR490T DP	WSS-M1A348-A6	MS264<S> -490DT							
GMW3399M-ST-S CR290T DP									
GMW3399M-ST-S CR590T DP	WSS-M1A348-A7	MS264<S> -590DT	JSC590Y	RP153-590N	JSC590Y	SPC590DU	SPCN-590Y	MJSC590Y	
GMW3399M-ST-S CR340T DP									
GMW3399M-ST-S CR780T DP		MS264<S> -780DT	JSC780Y	RP153-780	JSC780Y	SPC780DU	SPCN-780Y	MJSC780Y	
GMW3399M-ST-S CR420T DP									
GMW3399M-ST-S CR980T DP			JSC980Y		JSC980Y	SPC980DU		MJSC980Y	
GMW3399M-ST-S CR550T DP									
GMW3399M-ST-S CR590T TR							SPCN-590G		
GMW3399M-ST-S CR380T TR									
GMW3399M-ST-S CR750T TR									
GMW3399M-ST-S CR440T TR									
			JSC1180Y					MJSC1180Y	

Appendix

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Division	POSCO Specification	KS	JIS	ASTM	EN	RENAULT	
Mild Steel	CQ	CGCC	KS-SGCC	JS-SGCC	A653M-CS	DX51D+ZF	(Z/X) E
	LQ	CGCF	KS-SGCD1	JS-SGCD1	A653M-FS	DX52D+ZF	
	DQ	CGCD	KS-SGCD2	JS-SGCD1	A653M-DS-DS	DX53D+ZF	(Z/X) ES
	DDQ	CGCN	KS-SGC3N	JS-SGC3N	A653M-DS-DDS	DX54D+ZF	
	EDDQ	CGCE			A653M-DS-EDDS	DX56D+ZF	
	S-EDQ	CGCX				DX57D+ZF	(Z/X) SES
HSS	Microalloyed grade	CGCHS220Y					
		CGCHS260Y	SGC340		A653M-275	HX 260LAD+ZF	XE 280 D
		CGCHS300Y				HX 300LAD+ZF	XE 320 D
		CGCHS340Y	SGC400	SGC400	A653M-340	HX 340LAD+ZF	XE 360 D
		CGCHS380Y	SGC440	SGC440		HX 380LAD+ZF	
		CGCHS420Y	SGC490	SGC490	A653M-410	HX 420LAD+ZF	
		CGCHS60C					
	Rephosphorized grade	CGCHS35R		SGC340			XE 235 P
		CGCHS40					
		CGCHS45					
	IF grade	CGCHS35E(-E)				HX 180YD+ZF	
		PAY220E(-E)		SGC340		HX 220YD+ZF	
		CGCHS35E(-E)					
		CGCHS38E(-E)					
		CGCHS40				HX 260YD+ZF	
		CGCHS45E		SGC440			
		CGCHS35ES(-E)				HX 180YD+ZF	
	CGCHS40ES						
	Baked Hardening	PAY180B(-E)			A653M-BHS 410	HX 180BD+ZF	(Z/X)E BH
		CGC28BH-E					
		PAY210B(-E)				HX 220BD+ZF	XE 220 BH
CGCHS35BH(-E)					HX 260BD+ZF	XE 260 BH	
CGCHS40BH(-E)							
CGCHS45BH(-E)							
AHSS	Dual Phase	CGCHS50BH(-E)				HCT 500X+ZF	XE 300 B
		CGCHS60DP				HCT 600X+ZF	XE 360 B
		CGCHS80DP				HCT 780X+ZF	XE 450 B
		PAT980D-M(H)				HCT 980X+ZF	XE 550 B
	TRIP	CGCHS590TR					
		CGCHS690TR				HCT 690T+ZF	
		CGCHS80TR				HCT 780T+ZF	XE 450 T
	TWIP	CGCHS780TW					
	Complex Phase	CGCHS120CP					

GMW	FORD	DCX	JFS	NISSAN	HONDA	TOYOTA	MAZDA	mitsubishi	BAOGANG
GMW2M-ST-S CR1 HD52A52A(U/E)	WSS-M1A345-A1	MS-6000 44AE-CS	JAC270C	SP789	JAC270C	SCGA270C	SPCM1	MJAC270C-C	DC51D
GMW2M-ST-S CR2 HD52A52A(U/E)								MJAC270C	DC52D
GMW2M-ST-S CR3 HD52A52A(U/E)	WSS-M1A345-A2	MS-6000 44AE-DS	JAC270D	SP781	JAC270D	SCGA270D	SPCM2	MJAC270D	DC53D
GMW2M-ST-S CR4 HD52A52A(U/E)	WSS-M1A345-A3	MS-6000 44AE-DDS	JAC270E	SP782	JAC270E	SCGA270E	SPCM3	MJAC270E	DC54D
GMW2M-ST-S CR5 HD52A52A(U/E)	WSS-M1A345-A4		JAC270F	SP783	JAC270F	SCGA270F	SPCM4	MJAC270F	DC56D
			JAC270G	SP784	JAC270G		SPCM5	MJAC270G	EN-DX57D
	WSS-M1A347-A1	MS-6000 44VA-035							H220PD
GMW3032M-ST-S CR240LA HD52A52AU	WSS-M1A347-A2	MS-6000 44VA-040							H260YD (B260LYD)
GMW3032M-ST-S CR300LA HD52A52AU	WSS-M1A347-A3	MS-6000 44VA-045							H300LAD
GMW3032M-ST-S CR340LA HD52A52AU		MS-6000 44VA-050							H340LAD
GMW3032M-ST-S CR380LA HD52A52AU	WSS-M1A347-A4	MS-6000 44VA-055							H380LAD
GMW3032M-ST-S CR 420	WSS-M1A347-A5	MS-6000 44VA-060							H420LAD
	WSS-M1A347-A4	MS-6000 44VA-070			JAC590R		SPCM590R	MJAC590R	
GMW3032M-ST-S CR180P HD52A52AU	WSS-M1A347-A1	MS-6000 44WA-025	JAC340W	SP781-340	JAC340W	SCGA340	SPCM340W	MJAC340W	H220PD
			JAC390W	SP781-390	JAC390W	SCGA390	SPCM390W	MJAC390W	
			JAC440W	SP781-440	JAC440W	SCGA440	SPCM440W	MJAC440W	
GMW3032M-ST-S CR180F HD52A52AU(U/E)									H180YD
GMW3032M-ST-S CR210F HD52A52AU(U/E)			JAC340P	SP782-340		SCGA340HR	SPCM340P	MJAC340P	H220YD
GMW3032M-ST-S CR240IF HD52A52AU	WSS-M1A347-A1		JAC390P	SP782-390	JAC390P	SCGA390HR	SPCM390P	MJAC390P	
	WSS-M1A347-A2		JAC440P	SP782-440	JAC440P	SCGA440HR	SPCM440P	MJAC440P	B240P1D
GMW3032M-ST-S CR180B2 HD52A52AU(U/E)	WSS-M1A347-A3	MS-6000 44VA-025HK	JAC270H	SP785	JAC270H	SCGA270BH		MJAC270H	
GMW3032M-ST-S CR210B2 HD52A52AU(U/E)		MS-6000 44VA-035HK	JAC340H	SP785-340	JAC340H	SCGA340BH	SPCM340H	MJAC340H	
	WSS-M1A347-A1	MS-6000 44VA-040HK							
	WSS-M1A347-A9	MS-6000 44VA-045HK							
GMW3399M-ST-S CR490T DP HD52A52AU	WSS-M1A347-A6	MS-6000 44VA-490DT							
GMW3399M-ST-S CR290Y DP HD52A52AU									
GMW3399M-ST-S CR590T DP HD52A52AU	WSS-M1A347-A7	MS-6000 44VA-590DT	JAC590Y	RP783-590N	JAC590Y	SCGA590DU		MOAC590Y	
GMW3399M-ST-S CR780T DP HD52A52AU		MS-6000 44VA-780DT		RP783-780				MOAC780Y	
GMW3399M-ST-S CR420Y DP HD52A52AU									
GMW3399M-ST-S CR980T DP HD52A52AU								MOAC980Y	
GMW3399M-ST-S CR550Y DP HD52A52AU									
GMW3399M-ST-S CR590T TR HD52A52AU		MS-6000 44VA-590TT							
GMW3399M-ST-S CR380Y TR HD52A52AU									
		MS-6000 44VA-690TT							
GMW3399M-ST-S CR780T TR HD52A52AU									
GMW3399M-ST-S CR440Y TR HD52A52AU		MS-6000 44VA-780TT							

Appendix

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Division	POSCO Specification	KS	JIS	ASTM	EN		
Mild Steel	CQ	CGCC	KS-SGCC	JS-SGCC	A653M-CS	DX51D+Z	
	LQ	CGCF	KS-SGCD1	JS-SGCD1	A653M-FS	DX52D+Z	
	DQ	CGCD	KS-SGCD2	JS-SGCD2	A653M-DS-DS	DX53D+Z	
	DDQ	CGCN	KS-SGC3N	JS-SGC3N	A653M-DS-DDS	DX54D+Z	
	EDDQ	CGCE		JS-SGCD-3	A653M-DS-EDDS	DX56D+Z	
	S-EDQ	CGCX				DX57D+ZF	
HSS	Microalloyed grade	CGCHS220Y					
		CGCHS260Y	SGC340	SGC340	A653M-275	HX 260LAD+Z	
		CGCHS300Y				HX 300LAD+Z	
		CGCHS340Y	SGC400	SGC400	A653M-340	HX 340LAD+Z	
		CGCHS380Y	SGC440	SGC440		HX 380LAD+Z	
		CGCHS420Y	SGC490	SGC490	A653M-410	HX 420LAD+Z	
	Rephosphorized grade	CGCHS40					
		CGCHS45					
	IF grade	PGY220E(-E) CGCHS35				HX 220YD+Z	
		CGCHS40				HX 260YD+Z	
		CGCHS35ES				HX 180YD+Z	
	Baked Hardening	CGCHS28B(-E)				HX 180BD+Z	
		CGCHS35BH(-E)				HX 220BD+Z	
		CGCHS45BH(-E)					
	AHSS	Dual Phase	CGCHS60DP				HCT 600X+Z
			CGCHS80DP				HCT 780X+Z
			PGT980D-M(H)				HCT 980X+Z
		TRIP	CGCHS590TR				
CGCHS690TR						HCT 690T+Z	
CGCHS80TR						HCT 780T+Z	
TWIP		CGCHS780TW					
Complex Phase		CGCHS120CP					

RENAULT	GMW	FORD	DCX	NISSAN	BAOGANG
(Z/X) E	GMW2M-ST-S CR1 HD70G70G(U/E)	WSS-M1A345-A1	MS-6000 44E-CS	SP789	DC51D
	GMW2M-ST-S CR2 HD70G70G(U/E)				DC52D
(Z/X) ES	GMW2M-ST-S CR3 HD70G70G(U/E)	WSS-M1A345-A2	MS-6000 44AE-DS	SP781	DC53D
	GMW2M-ST-S CR4 HD70G70G(U/E)	WSS-M1A345-A3	MS-6000 44AE-DDS	SP782	DC54D
(Z/X) SES	GMW2M-ST-S CR5 HD70G70G(U/E)	WSS-M1A345-A4		SP783	DC56D
				SP784	EN-DX57D
		WSS-M1A347-A1	MS-6000 44V-035		H220PD
	GMW3032M-ST-S CR240LA HD70G70GU	WSS-M1A347-A2	MS-6000 44V-040		H260YD (B260LYD)
XE 320 D	GMW3032M-ST-S CR300LA HD70G70GU	WSS-M1A347-A3	MS-6000 44V-045		H300LAD
XE 360 D	GMW3032M-ST-S CR340LA HD70G70GU		MS-6000 44V-050		H340LAD
	GMW3032M-ST-S CR380LA HD70G70GU	WSS-M1A347-A4	MS-6000 44V-055		H380LAD
	GMW3032M-ST-S CR420LA HD70G70GU	WSS-M1A347-A5	MS-6000 44V-060		H420LAD
		WSS-M1A347-A1			
		WSS-M1A347-A2			
	GMW3032M-ST-S CR210IF HD70G70G(U/E)			SP782-340	H220PD
	GMW3032M-ST-S CR240IF HD70G70G(U/E)	WSS-M1A347-A1			
XE 220P	GMW3032M-ST-S CR180IF HD70G70GE				
(Z/X)E BH	GMW3032M-ST-S CR180BE HD70G70GE	WSS-M1A341-A3	MS-6000 44VA-025HK		
XE 220 BH	GMW3032M-ST-S CR210BE HD70G70GE	WSS-M1A341-A4	MS-6000 44VA-035HK	SP782-340	
	GMW3032M-ST-S CR270BE HD70G70GE		MS-6000 44VA-045HK		
XE 360 B	GMW3399M-ST-S CR590T DP HD70G70GU GMW3399M-ST-S CR340Y DP HD70G70GU	WSS-M1A348-A7	MS-6000 44V-590DT	RP783-590N	
XE 450 B	GMW3399M-ST-S CR780T DP HD70G70GU GMW3399M-ST-S CR420Y DP HD70G70GU		MS-6000 44V-780DT	RP783-780	
XE 550 B	GMW3399M-ST-S CR980T DP HD70G70GU GMW3399M-ST-S CR550Y DP HD70G70GU			RP783-980	
	GMW3399M-ST-S CR590T TR HD70G70GU GMW3399M-ST-S CR380Y TR HD70G70GU		MS-6000 44V-590TT		
			MS-6000 44V-690TT		
XE 450 T	GMW3399M-ST-S CR780T TR HD70G70GU GMW3399M-ST-S CR440Y TR HD70G70GU		MS-6000 44V-780TT		

Appendix

*EG

Division		POSCO Specification	KS	JIS	
Mild Steel	CQ	Pure Zn	EGSC		
	LQ	Pure Zn Zn-Fe Fuel tank Zn-Ni	EGSC-E EFSC ENSC(-E)	KS-SECC JS-SECC	
	DQ	Pure Zn Zn-Fe Fuel tank Zn-Ni	EGSD(-E) EFS EFTSD ENSD(-E)	KS-SECD JS-SECD	
	DDQ	Pure Zn Zn-Fe Fuel tank Zn-Ni	EGSN(-E, -L) EFSN(-E) EFTSN ENSN(-E, -L)	KS-SECEN JS-SECEN	
	EDDQ	Pure Zn Zn-Fe Zn-Ni	EGSE(-E, -L) EFSE(-E) ENSE(-E, -L)	JS-SECE	
	S-EDDQ	Pure Zn	EGSX-E		
HSS	Baked Hardening		PZY180B(-E) EGCSP28BH-E		
			PZY210B(-E) EGCHSP35B-E	KS-SEFC340H	JS-SEFC340H
			EGCHSP40B-E		
	ISOTROPIC		EGCHSP220-E		
	IF grade		EGCHSP35E(-E)	KS-SEFC340	JS-SEFC340
			EGCHSP38E	KS-SEFC370	JS-SEFC370
			EGCHSP40E(-E)	KS-SEFC390	JS-SEFC390
			EGCHSP45E	KS-SEFC440	JS-SEFC440
	Rephosphorized grade		EGCHSP35R	KS-SEFC340	JS-SEFC340
			EGCHSP40R	KS-SEFC390	JS-SEFC390
	Microalloyed grade		EGCHSP340Y		
			EGCHSP45C	KS-SEFC440	JS-SEFC440
	Rephosphorized grade	Zn-Fe	EFCHSP35E(-E)	KS-SEFC340	JS-SEFC340
			EFCHSP38E(-E)	KS-SEFC370	JS-SEFC370
	EFCHSP45E		KS-SEFC440	JS-SEFC440	
	Microalloyed grade	Zn-Fe	EFCHSP35R	KS-SEFC340	JS-SEFC340
			EFCHSP38R	KS-SEFC370	JS-SEFC370
	Rephosphorized grade	Zn-Ni	ENCHSP35E-E	KS-SEFC340	JS-SEFC340
			ENCHSP35E-E	KS-SEFC390	JS-SEFC390
	Microalloyed grade		Zn-Ni	ENCHSP35R	KS-SEFC340
ENCHSP40R		KS-SEFC390		JS-SEFC390	
AHSS	TRIP	Pure Zn	EGCHSP60TR	KS-SEFC590Y JS-SEFC590Y	
		Zn-Fe	EFCHSP60TR	KS-SEFC590Y JS-SEFC590Y	
		Zn-Ni	ENCHSP80TR	KS-SEFC780Y JS-SEFC780Y	
		Zn-Ni	ENCHSP60TR	KS-SEFC590Y JS-SEFC590Y	

ASTM	EN	JFS	DIN	GMW
A591M-CS	DC01+ZE	JEC270C JEC270C (JEC : Zn-Fe Coating)		GMW2M-ST-S CR1 EG70G70G(U/E)
	DC03+ZE		DN-ST1203EG DN-ST1205EG	GMW2M-ST-S CR2 EG70G70G(U/E)
	DC03+ZN			
A591M-DS	DC04+ZE	JEC270D JEC270D	DN-ST1303EG DN-ST1305EG	GMW2M-ST-S CR3 EG70G70G(U/E)
	DC04+ZN			
A591M-DDS	DC05+ZE	JEC270E JEC270E	DN-ST1403EG DN-ST1405EG	GMW2M-ST-S CR4 EG70G70G(U/E)
	DC05+ZN			
A591M-DDS	DC06+ZE	JEC270F JEC270F		GMW2M-ST-S CR5 EG70G70G(U/E)
	DC06+ZN			
		JEC270G JEC270G		
A591M-BHS410	HC 180B+ZE			GMW3032M-ST-S CR180B2 EG70G70GU
A591M-BHS210	HC 220B+ZE	JEC340H		GMW3032M-ST-S CR210B2 EG70G70GU(U/E)
	HC 260B+ZE			GMW3032M-ST-S CR240B2 EG70G70GU(U/E)
	HC 220I+ZE			
	HC 180Y+ZE	JEC340P JEC340P		GMW3032M-ST-S CR180IF EG70G70GU(U/E)
	HC 260Y+ZE	JEC370P JEC370P		GMW3032M-ST-S CR210IF EG70G70GU(U/E)
		JEC390P JEC440P		GMW3032M-ST-S CR240IF EG70G70GU(U/E)
A591M-230	HC 220P+ZE	JEC340W JEC340W		GMW3032M-ST-S CR180P EG70G70GU
A591M-275	HC 260P+ZE	JEC390W		GMW3032M-ST-S CR240P EG70G70GU
	HC 340LA+ZE			GMW3032M-ST-S CR340P EG70G70GU
	HC 300LA+ZE	JEC440W		
	HC 180Y+ZE	JEC340P JEC340P		GMW3032M-ST-S CR180IF EG70G70GU(U/E)
	HC 260Y+ZE	JEC370P JEC370P		GMW3032M-ST-S CR210IF EG70G70GU(U/E)
		JEC440P		
A591M-230	HC 220P+ZE	JEC340W JEC340W		GMW3032M-ST-S CR180P EG70G70GU
		JEC370W		GMW3032M-ST-S CR210P EG70G70GU
	HC 180Y+ZE	JEC340P JEC340P		GMW3032M-ST-S CR180IF EG70G70GU(U/E)
		JEC390P		GMW3032M-ST-S CR240IF EG70G70GU(U/E)
A591M-230	HC 220P+ZE	JEC340W JEC340W		GMW3032M-ST-S CR180P EG70G70GU
A591M-275	HC 260P+ZE	JEC390W		
	HC 780T+ZE			GMW3399M-ST-S CR780T TR EG70G70GU GMW3399M-ST-S CR440Y TR EG70G70GU

*Gi

Division	POSCO Specification	KS	JIS	ASTM	EN	JFS	TOYOTA	MAZDA	MITSUBISHI
Mild Steel	CQ	KS-SGHC	JS-SGHC	A653M-CS	DD11+ZF	JAH270C	SHGA270C	SPHM1	MJAH270C
	LQ	CGHC					SHGA270D	SPHM2	MJAH270D
	DQ	CGHD		A653M-DS	DD12+ZF	JAH270D	SHGA270E	SPHM3	
	DDQ					JAH270E			
Structural	CGH35	KS-SGH340 KS-SGH35	JS-SGH340			JAH310W	SHGA310	SPHM310W	
	CGH37			A653M-255		JAH370W	SHGA370		
	CGH41	KS-SGH400 KS-SGH41	JS-SGH400			JAH400W	SHGA400	SPHM400W	MJAH400W
	CGH45	KS-SGH440 KS-SGH45	JS-SGH440	A653M-340	S355MC+ZF	JAH440W	SHGA440	SPHM440W	MJAH440W
	CGH50	KS-SGH490 KS-SGH50	JS-SGH490						
	CGH58								

AUTOMOTIVE STEEL

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PosMAC[®]

**POSCO Magnesium Aluminium
alloy Coating product**





PosMAC® is a range of steel products that provide 5 to 10 times greater corrosion resistance compared with ordinary hot-dip galvanized steel sheet (GI, GI(H)) of the same coating weight. PosMAC® especially has an excellent cross section corrosion resistance. Ordinary products having thick plating can be replaced with it. The same processing, assembly and painting processes can be applied to PosMAC® as one would apply to GI steels.

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PosMAC®

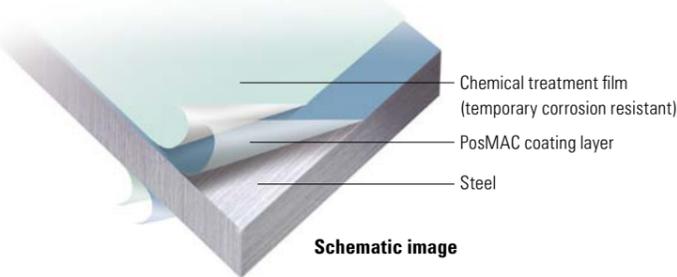
What is PosMAC®?

What is PosMAC®?

PosMAC(POSCO Magnesium Aluminium alloy Coating product) is a ternary alloy coated steel(Zn- 3%Mg- 2.5%Al) with high corrosion resistance developed with POSCO's own technology.

* **PosMAC®** is the registered trademark of POSCO.

Product configuration



Product characteristics

- PosMAC is a corrosion resistant products that is 5 to 10 times stronger resistance than that of a normal hot-dip galvanized steel sheet(GI, GI(H)) with the same coating weight. PosMAC has an excellent cross-section corrosion resistance; normal thick plating products can be replaced with this product.
- The same processing, assembly and painting process can be applied to PosMAC as one would apply to GI.

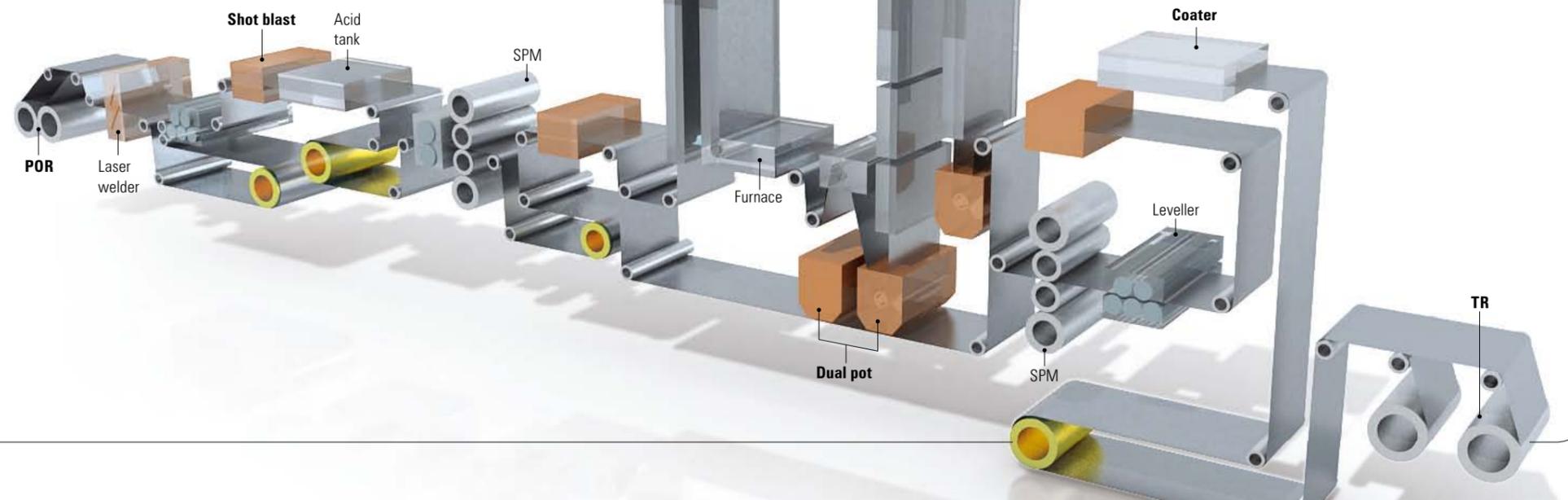
Product characteristics comparison

- PosMAC is superior to GI in corrosion resistance on flat, machined, cross-section parts and is superior to galvalume in cross-section corrosion resistance.

Quality items	PosMAC	GI	Galvalume
Hardness(Hv) of coating layer	110~130	60~80	80~100
Friction characteristics	◎	X	△
Corrosion resistance	Flat sheet	◎	△
	Bending	◎	△
	Cup	◎	△
	Cross-section	◎	X
Chemical resistance	◎	△	△
Weldability	◎	◎	◎

Equipment specifications

Classification	Pohang #1CGL	
Operation date	2012. 04	
Capacity	750 thousands ton/year	
Product dimensions	Thickness	0.4~4.5mm
	Width	800~1650mm
Coating weight	60~400 g/m ²	
Product grade	General, Structural	
Post treatment	Chromate(Cr ⁶⁺ , Cr ³⁺), Cr-free, Oiling	



Manufacturing equipment



The equipments at the entry section are composed of two pay off reels and a welder.

The scales from an HR coil can be removed completely by passing through the shot blast and pickling tank.

Zn-Mg-Al is coated onto the surface of the steel sheet after passing the annealing furnace in the pot reserved for PosMAC, and then the targeted coating weight is achieved by spraying high pressurized air from the air knife.



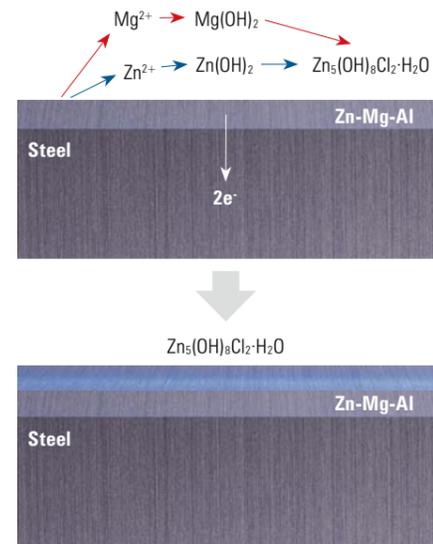
In order to obtain the flat shape and elegant surface, PosMAC product get passed through a skin pass mill. Also to prevent any white rust, product surface is coated with Cr-free or chromate to improve corrosion resistance property.

The equipment at the exit section are composed of an inspection table and an oiler equipment where the products are inspected synthetically and judged whether they are adequate for sale.

Corrosion resistance of PosMAC®

Why PosMAC® has excellent corrosion resistance?

The magnesium(Mg) in PosMAC's coating layer will accelerate the formation of a dense corrosion product called "Simonkollite ($Zn_5(OH)_8Cl_2 \cdot H_2O$)" which is extremely stable. When simonkollite is formed on the surface of the coating layer in a film-like-form, it plays a role as a corrosion inhibitor for the base metal.

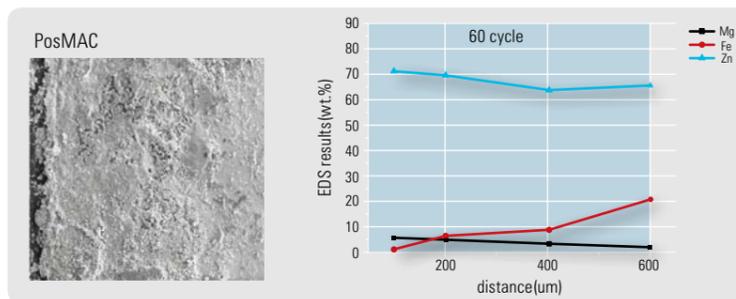
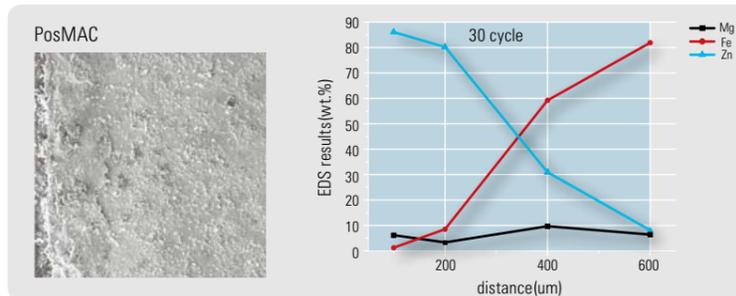


	CCT	Surface	Cross-section
30 cycle			
60 cycle			

In addition, the upper coating layer can be dissolved to cover the cross-section and accelerate the growth of a stable corrosion product. However red-rust can be found in the already exposed steel plate, but fortunately, the film of the corrosion products covers the cross-section and serves to prevent corrosion.

Zn^{2+}, Mg^{2+}
 $OH^- \leftarrow O^2$
 $Mg(OH)_2$
 $Zn_5(OH)_8Cl_2 \cdot H_2O$
 Fe^{2+} Red-rust

Self healing



Comparison to galvanized(GI(H)) / Galvalume in corrosion resistance on flat surfaces(SST)

SST	GI(H)	Galvalume	PosMAC	
	600g/m ²	100g/m ²	200g/m ²	350g/m ²
480Hr				
720Hr				
1440Hr				
2400Hr				

- PosMAC shows 5 to 10 times the corrosion resistance compared to galvanized steel sheet on flat surfaces.
- In addition, PosMAC shows equal or greater corrosion resistance than Galvalume on flat surfaces.

Test method :
Surface inspection after salt spray test (JIS Z 2371, 5% NaCl, 35°C) every 24Hr

Comparison to galvanized(GI(H)) / Galvalume in corrosion resistance on flat surfaces(CCT)

- PosMAC shows 5 to 10 times the corrosion resistance compared to galvanized steel sheet on flat surfaces.
- In addition, PosMAC shows equal or greater corrosion resistance than galvalume on flat surfaces.

CCT	GI(H)				Galvalume	PosMAC		
	120g/m ²	200g/m ²	300g/m ²	600g/m ²	100g/m ²	140g/m ²	200g/m ²	275g/m ²
10 cycle (80Hr)								
70 cycle (560Hr)								
120 cycle (960Hr)								

Test method : CCT(Cyclic Corrosion Test)
CCT 1cycle(KS R1127) : Salt spray 2Hr(5%NaCl, 35°C) → Dry 4Hr(25%RH, 60°C) → Wet 2Hr(95%RH, 50°C)

Corrosion resistance of PosMAC®

PosMAC®'s corrosion resistance on flat sheets compared to batch plated GI

(Korea Testing & Research Institute : Test No. TBO-000048)

PosMAC shows 5~10 times corrosion resistance to that of batch plated GI sheet.



SST	PosMAC		Batch plated GI	SST	PosMAC		Batch plated GI
	60g/m ²	300g/m ²	550g/m ²		Coating weight	60g/m ²	300g/m ²
480 Hr				1200 Hr			
720 Hr				2400 Hr			

Test method : Surface inspection after salt spray test(JIS Z2371, 5%NaCl, 35°C) every 24Hr.

PosMAC®'s corrosion resistance on bent areas compared to that of hot dip galvanized steel(GI(H)) and galvalume

PosMAC shows 2~3 times corrosion resistance to that of GI(H) and Galvalume on bent areas.

SST	2.0 mmt CQ Grade		
	PosMAC	GI(H)	Galvalume
Coating weight	140g/m ²	140g/m ²	140g/m ²
800 Hr			
1200 Hr			

Test method: Surface inspection after salt spray test(JIS Z2371, 5%NaCl, 35°C) every 24Hr.

Corrosion resistance of cup drawing region

Corrosion resistance of PosMAC is 2~3 times higher than that of GI(H) while equal to that of Galvalume.

CCT	PosMAC	GI(H)	Galvalume
Coating weight	275g/m ²	350g/m ²	200g/m ²
60 cycle		 Red-rust happened after 35 cycle	
80 cycle			
100 cycle			

Test method : Cup drawing was followed by CCT(Cyclic Corrosion Test)
CCT 1cycle(KS R1127) : Salt spray 2Hr(5%NaCl, 35°C) → Dry 4Hr(25%RH, 60°C) → Wet 2Hr(95%RH 50°C)

PosMAC®'s corrosion resistance of processed product

■ **Processed product** : C-Type steel for solar photovoltaic power generator support structure.



Division	Coating weight	Processed area	Frontal cross-section
SST 500Hr	Batch-GI 370.3g/m ² (One side)		
	PosMAC 116.1g/m ² (One side)		

Test method : Every 24 hours after spraying salt water solution(JIS Z2371, 5% NaCl, at 34C), check the condition of samples.

■ **Processed product** : Square type part for solar photovoltaic power generator support structure

Division	Batch-GI	PosMAC
	432g/m ² (One side)	195g/m ² (One side)
SST 1000Hr		
SST 2000Hr		

Test method : Every 24 hours after spraying salt water solution(JIS Z2371, 5% NaCl, at 34C), check the condition of samples.

Corrosion resistance of PosMAC®

Weathering test on cross-section part (Korea conformity laboratories)

- Corrosion resistance in cross-section parts of PosMAC, is superior to that of GI(H) and galvalume.
- PosMAC also gets red-rust in cross-section parts when initially exposed outdoors. However as the time goes by, the corrosion(red-rust) area of PosMAC tends to decrease through the formation of its distinctive oxide-based material(simonkollite).
- If the thickness of PosMAC is more than 1.6t, we recommend post-treatment(catalog 19p, 22p), because it is not fully covered by simonkollite after 1 year. And when the thickness of PosMAC is less than 1.6t and cross-section parts is clean without red-rust at initial construction, it is recommended to carry out post-treatment by the option of the customers.



Outdoor exposure test

Sample	Thickness	Coating weight (g/m ²)	Cross-section image		
			After 6 months	After 1 year	After 2 years
PosMAC	1.2	130			
	1.6	120			
	2.0	300			
Galvalume	1.6	120			
GI(H)	1.6	180			

Note. Outdoor exposure test at seosan chemical industrial complex(Oct. '12 ~ Oct. '14, Korea conformity laboratories)

Estimation of PosMAC®'s longevity (KOBELCO from Japan)

Classification	Test sample	Thickness(mm)	Coating weight (Both sides, g/m ²)	Post-treatment	Corrosion start time of Fe(CCT)	Estimate of longevity (Salt damage environment)
Ternary alloy coated steel	PosMAC (POSCO)	2.0	140	Cr	1,920Hr	50 years
		2.0	350	Cr-free(NB)	3,700Hr	100 years
	Competitor's high corrosion resistant Type 1	2.0	120	Cr-free	1,920Hr	50 years
		1.6	190	Cr	2,200Hr	60 years
	Type 2	0.27	120	Cr-free	2,200Hr	60 years
Galvanized steel	GI(H) (POSCO)	2.0	600	Cr	960Hr	25 years(Base)
	Batch GI (Domestic galvanizer)	2.0	1,000	-	960Hr	25 years

Test Method : CCT(Cyclic Corrosion Test) CCT 1cycle(KS R1127) : Salt spray 2Hr(5%NaCl, 35°C) → Dry 4Hr(25%RH, 60°C) → Wet 2Hr(95%RH 50°C)

Evaluation of longevity : Japan's bridge construction association stated that the longevity of a GI with K600 zinc coating has a corrosion resistance longevity of 25years.

Based on this study the relative longevity of other comparable steel products was extracted.

White rust occurrence of the PosMAC®

- PosMAC is strong corrosion-resistant steel to protect the base metal by forming oxide of a dense structure called simonkollite.
- Therefore, white rust also can occur as usual galvanized steel. To avoid white rust of PosMAC before the construction, the following should be noted.

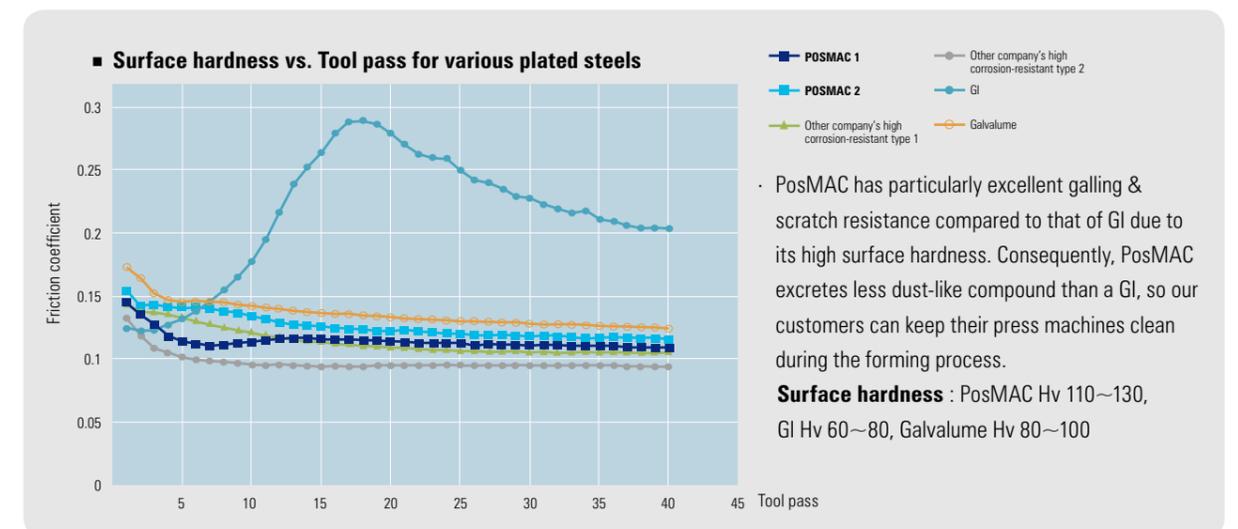
FE-SEM image comparison of the corrosion product of the PosMAC & GI

Division	GI	PosMAC
Classification	ZnO	Zn ₅ (OH) ₈ Cl ₂ , H ₂ O, Zn ₄ CO ₃ (OH) ₆ , H ₂ O
Image	 Porous & incompact structure	 Stable & dense structure

Precautions when storing the PosMAC before the construction

- Coils, sheet, and processed products must be kept dry and smooth-ventilated place. White rust can be caused by water vapor on the ground floor when storing.
- Set vinyl and the thick pentagonal timber(thicker than 10mm recommended) on the ground first and stack the coils to ventilate ordinarily.
- The coil and sheet should be wrapped when raining and if the rain stops, the package should be removed so that the internal water could evaporate and get removed.
- To cover vinyl above the unpackaged coil where it has moisture in the air should not be kept for a long time as it might promote the reaction with coil and the moisture.
- When keeping the coil for a long time, it should be used quickly and in first-in-first-out manner since there is the possibility that white rust might occur.
- The unpackaged or package-seperated coils have to be used quickly.

Galling & scratch resistance of PosMAC®



PosMAC has particularly excellent galling & scratch resistance compared to that of GI due to its high surface hardness. Consequently, PosMAC excretes less dust-like compound than a GI, so our customers can keep their press machines clean during the forming process.

Surface hardness : PosMAC Hv 110~130, GI Hv 60~80, Galvalume Hv 80~100

Surface appearance after friction test



Test condition

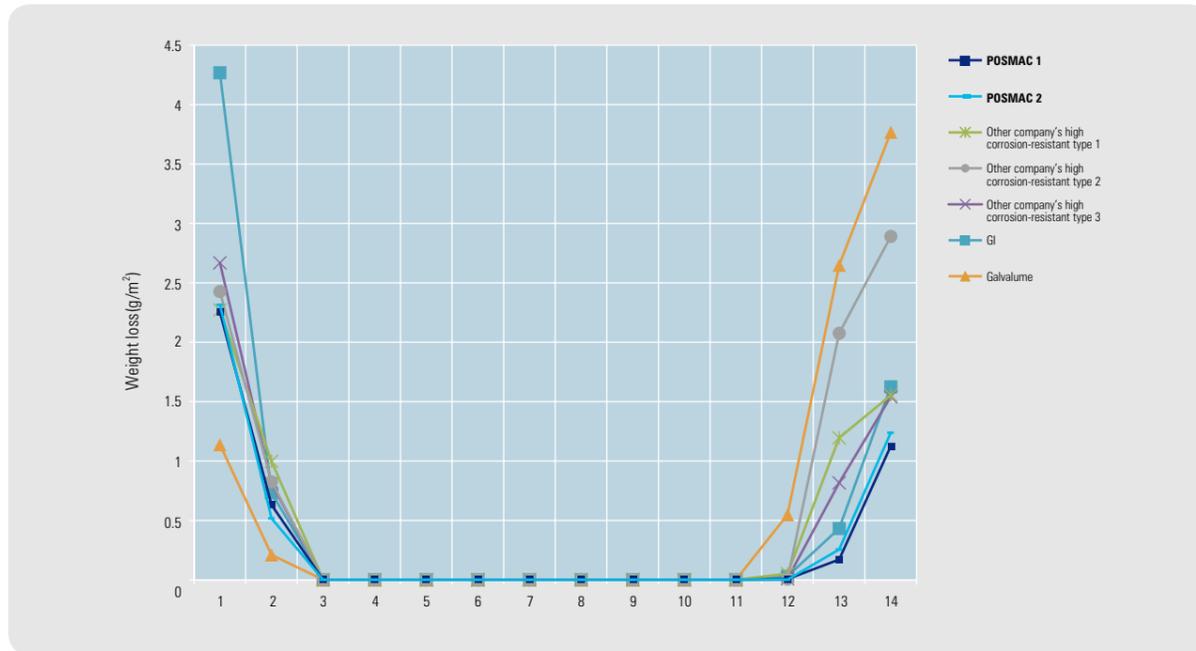
- Target force : 333.3 kgf, Pressure : 3.736 MPa
- Tip movement : 200 mm length, 20 mm/sec rate
- Avg. calculation region : 30mm ~ 170mm
- P-DBH(washing oil) oiled.

Type 1, 2 Other company's high corrosion-resistant

Chemical resistance of PosMAC®

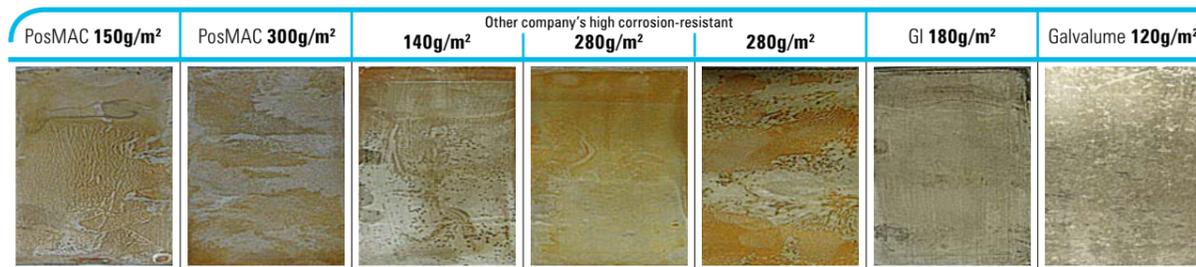
- PosMAC shows less weight loss of plating layer in comparison to GI and galvalume under either an acidic or an alkaline environment. This means that PosMAC is much more resistant to potent chemicals than other plated steels products.
- GI and galvalume are especially weak under the strong acidic condition (pH 1~2) and strong basic condition (pH 13~14), respectively.
- PosMAC is applicable for farm housing and building materials thanks to its excellent chemical resistance.

Weight loss of plating layer vs. pH for various plated steels

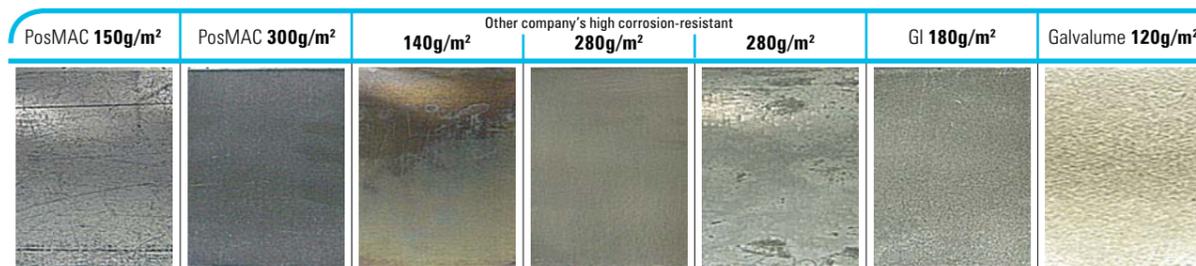


Test method: Weighing the loss of plated layer after dipping into various solutions (pH 1~14, H₂SO₄, NaOH and NH₃ single or mixed) for 24 hours.

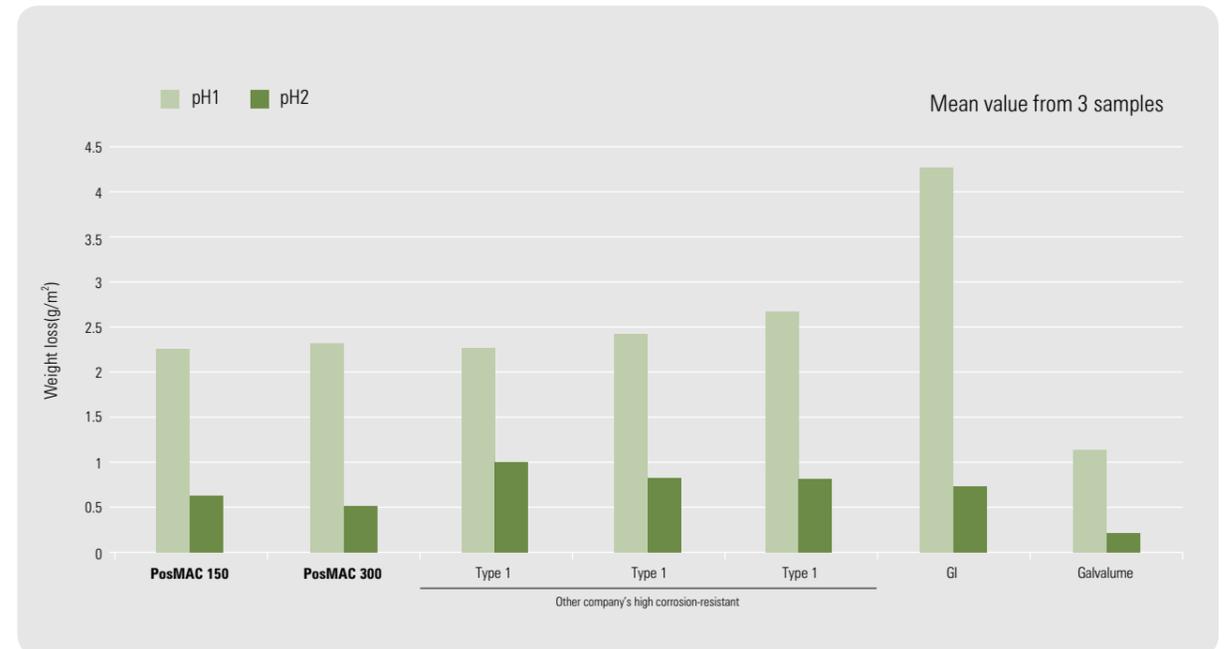
Chemical resistance against pH 1 solutions



Chemical resistance against pH 2 solutions

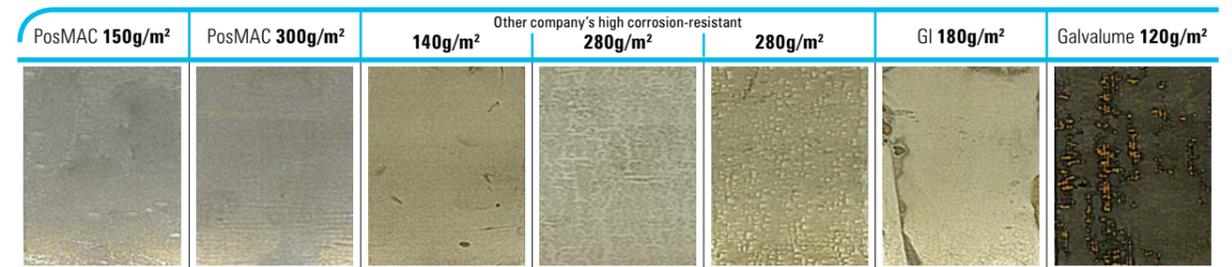


Weight loss from pH 1 and 2 solutions



- All of the commercial alloy plated steels above shows similar chemical resistance under acidic conditions (pH 1~2).
- The galvalume which has the highest Al content shows the highest chemical resistance under acidic conditions (pH 1~2).

Chemical resistance against pH 13 solutions

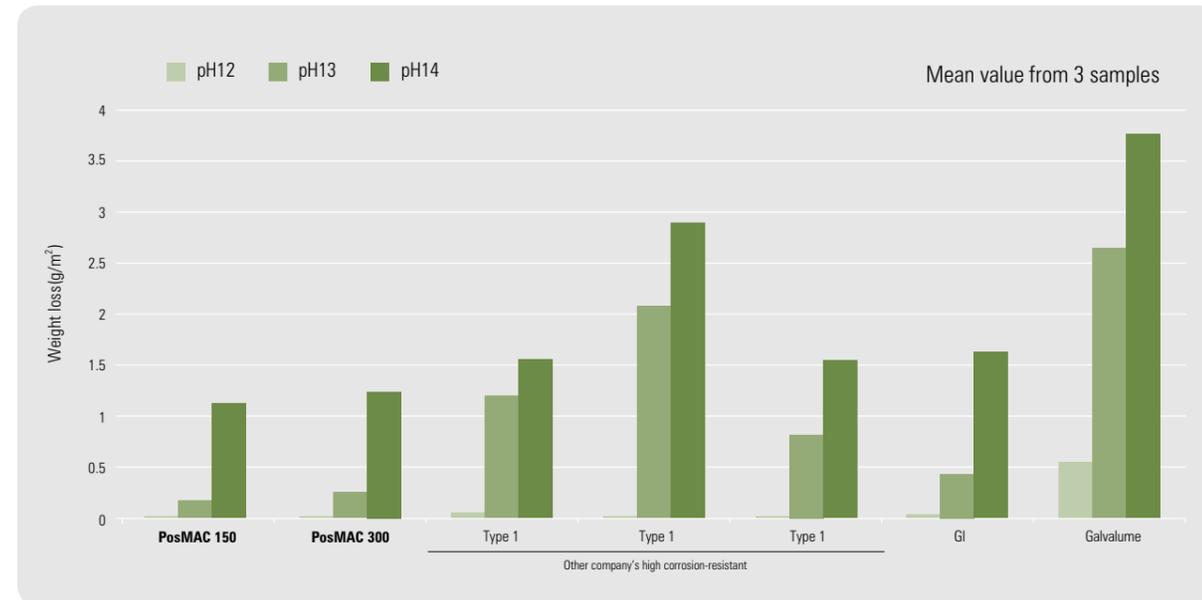


Chemical resistance against pH 14 solutions



Chemical resistance of PosMAC®

Weight loss from pH 12, 13 and 14 solutions



- Galvalume's chemical resistance is the poorest under alkaline conditions (pH 12~14) although its chemical resistance was excellent under acidic conditions (pH 1~2).
- PosMAC's chemical resistance is especially excellent under alkaline conditions (pH 12~14).

Chemical resistance to ammonia solutions



Evaluation method

- Dipping into a 10% ammonia solution (pH 12.5).
- Replace with fresh solution every 100 hours.
- Surface inspection after 1200 hours.

Anti-corrosiveness after 1000, 1200 hours

Dipping Time	PosMAC 120g/m ²	GI 275g/m ²	Galvalume 100g/m ²	Dipping Time	PosMAC 120g/m ²	GI 275g/m ²	Galvalume 100g/m ²
	1000Hr					1200Hr	

- Galvalume displayed red-rust formation after 400 hours. / GI displayed rapid red-rust formation after 1000 hours.
- PosMAC did not display red-rust formation after 1200 hours.

Acid rain simulation test results

- Red-rust formed on the exposed edge of the galvalume after 30 cycles / similar symptoms became visible on the GI after 60 cycles.

Acid rain simulation	30 Cycle			60 Cycle		
	PosMAC	GI	Galvalume	PosMAC	GI	Galvalume
The coating weight on both sides	100g/m ²	275g/m ²	100g/m ²	100g/m ²	275g/m ²	100g/m ²
Cut surface edge taped						
Cut surface edge exposed						

Test condition: Artificial acid rain (0.1% NaCl solution + H₂SO₄, 35°C, 1Hr, pH4) → Drying (30%RH at 60°C, 4Hr) → Humid environment (95%RH at 50°C, 3Hr).

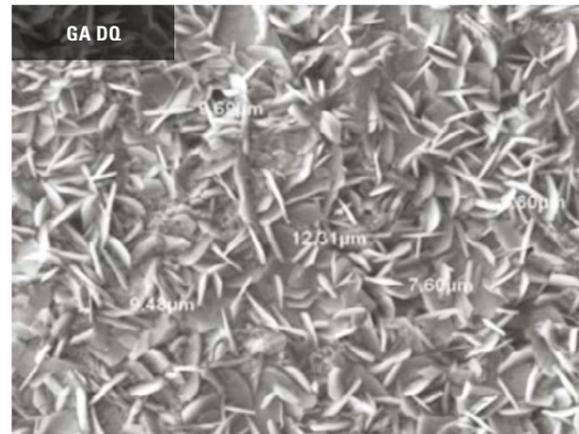
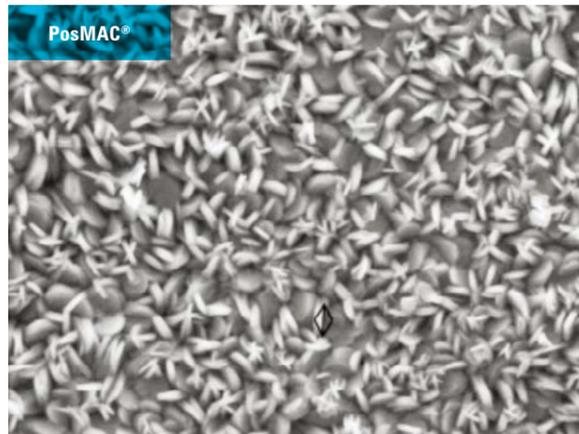
- Red-rust did not form on the exposed edge of the PosMAC after 90 cycles.

Acid rain simulation	90 Cycle			120 Cycle		
	PosMAC	GI	Galvalume	PosMAC	GI	Galvalume
The coating weight on both sides	100g/m ²	275g/m ²	100g/m ²	100g/m ²	275g/m ²	100g/m ²
Cut surface edge taped						
Cut surface edge exposed						

Test condition: Artificial acid rain (0.1% NaCl solution + H₂SO₄, 35°C, 1Hr, pH4) → Drying (30%RH at 60°C, 4Hr) → Humid environment (95%RH at 50°C, 3Hr).

Phosphating property

· Because phosphate crystallization is formed densely, phosphating property is advantageous.



Classification	Phosphate coating weight (g/m ²)	Crystallization size (μm)
PosMAC	3.75	4.6
GA-DQ	3.64	9~12
GA-DDQ	3.56	5~8

Gas metal arc(GMA) welding

Welding machine Welding is achievable with general market-grade welding machine.

Welding wire It can apply general mild steel, structural wire. If you use KC28 of carbon steel, it is profitable in LME(Liquid Metal Embrittlement) prevention of weld zone more than SM309L, SM310. (stainless steel)

Shield gas It uses gas Ar+20% CO₂ for decreasing spatter.

Welding current, voltage When welding with the same speed of a general cold-rolled steel sheet, PosMAC is robbed of heat by the evaporation of its Zinc plating layer. So welding input heat must be established more than that of a general cold-rolled steel sheet. (About 5~10% in electric current)

Welding speed To prevent defect occurrence like a blow hole or pit, welding speed must be set lower than that of a cold-rolled steel sheet.

Repair spray coating Damaged Zn-Mg-Al coating layer of weld zone, must execute repair spray coating for corrosion resistance security of weld zone. Execute Zn-Al alloy spray coating that is on common use according to specifications of makers.

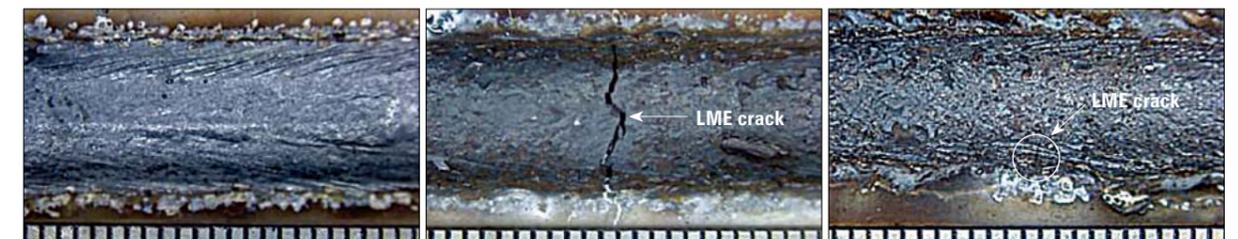
LME(Liquid Metal Embrittlement) occurrence by welding material

Test information : PosMAC-C, 1.2 mmt, Coating Weight M140g/m², No oiled, No post treatment.

Welding material	Chemical composition	TS	EL	Note
KC28(1.2Φ)	0.07C-0.86Si-1.5Mn	580MPa	28%	YGW12, ER70S-6
SM309L(1.2Φ)	22Cr-12Ni-0.02C	563MPa	43%	STS Welding material
SM310(1.2Φ)	25Cr-20Ni-0.1C	610MPa	35%	

LME crack observed on welding surface

KC28(carbon steel) is good without LME, but STS welding material is sensitive in the LME.



KC28 : 150A-18V-1.0m/min

SM309L : 180A-18V-1.0m/min

SM310 : 180A-20V-1.1m/min

※ When welding under excessive stress condition, LME crack can happen. Before using the material, please contact our product technical part.

PosMAC welding guideline

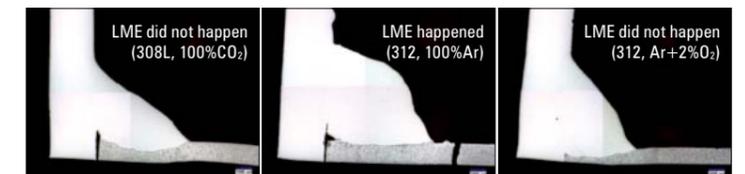
Circular fillet arc welding method between PosMAC panel and STS304 Pipe

In order to prevent LME crack when welding of the PosMAC, (example of application: water tank),

it has to be welded with both appropriate welding material and protection gas mixture ratio.

- 308L(100% CO₂), 312(Ar+2% O₂)

The fillet arc welding part sectional picture between the PosMAC panel & the STS304 pipe



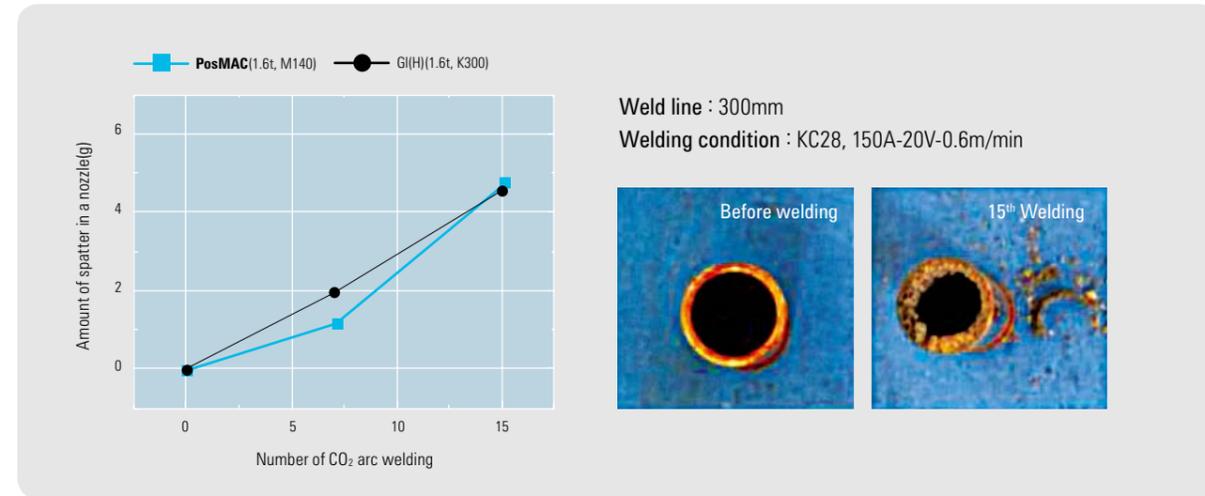
Classification	Maker	Diameter	Type	Shield gas	IASSI					
					C	Mn	Si	Cr	Ni	Mo
Shield-bright 308L Xtra SMP-M312	SeAH ESAB	φ1.2	Flux cored wire	100%CO ₂	0.03	1.3	0.6	19.2	9.6	0.2
			SolidWire	Ar+2%O ₂	0.1	1.9	0.33	29.9	9.79	-

* If the shield gas mixture ratio change, LME crack could happen in PosMAC welding part.

Weldability of PosMAC®

Spatter occurrence when welding

Test information : PosMAC-C, 1.6 mmt, Coating Weight M140g/m², No oiled, No post treatment.
Welding condition : CO₂ welding, Welding material: KC28 solid wire(1.2Φ), Current 150A, Voltage 20V, Welding speed 0.6m/min
Test Result : As the number of arc welding increases, spatter weight of nozzle parts increases.
 Therefore, nozzle cleaning is necessary after the 10th(Weld line 3,000mm) welding.

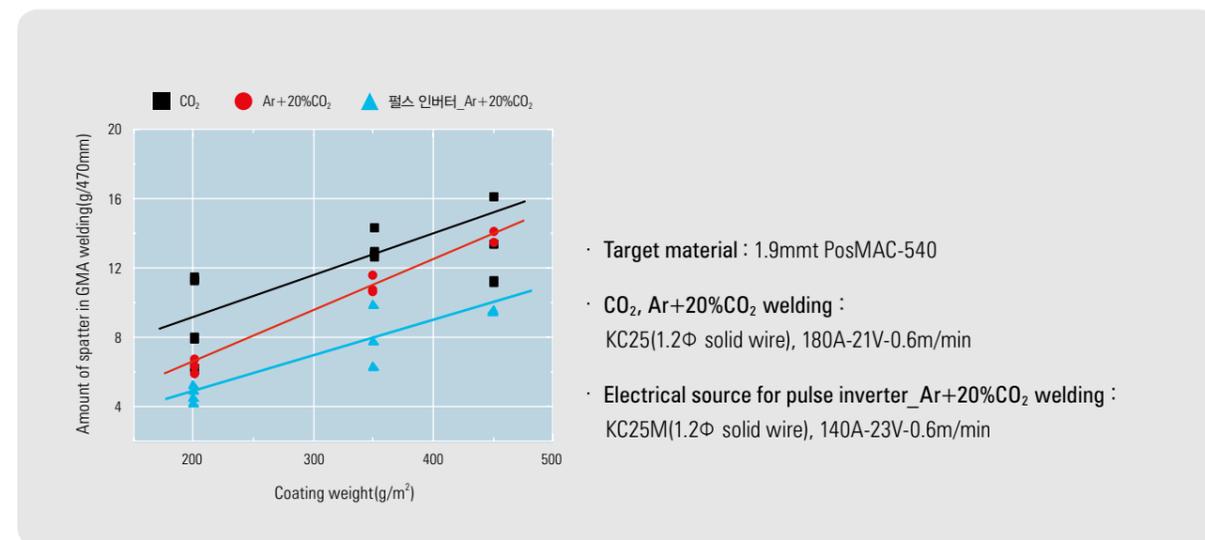


Spatter weight of nozzle of CO₂ arc welder

Nozzle condition after welding

How to reduce spatter

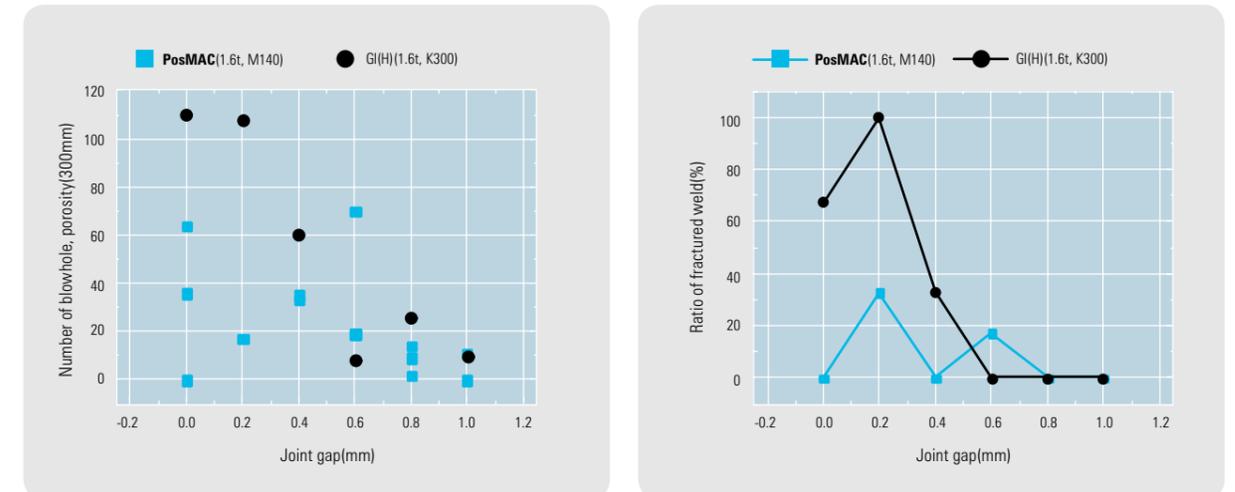
During arc welding of coated materials, evaporating zinc pushes out molten metals, creating lots of spatter. The amount of spatter increases dramatically with coating weight. Spatter also reacts sharply with CO₂ used in the welding of non-coated materials. Spatter can be reduced by using pulse inverter electrical sources for arc generation and using Ar+20CO₂ as a shield gas.



Properties relationship between amount of spatter, coating weight, and electrical source for arc welding

Occurrence of porosity and blow hole reduction method

Test information : PosMAC-C 1.6 mmt, coating weight M140g/m², No oiled, No post treatment.
Welding condition : CO₂ welding, Welding material: KC28 solid wire, Current 150A, Voltage 20V, Welding speed 0.6m/min.
Test result : If it is set joint gap interval 0.6mm, because discharge of zinc stream is increased through joint, so strength of weld zone improves.



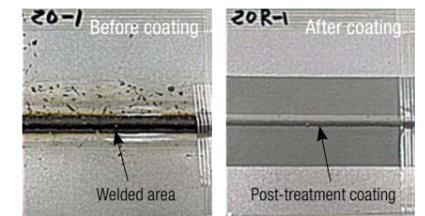
Relation of joint gap interval and porosity, blow hole

Relation of joint gap interval and weld zone fracture

Post-treatment of arc-welded area

After arc-welding, post-treatment is necessary due to the loss of coated layers in the deposited metal zone as well as the heat affected zone. For PosMAC, by spraying a layer (minimum 40μm per each side) of post-treatment solution containing commonly available Al-powder, galvanic corrosion-resistance appropriate to the material can be restored.

Material : 1.9mmt, 540MPa, Coating weight M450
Arc welding : KC25M(1.2Φ, solid wire), Ar+20%CO₂, 160A-0.7m/min



Result of SST per condition after post-treatment of arc-welded area of PosMAC(after 960 hours)

Original material	Silver powder from A company(Paint)	Galvanic from A company (Paint)

Test method : Every 24 hours after spraying salt water solution(JIS Z2371, 5% NaCl, at 34C), check the condition of samples.

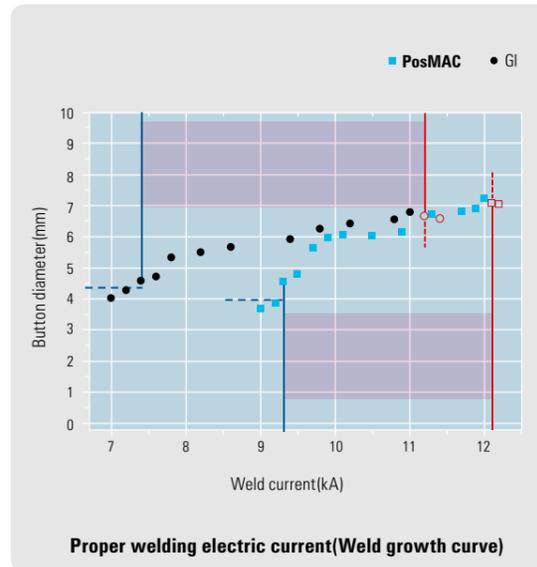
Weldability of PosMAC®

Spot welding

- When PosMAC is welding (likely general Zn coating product) welding current must be enhanced compared to that of cold-rolled steel sheet.
- When PosMAC is welding (likely general Zn coating product), current density falls and conduction path is expanded by the melting of the Zn layer.
- Electrode life-time is decreased due to the consumption of electrodes. As a reaction of the electrode and the Zn layer, figures out electrode life-time in advance and must carry out dressing, exchange regularly.

Spot weldability comparison of hot dip galvanized sheet and PosMAC

Classification	Thickness (mm)	Coating weight of one side (g/m ²)	Proper welding electric current (standard : more than 1.0kA)
PosMAC	0.97	122	2.7
GI	1.2	72	3.8



High frequency pipe-making welding

- High frequency pipe-making workability of PosMAC is similar to that of a general galvanized steel.
- Corrosion resistance of weld zone is superior to that of a general hot dip galvanized steel after spray coating processing.

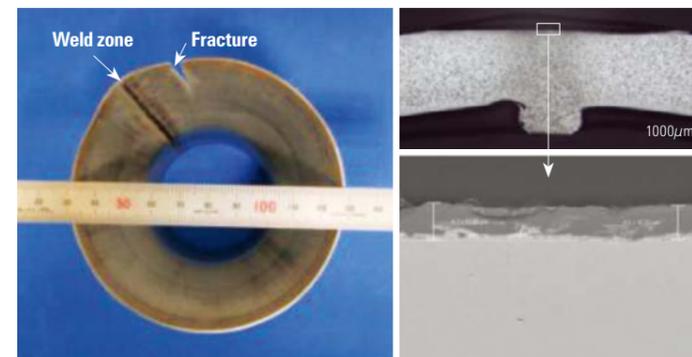
Pipe-making and high frequency pipe-making weld of PosMAC

Steel grade and steel pipe specification : PosMAC M200, Post-treatment : Chromate / Out dia 60.4mm, 48.9mm, Thickness 2.0mm

Test result :

Pipe-making property is good. Forming property of weld zone is excellent. Pipe extension ratio is more than 60% until base metal fracture occurs. Weld zone spray coating for repairing must be Al+Zn, Al-Zn alloy, Al and spray coating thickness is more than 7μm.

* Base layer spray coating needs application of Al spray coating material for insurance of coating cohesiveness and thickness.



Pipe shape after pipe extension of high frequency pipe-making weld of PosMAC.

Micro-structure of the spray coating layer in the high frequency welded pipe of PosMAC.

Classification	High frequency welding		
	GI(H) 180g/m ²	Batch-GI 600g/m ²	PosMAC 140g/m ²
SST 300Hr			
600Hr			

Weld zone corrosion resistance of high frequency welded pipe of PosMAC.

Laser beam welding

Laser beam welding, in comparison to arc welding, generates a low heat point weld, which reduces spatter and defects, leading to improvements in quality and usability.

Welding butt Joints

During laser beam welding of PosMAC, heat input must be tightly controlled to retain desired physical properties. If heat input application is excessive during low-speed welding, coated layers will be vaporized and oxidized by welding heat, making it difficult for the welded part to retain corrosion resistance. On the other hand, if heat input is low madeguatly during high-speed welding, it is difficult to perform piercing welding.

The chart below shows the desirable welding speed range according to steel thickness and coating weight. For steel products other than those shown here, specific welding requirements can be derived.

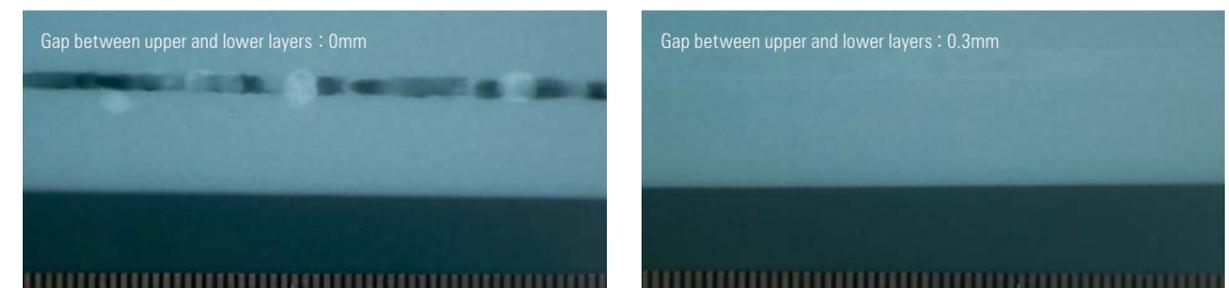
Division	Welding speed(m/min), Laser output 6kW					
	2	4	6	8	10	12
3.28t, M140, Chrome treatment	Coated layer elimination and oxidization	Proper welding condition	Partial penetration			
2.48t, M275, Chrome treatment						
2.47t, M275, Chrome treatment						
2.1t, M350, Chrome treatment						
2.34t, M140, No treatment						
2.33t, M140, NT treatment						
1.95t, M275, NT treatment						

Laser beam welding requirements for PosMAC butt joints

* Penetration refers to the depth of the original material converted to welded metal after the melting process. The depth of this zone in the plate thickness direction is called penetration depth. If only part of a joint is penetrated, it is called partial penetration.

Welding lap joints

When a lap joint is welded, the coated layer between the two plates vaporizes, and is absorbed into the molten metal, likely creating gas pockets. The faster the welding speed, the more gas pockets are formed. With reduced welding heat input, the number of gas pockets will decrease to a certain degree, but it is hard to completely prevent their occurrence. At the present time, the most effective way to minimize gas pockets is maintain a gap between the two plates of at least 0.3mm so that the vaporized coating layer can easily escape to the outside. However, though a bigger gap between upper and lower plates is favorable for preventing gas pockets, it must be heeded that too big a gap could hinder the creation of a sound joint.

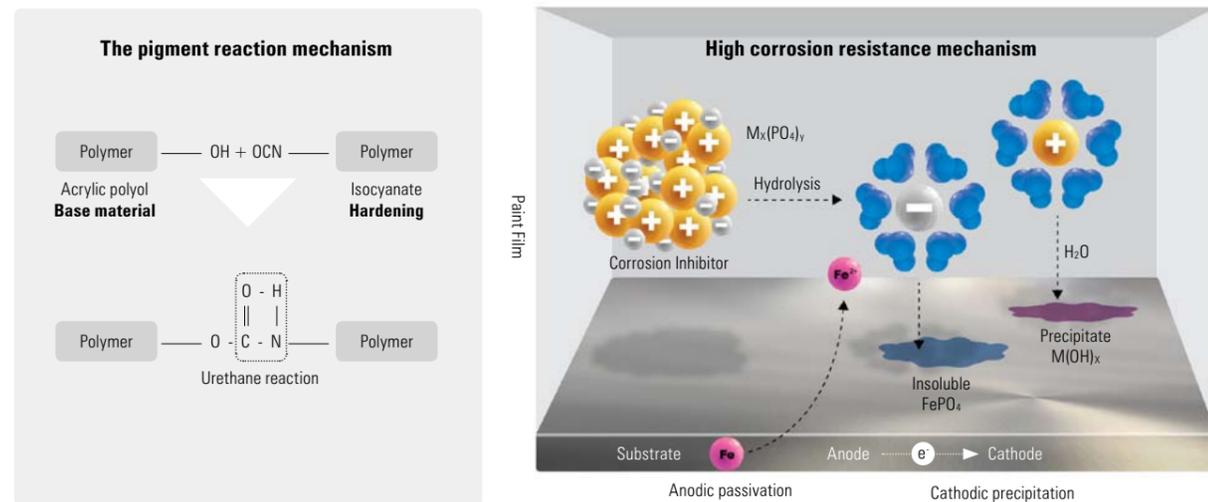


X-ray analysis result of laser-beam-welded lap joint: 2.3t PosMAC-C, M140, NT / 6kW-4m/min

Post-treatment for PosMAC® only

The feature of MAC-GUARD

- The MAC-GUARD product is the repair solution developed by the PosMAC only.
- The MAC-GUARD product has excellent hardness, chemical resistance, water resistance due to the urethane(Urethane) coupling between polymers.
- The MAC-GUARD product contains two-component coating material with main component an acrylic polyol, a special anti-corrosive pigment [Mx (PO4) y]. It has excellent corrosion resistance by using zinc and aluminum flake.
- MAC-GUARD product has excellent weather resistance by using HDI(Hexamethylene diisocyanate) as a hardener instead of using MDI (Methylene Diphenyl Diisocyanate) or TDI(Toluene diisocyanate) to combine isocyanate to the benzene ring directly.
- 40 μm or more of the MAC-GUARD should be applied for one side with spray or paint to secure corrosion resistance.



The results of corrosion resistant test

It is possible to ensure excellent corrosion resistance of welded parts by small amount of deposition(40μm) than commercial product(60μm)

CCT Test result

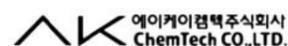
CCT*	Commercialized product(60μm)	MAC-GUARD(40μm)
150 Cycle (1200Hr)	Red-rust happened	

*CCT 1cycle(KS R 1127) : Salt spray 2Hr(5% NaCl, 35℃) → Dry 4Hr(25% RH, 60℃) → Wet 2Hr(95% RH, 50℃)



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Tel : +82-54-280-2127 / Fax : +82-54-278-6579
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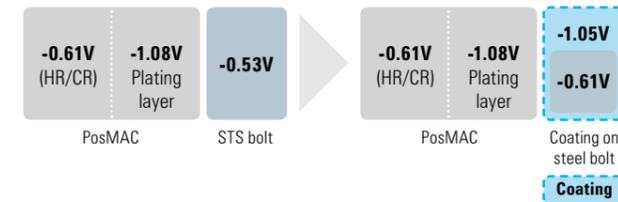


Bolt for PosMAC® only

The feature of MAC-BOLT

By developing product which has similar self-potential of the PosMAC, the galvanic corrosion due to potential difference get controlled. MAC-BOLT has excellent corrosion resistance, which is exclusively used with PosMAC through the sacrificial protection of the Zn & Al Flake.

The self-potential among 5% the NaCl aqueous solution and corrosion-resistance



The self-potential result of measurement for each material

·5% NaCl(pH6.5, 35℃), PosMAC : -1041.6 mV/SCE

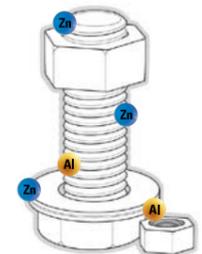
Material	Electric potential(mV)
Steel	-634.8
Zn plating	-1049.0
STS 304	-530.8
MAC-BOLT	-1054.7

* Galvanic Corrosion : The corrosion occurred by the electrochemical process when two mutually different kinds of metals get touched.

The surface treating material and method

The ingredient of coating material

- Binder : Epoxy type
- Main ingredient : Zn & Al Flake + Nano Powder
- Feature : MAC-BOLT has the excellent corrosion resistance by combining Zn and Al Flake that is the sacrificial anode. The formation of the coating layer with the nano-powder in the space between flake
- Coating method : Dip & Spin → Heat Treatment(Dry)



Coating process



CCT test of Bolt

10~25 Cycle	30~50 Cycle	180~250 Cycle
Zn(Cr)*	STS 304	MAC-BOLT

*m(Cr) : Chromate treatment on electro galvanized steel

- MAC-BOLT : Red-rust did not occur over CCT 200 Cycle(1,600Hr)
- Zn(Cr) coated product : Red-rust happened in 30 cycle(240Hr), STS 304 : Red-rust happened in 50cycle(400Hr)
- CCT 1cycle(KS R 1127) : Salt spray 2Hr(5% NaCl, 35℃) → Dry 4Hr(25% RH, 60℃) → Wet 2Hr(95% RH, 50℃)

CCT test after bolting of PosMAC & PosMAC

30 Cycle	100~300 Cycle



Contact SAMIL CO.,LTD

(Sihwa Industrial Complex 5ra 409) 89, Jiwon-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Korea
Tel : +82-31-319-8137 / Fax : +82-31-319-8139 / E-mail : samil98@sifastener.com
http://www.sifastener.com

Main usage



Foundation structure supporting solar power panels



Foundation structure supporting solar power panels on the water



PEB(Pre-engineered metal building system)



Cooling tower



Silo



Distributing board



Pipe



Plant factory structure



Vinyl house pad



Vinyl house switch



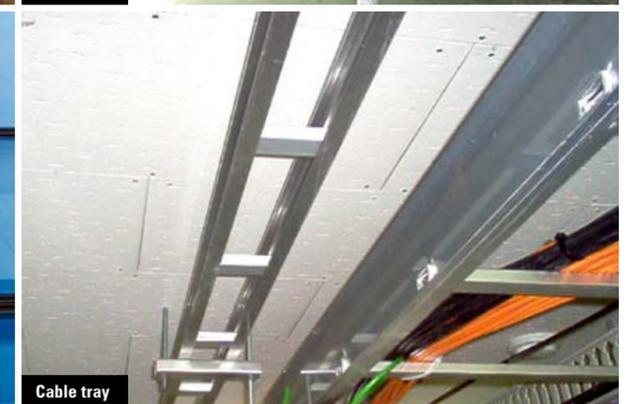
Stock farm



Fish farms



Steel curtain wall



Cable tray

Main usage



High corrosion resistance required part of an air conditioner



Motor case



Rock bolts



Corrugated steel



Back plate of noise barrier



Guard rail



Water storage tank



Sandwich panel



Roof, Wall



Resort building wall in coast(PosMAC+PVDF treatment)



General house(PosMAC+Polyester or PVDF treatment)



Apartment roof(PosMAC+PVDF treatment)



PD panel



Post-treatment

Organic ingredient Cr-free(NB)

Excellent corrosion resistance It displays excellent white-rust resistance with its organic ingredient Cr-free membrane.
Environment friendly Because it is a membrane that does not contain chromate, it is an environment-friendly material.



Post treatment	Corrosion resistance of flat sheet		Corrosion resistance of erichsen sheet		Blackening resistance Standard $\Delta E \leq 3.0$
	SST 72Hr	SST 96Hr	SST 24Hr	SST 48Hr	
NB					2.1 Anti-finger Printed property is good.

※ Blackening resistance test : Humid Environment(95% RH at 50°C, 120Hr) → measurement of ΔE

Inorganic ingredient Cr-free(NT)

Conductivity Because it is an inorganic ingredient membrane, electric resistance is low while the conductivity of the surface is excellent.
Corrosion resistance It has white-rust resistance similar to that of chromate.
Environment friendly Because it is a membrane that does not contain chromate, it is an environment-friendly material.

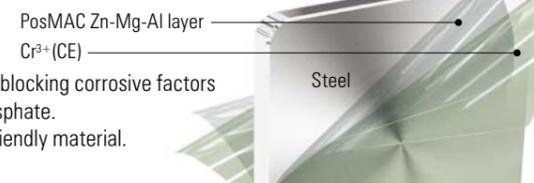


Post treatment	Corrosion resistance of flat sheet		Corrosion resistance of erichsen sheet		Blackening resistance Standard $\Delta E \leq 3.0$
	SST 72Hr	SST 96Hr	SST 24Hr	SST 48Hr	
NT					2.8 Electric resistance is lower than 1m Ω

※ Blackening resistance test : Humid Environment(95% at 50°C, 120Hr) → measurement of ΔE

Cr³⁺ Eco chromate(CE)

Excellent corrosion resistance It displays excellent white-rust resistance by blocking corrosive factors with its chromium nitrate and chromium phosphate.
Environment Friendly Because it does not contain Cr⁶⁺, it is an environment friendly material.



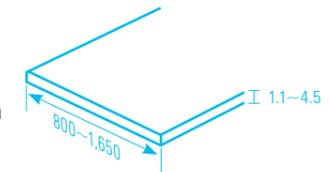
Post treatment	Corrosion resistance of flat sheet		Corrosion resistance of erichsen sheet		Blackening resistance Standard $\Delta E \leq 3.0$
	SST 72Hr	SST 96Hr	SST 24Hr	SST 48Hr	
CE					2.9 Pipe making and alkali resistance is good

※ Blackening resistance test : Humid Environment(95% at 50°C, 120Hr) → measurement of ΔE

PosMAC®(HR Base) specification

HR Base PosMAC®

- Coating mass : 60~400g/m² (Both Sides)
- Post treatment : Cr-Free (NB, NT), Chromate(CL), Cr³⁺ ECO Chromate(CE)
- Sizes in production(CQ) : Thickness 1.1~ 4.5mm / Width 800 ~ 1,650mm
 ※ Width may vary depending on the thickness



Grade	POSCO	KS D 3030	ASTM Equivalents *() ksi unit	EN Equivalents	JIS Equivalents	Mechanical properties(MPa,%)			
						YP	TS	EL	CMB
CQ	PosMAC-C	KS-SGMHC	A653-CS	EN-DX51D	JIS-SGHC	170~400	270~450	28~	1T
DQ	PosMAC-D	-	A653-FS	EN-DX52D	-	~245	270~400	35~	1T
Structural	PosMAC-340	KS-SGMH340	A653-SS255 (SS37)	EN-S250GD	JIS-SGH340	245~450	340~470	20~	1T
	PosMAC-400	KS-SGMH400	A653-SS275 (SS40)	EN-S280GD	JIS-SGH400	295~490	400~560	18~	2T
	PosMAC-440	KS-SGMH440	A653-SS340 (SS50)	-	JIS-SGH440	335~490	440~600	18~	3T
	PosMAC-Y340	-	A653-HSLAS340 (HSLAS50)	EN-S350GD	-	340~	410~	21~	2T
	PosMAC-490	KS-SGMH490	A653-HSLAS380 (HSLAS55)	-	JIS-SGH490	365~600	490~650	16~	3T
	PosMAC-540	KS-SGMH540	A653-HSLAS410 (HSLAS60)	EN-S450GD	JIS-SGH540	450~600	540~650	16~	3T
	PosMAC-700	-	-	-	-	500~	700~	8~	3T

*CMB : Coating metal bending test.

PosMAC®(HR Base) specification

PosMAC-540

■ Can be produced ■ Require consultation

w \ t	1.0st	1.1st	1.2st	1.3st	1.4st	1.5st	1.6st	1.7st	1.8st	1.9<t	2.0<t	2.1<t	2.2<t	2.3<t	2.4st	2.5st	2.6st	2.7st	2.8st	t≤4.0	t≤4.5	
w ≤ 800						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 850						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 900						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 950						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1000						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1050						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1100						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1150						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1200						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1250						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1300						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1350						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1400						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
w ≤ 1450						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

PosMAC-700

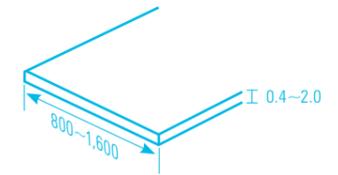
■ Require consultation

w \ t	1.0st	1.1st	1.2st	1.3st	1.4st	1.5st	1.6st	1.7st	1.8st	1.9<t	2.0<t	2.1<t	2.2<t	2.3<t	2.4st	2.5st	2.6st	2.7st	2.8st	t≤4.0	t≤4.5	
w ≤ 800																						
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w ≤ 1150																						
w ≤ 1200																						
w ≤ 1250																						
w ≤ 1300																						
w ≤ 1350																						
w ≤ 1400																						
w ≤ 1450																						

△ Please be sure to consult with our associates when making orders for specific usage.

CR Base PosMAC®

- Coating mass : 60~400g/m² (Both sides)
- Post treatment : Cr-Free(NB, NT), Chromate(CL), Cr³⁺ ECO Chromate(CE)
- Sizes in production(CQ) : Thickness 0.4~ 2.0mm / Width 800 ~ 1,600mm
- ※ Width may vary depending on the thickness



Grade	POSCO	KS D 3030	ASTM Equivalents *() ksi unit	EN Equivalents	JIS Equivalents	Mechanical properties(MPa,%)			
						YP	TS	EL	CMB
CQ	C-PosMAC-C	KS-SGMCC	A653-CS	EN-DX51D	JIS-SGCC	170~400	270~450	28~	1T
DQ	C-PosMAC-D	KS-SGMCD2	A653-FS	EN-DX53D	JIS-SGCD2	~245	270~400	40~	1T
DDQ	C-PosMAC-N	KS-SGMCD3	A653-DDS	EN-DX54D	JIS-SGCD3	~245	270~400	43~	1T
Structural	C-PosMAC340	KS-SGMC340	A653-SS255 (SS37)	EN-S250GD	JIS-SGC340	245~450	340~500	20~	1T
	C-PosMAC400	KS-SGMC400	A653-SS275 (SS40)	EN-S280GD	JIS-SGC400	295~490	400~560	18~	2T
	C-PosMAC440	KS-SGMC440	A653-HSLAS340 (HSLAS50)	EN-S350GD	JIS-SGC440	335~490	440~600	18~	2T
	C-PosMAC490	KS-SGMH490	A653-HSLAS380 (HSLAS55)	-	JIS-SGC490	365~600	490~650	16~	3T
	C-PosMAC540	-	A653-HSLAS410 (HSLAS60)	EN-S450GD	-	450~600	540~650	16~	3T
	C-PosMAC570	KS-SGMC570	A653-HSLAS480 (HSLAS70)	EN-S550GD	JIS-SGC570	560~	570~	8~	3T

*CMB : Coating Metal Bending test.

PosMAC®(CR Base) specification

* The following manufacturing spec is the standard when the mill edge order.

C-PosMAC-C

■ Can be produced ■ Require consultation

w \ t	0.4≤t	0.6<t	0.7<t	1.0<t	1.8<t	2.0≤t
w ≤ 800	■	■	■	■	■	■
w ≤ 850	■	■	■	■	■	■
w ≤ 900	■	■	■	■	■	■
w ≤ 950	■	■	■	■	■	■
w ≤ 1000	■	■	■	■	■	■
w ≤ 1050	■	■	■	■	■	■
w ≤ 1100	■	■	■	■	■	■
w ≤ 1150	■	■	■	■	■	■
w ≤ 1200	■	■	■	■	■	■
w ≤ 1250	■	■	■	■	■	■
w ≤ 1300	■	■	■	■	■	■
w ≤ 1350	■	■	■	■	■	■
w ≤ 1400	■	■	■	■	■	■
w ≤ 1470	■	■	■	■	■	■
w ≤ 1500	■	■	■	■	■	■
w ≤ 1550	■	■	■	■	■	■
w ≤ 1600	■	■	■	■	■	■

C-PosMAC-D, C-PosMAC-N

■ Can be produced ■ Require consultation

w \ t	0.4≤t	0.6<t	0.7<t	1.0<t	1.8<t	2.0≤t
w ≤ 800	■	■	■	■	■	■
w ≤ 850	■	■	■	■	■	■
w ≤ 900	■	■	■	■	■	■
w ≤ 950	■	■	■	■	■	■
w ≤ 1000	■	■	■	■	■	■
w ≤ 1050	■	■	■	■	■	■
w ≤ 1100	■	■	■	■	■	■
w ≤ 1150	■	■	■	■	■	■
w ≤ 1200	■	■	■	■	■	■
w ≤ 1250	■	■	■	■	■	■
w ≤ 1300	■	■	■	■	■	■
w ≤ 1350	■	■	■	■	■	■
w ≤ 1400	■	■	■	■	■	■
w ≤ 1470	■	■	■	■	■	■
w ≤ 1500	■	■	■	■	■	■
w ≤ 1550	■	■	■	■	■	■
w ≤ 1580	■	■	■	■	■	■

⚠ Please be sure to consult with our associates when making orders for specific usage.

C-PosMAC340, C-PosMAC400

■ Require consultation

w \ t	0.4≤t	0.6<t	0.7<t	1.0<t	1.8<t	2.0≤t
w ≤ 800	■	■	■	■	■	■
w ≤ 850	■	■	■	■	■	■
w ≤ 900	■	■	■	■	■	■
w ≤ 950	■	■	■	■	■	■
w ≤ 1000	■	■	■	■	■	■
w ≤ 1050	■	■	■	■	■	■
w ≤ 1100	■	■	■	■	■	■
w ≤ 1150	■	■	■	■	■	■
w ≤ 1200	■	■	■	■	■	■
w ≤ 1250	■	■	■	■	■	■
w ≤ 1300	■	■	■	■	■	■
w ≤ 1350	■	■	■	■	■	■
w ≤ 1400	■	■	■	■	■	■
w ≤ 1470	■	■	■	■	■	■
w ≤ 1500	■	■	■	■	■	■
w ≤ 1550	■	■	■	■	■	■
w ≤ 1600	■	■	■	■	■	■

C-PosMAC440, C-PosMAC490, C-PosMAC540, C-PosMAC570

■ Require consultation

w \ t	0.4≤t	0.6≤t	0.7<t	1.0<t	1.8<t	2.0≤t
w ≤ 800	■	■	■	■	■	■
w ≤ 850	■	■	■	■	■	■
w ≤ 900	■	■	■	■	■	■
w ≤ 950	■	■	■	■	■	■
w ≤ 1000	■	■	■	■	■	■
w ≤ 1050	■	■	■	■	■	■
w ≤ 1100	■	■	■	■	■	■
w ≤ 1150	■	■	■	■	■	■
w ≤ 1200	■	■	■	■	■	■
w ≤ 1250	■	■	■	■	■	■
w ≤ 1300	■	■	■	■	■	■
w ≤ 1350	■	■	■	■	■	■
w ≤ 1400	■	■	■	■	■	■
w ≤ 1470	■	■	■	■	■	■
w ≤ 1500	■	■	■	■	■	■
w ≤ 1550	■	■	■	■	■	■
w ≤ 1600	■	■	■	■	■	■



POSCO acquired the certification of KS D 3030(hot-dip zinc-magnesium-aluminum alloy coated steel sheet and strip) standard in July 2015.

Cold-rolled products :
SGMCC, SGMCD2, SGMCD3, SGMCC340, SGMCC400, SGMCC440, SGMCC490, SGMCC570

Hot-rolled products :
SGMHC, SGMH340, SGMH400, SGMH440, SGMH490, SGMH540

Yield strength, Tensile strength, Elongation

■ Hot-rolled products

Designation	YS Min, N/mm ²	TS Min, N/mm ²	EL Min, %	Test piece
SGMHC	(205)	(270)	-	No.5, Rolling direction
SGMH340	245	340	20	No.5 Rolling direction or Cross-section
SGMH400	295	400	18	
SGMH440	335	440	18	
SGMH490	365	490	16	
SGMH540	400	540	16	

Remark1) 1N/mm² = 1MPa
Remark2) () is only for reference

■ Cold-rolled products

Designation	YS Min, N/mm ²	TS Min, N/mm ²	EL Min, %					Test piece
			Thickness(mm)					
			0.25≤t < 0.40	0.40≤t < 0.60	0.60≤t < 1.0	1.0≤t < 1.6	1.6 ≤ t < 2.3	
SGMCC	(250)	(270)	-	-	-	-	-	No.5, Rolling direction
SGMCH	-	-	-	-	-	-	-	
SGMCD1	-	270	-	34	36	37	38	
SGMCD2	-	270	-	36	38	39	40	No.5 Rolling direction or Cross-section
SGMCD3	-	270	-	38	40	41	42	
SGMC340	245	340	20	20	20	20	20	
SGMC400	295	400	18	18	18	18	18	
SGMC440	335	440	18	18	18	18	18	
SGMC490	365	490	16	16	16	16	16	No.5 Rolling direction or Cross-section
SGMC570	560	570	-	-	-	-	-	

Remark1) When the anti-aging characteristics is featured in the SGMCD3 sheets and coils, the anti-aging characteristics is guaranteed for 6 months. Anti-aging refers to the characteristic preventing stretcher strains from occurring during manufacturing.
Remark2) In principle, tensile strength tests are not performed on plates with thickness under 0.25mm.
Remark3) () is only for reference.
Remark4) 1N/mm² = 1MPa

Coating weight(Both sides)

Coating designation	Triple point test (g/m ² , Average)	Single point test (g/m ² , Min)
(M06) ^a	60	51
M08	80	68
M10	100	85
M12	120	102
M14	140	119
M18	180	153
M20	200	170
M22	220	187
M25	250	213
M27	275	234
(M35) ^a	350	298
(M45) ^a	450	383

Remark1) For both sides, triple spots coating weight, the average value of the measurement of 3 test pieces is applied.
Remark2) For one side, single spot coating weight, the minimum value of the measurement of 3 test pieces is applied.
Remark3) Separate consultation is available for the maximum coating weight on both sides.

KS D 3030

Coating weight(Both sides)

Hot-rolled products(CQ~DQ)

(Unit : mm)

Order thickness	Width		
	W < 1200	1200 ≤ W < 1500	1500 ≤ W < 1800
1.20 ≤ t < 1.60	±0.16	±0.17	±0.18
1.60 ≤ t < 2.00	±0.17	±0.18	±0.19
2.00 ≤ t < 2.50	±0.18	±0.20	±0.22
2.50 ≤ t < 3.15	±0.20	±0.22	±0.25
3.15 ≤ t < 4.00	±0.22	±0.24	±0.27
4.00 ≤ t < 5.00	±0.25	±0.27	-

Hot-rolled products(Structural steel)

(Unit : mm)

Order thickness	Width	
	W < 1600	1600 ≤ W < 1800
1.20 ≤ t < 1.60	±0.19	-
1.60 ≤ t < 2.00	±0.20	±0.24
2.00 ≤ t < 2.50	±0.21	±0.26
2.50 ≤ t < 3.15	±0.23	±0.30
3.15 ≤ t < 4.00	±0.25	±0.35
4.00 ≤ t < 5.00	±0.46	-

Cold-rolled products

(Unit : mm)

Order thickness	Width				
	W < 630	630 ≤ W < 1000	1000 ≤ W < 1250	1250 ≤ W < 1600	1600 ≤ W
t < 0.25	±0.04	±0.04	±0.04	-	-
0.25 ≤ t < 0.40	±0.04	±0.05	±0.05	±0.06	-
0.40 ≤ t < 0.60	±0.06	±0.06	±0.06	±0.07	±0.08
0.60 ≤ t < 0.80	±0.07	±0.07	±0.07	±0.07	±0.08
0.80 ≤ t < 1.00	±0.07	±0.07	±0.08	±0.09	±0.10
1.00 ≤ t < 1.25	±0.08	±0.08	±0.09	±0.10	±0.12
1.25 ≤ t < 1.60	±0.09	±0.10	±0.11	±0.12	±0.14
1.60 ≤ t < 2.00	±0.11	±0.12	±0.13	±0.14	±0.16
2.00 ≤ t < 2.30	±0.13	±0.14	±0.15	±0.16	±0.18
2.30 ≤ t	±0.15	±0.16	±0.17	±0.18	±0.21

Remark) () is only for reference

Tolerances on width

(Unit : mm)

Width	Hot-rolled products		Cold-rolled products
	Mill edge(A)	Cut edge(B)	
W ≤ 1500	0~+25	0~+10	0~+7
1500 < W			0~+10

Tolerances on length(for sheet)

(Unit : mm)

Hot-rolled products	Cold-rolled products
0~+15	0~+15

Tolerances on camber

Hot-rolled products

(Unit : mm)

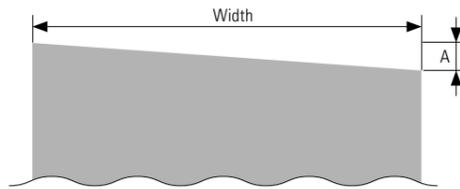
Width	Sheet			Coil
	Length			
	L < 2500	2500 ≤ L < 4000	4000 ≤ L	
W < 630	5	8	12	5mm/About an arbitrary length of 2000mm
630 ≤ W < 1000	4	6	10	
1 000 ≤ W	3	5	8	

Cold-rolled products

(Unit : mm)

Width	Sheet		Coil
	Length		
	L < 2000	2000 ≤ L	
W < 630	4	4mm/About an arbitrary length of 2000mm	
630 ≤ W	2	2mm/About an arbitrary length of 2000mm	

Tolerances on out-squareness



△ Out-of-squareness $\frac{A}{W} \times 100(\%)$
Do not exceed 1%!

Tolerance on flatness

Hot-rolled products

(Unit : mm)

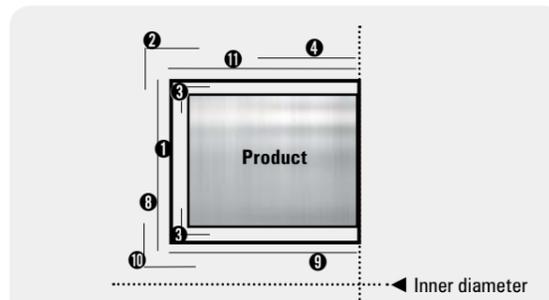
Thickness	Width				
	W ≤ 1250	1250 ≤ W < 1600	1600 ≤ W < 2000	2000 ≤ W < 3000	W ≥ 3000
1.20 ≤ t < 1.60	18	20	-	-	-
1.60 ≤ t < 3.15	16	18	20	-	-
3.15 ≤ t < 4.00		16		-	-
4.00 ≤ t < 6.00		14		24	25

Remark) Unless otherwise specified, the maximum value of steel flatness shall be 1.5 times of the above table on the steels of the minimum tensile strength spec of over 570N/mm² or the minimum yield strength of over 430N/mm² or having equivalent chemical element or hardness.

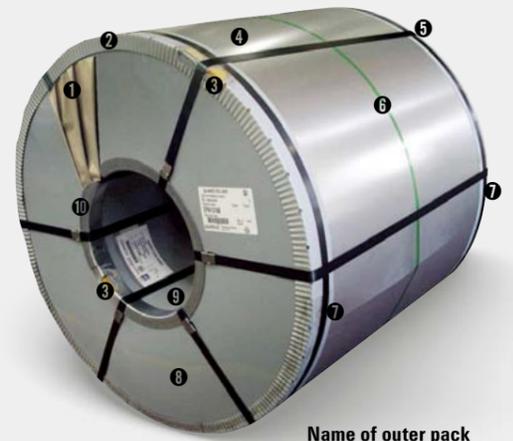
Cold-rolled products

(Unit : mm)

Width	Designation		
	Bow	Edge wave	Center wave
w < 1000	12	8	6
1000 ≤ w < 1250	15	9	8
1250 ≤ w < 1600	15	11	8
1600 ≤ w	20	24	9



Name of cross-sectional pack



Name of outer pack

Packing

NO	Name	Material
①	PP VCI wrap	Vinyl
②	Outer ring	Steel
③	Corner wrap	Anti-rust board
④	Outer protect board	Steel
⑤	Horizontal band	Steel
⑥	Center band	PET
⑦	Vertical band	Steel
⑧	Side board	Plastic
⑨	Inner protect board	Plastic
⑩	Inner ring	Steel
⑪	Outer protect board	Anti-rust board

* Packing type and materials are changeable.

Please refer to the instructions mentioned below in order for you to select the products appropriate for your final usage when you place an order.



Specifications

It is important for you to select a size appropriate for your final usage when you place an order for a product in a specific size. In addition, since there are various grades of products which you can choose, even if the product is for general commercial use, please consult it with us before you place an order.



Post-treatment

Please select a post-treatment method for the product following the surface treatment, and a surface treatment method appropriate for the conditions under which the final product is to be used. Please refer to the relevant catalog. Cr-treated or Cr-free treated materials for post-treatment is effective in preventing white rust on the surface of galvanized steel sheet.



Coating weight

Please select a proper coating weight according to the targeted durable life-span of the coating weight, the conditions of use, the method in which it will be processed and other various conditions where the final product will be used. A post-plating treated product is better under corrosive conditions, while on the other hand, a foil plating method is better for products requiring good formability and weldability.



Oiling

Customer can choose the oiling volume according to the usage conditions. However, if you place an order for untreated and un-oiled product, white rust may formed on the surface of the product.



Dimensions

The dimensions of a product greatly affects the actual yield ratio and the formability. If you need stricter dimensions within the available sizes in our catalogs, please consult with us when placing an order.



Edge

Customer can select a product with mill edge or slit edge according to the usage of the product. If the edge of our company's product is to be used as is for the final product, it is better to place an order with slit edge.



Weld zone

In case of a coil product, a pickled weld zone and a plated weld zone could be mingled. Although such weld zones are relatively small parts of the product, their hardness is high and they are a little thick. Therefore, in case that it is hard for a customer to remove such parts, please select an option, 'No Mingle', then, we will take a measure for it.



Packaging

An appropriate packaging type can be selected according to the conditions of the transportation and storage of a product, but if no packaging is selected, a warranty for white rust can not be issued.

Cautions on use

Since hot-dip galvanized steel sheets cannot exert its various characteristics when utilized inappropriately, please heed the following instructions concerning the care of the product.



Storage

Do not keep the product in a place where excess moisture or water may permeate into the product's packaging. If excess moisture or water does come in contact with the product's surface, please dry it off right away. Keep the product indoors in a well ventilated facility, away from conditions where the daily temperature fluctuation is a norm. If the wrapping paper, etc., is damaged while it is being kept, please repair it right away, but keep in mind that even when the packaging is perfectly intact, white rust is known to formate when a galvanized product is kept in stock over a extended period of time. Lastly please take caution and be careful that the plated surface is not damaged during transportation or other operations.



Processing

Since certain lubricant products contains additives that causes zinc erosion, please use lubricants without corrosive properties, and in case the usage of such corrosive lubricant is inevitable, please remove it and treat the surface with an anti-corrosion agent after processing. If the product is to be processed, please select a size appropriate for the usage. Please avoid processing the product under highly moist, sulfurous conditions. Processing environments with either acid gas or sooty smoke should also be avoided.



Welding

In case of a resistance welding(RW), since zinc is attached to the electrode, it is necessary to clean it periodically. In case of a seam welding, the life span of the electrode can be extended by using the KNURL-GEAR DRIVE System. In case of a high-temperature brazing, especially, please avoid brazing with a GA material. Since some fumes are generated when welding, please weld a product at an airy place. Usually, a hot-dip galvanized product is not good for soldering with some general flux.



Degreasing

It is good to use a weak alkaline degreasing agent, either a natural degreasing agent or an organic solvent. Since strong alkaline degreasing agent corrodes zinc, please do not use such agents.



Coating

Since zinc is a highly active metal, it is difficult to attain the necessary adhesiveness when coated directly on to the surface of a hot-dip galvanized steel sheet without some additional treatments.



Aging

As time progresses, a product may suffer from deteriorated formability, stretcher-strain or fluting phenomena. Therefore, please use a non-aging steel sheet in order to prevent such problems.



Usage

Do not deviate from the original usage for which the product was intended for. If the usage of the product differs from the time it was ordered, it may face problems while being processed.



Others

When using a processed product, if certain treatments, such as coating, and etc., are not conducted on the plated surface, the effects of using a plated steel sheet decreases. (The corrosion levels of the products can vary depending on the conditions it is used.) So, please be noted.

PosMAC[®]

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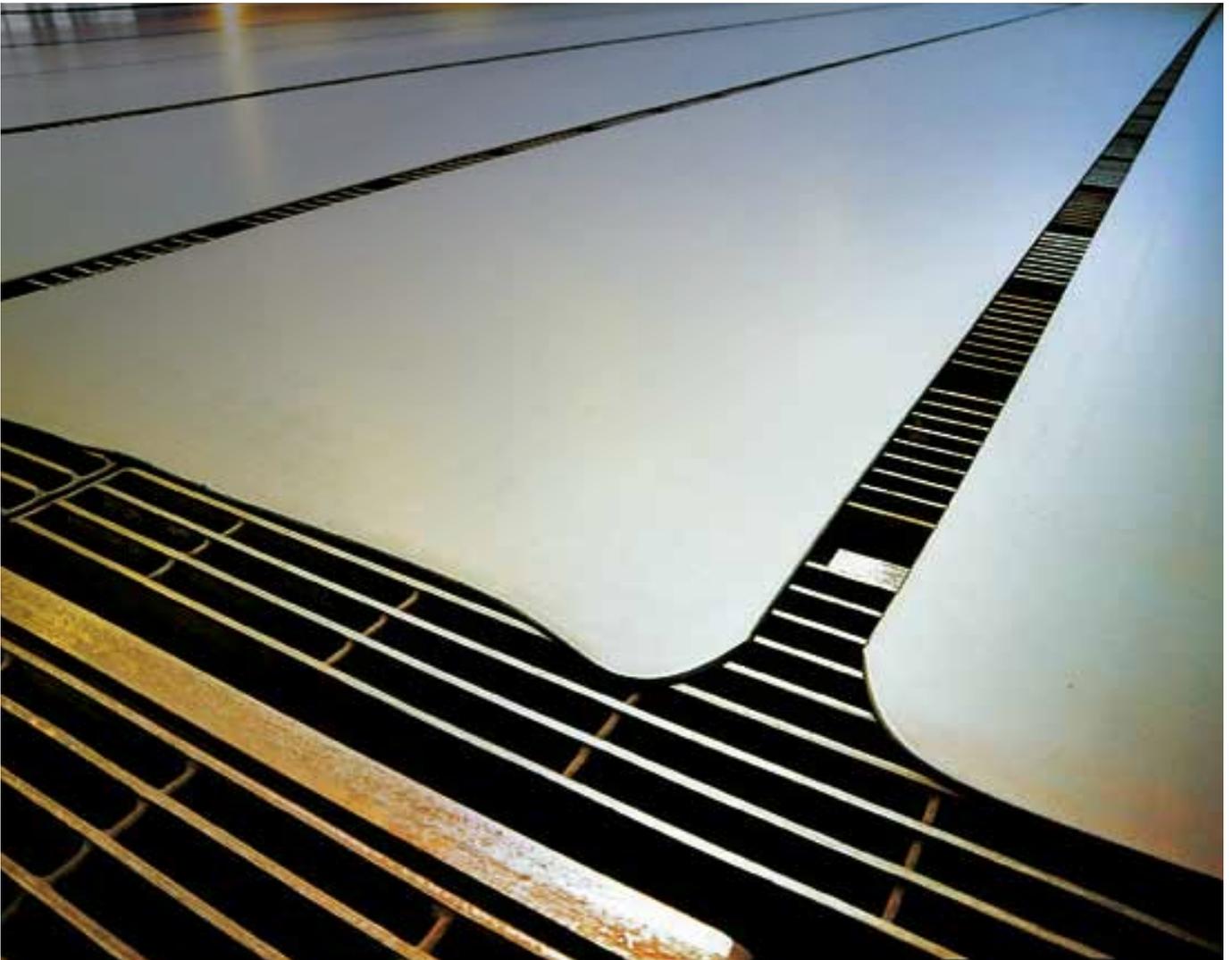
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www.posco.com

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STEEL PLATES





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STEEL PLATES

Introduction: Pohang, Gwangyang Works



Pohang Works

MAJOR PRODUCTS

Hot-Rolled Products

automobile frames and wheels, shipping containers, steel pipes

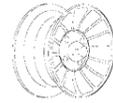
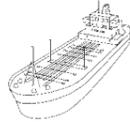


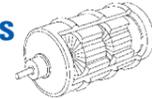
Plate Products

marine vessels and structures, bridges, building structures



Electrical Steel Products

electric motors and transformer cores



Cold-Rolled Products

automobiles, home appliances, machinery, construction



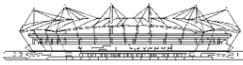
Wire Rod Products

fasteners, wire ropes, undersea cables



Stainless Steel Products

automobile exhaust systems, kitchenwares, walls/roofings



POHANG WORKS

Major Products: Hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, STS, API steel, etc.

Crude Steel Production: 16,185,000 tons (2013)

Manufacturing Focus: Flexible short-run.

GWANGYANG WORKS

Major Products: Hot-rolled steel, cold-rolled steel, automotive steel, API steel, plate, etc.

Crude Steel Production: 20,231,000 tons (2013)

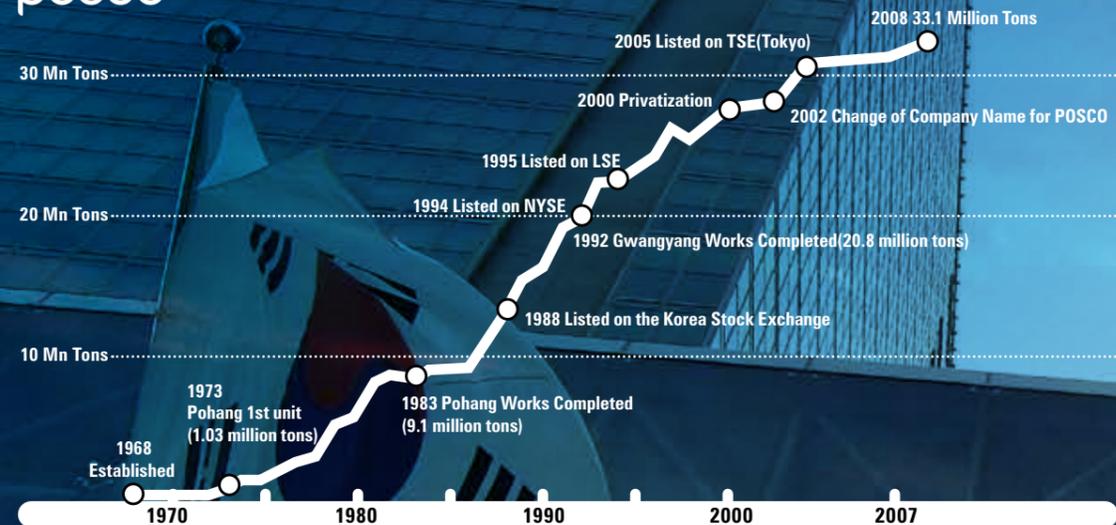
Manufacturing Focus: Dedicated long-run



Gwangyang Works

POSCO is a leading global steel company

posco Brief History



RANKED 1ST IN COMPETITIVENESS (WORLD STEEL DYNAMICS, FEB 2013)

Rank	Company	Score	Production (mn ton)	Criteria
1	POSCO	7.76	39.9	Tech. Innovation, Conversion Cost
2	NLMK	7.33	14.9	High Growth Market, Raw Material
3	Severstal	7.32	15.1	Raw Material, Labor Costs
4	JSW Steel	7.23	8.5	Expanding Capacity, Labor Costs
5	Nippon Sumitomo	7.15	47.9	Value-added product mix, Conversion cost; yields

* Weighted-Average Score based

2011 MOST ADMIRED METALS COMPANY (FORTUNE, MAR 2011)

GLOBAL OPERATIONS

USA	JV with US Steel in 1.5mtpa CR mill JV with US Steel and SeAH to produce API pipes
Mexico	New automotive steel sheet plant in June 2009
China	82.5% interest in ZPSS with a capacity of 0.8mtpa(STS) 80.0% interest in QPSS with a capacity of 0.2mtpa(STS)
India	Construction of integrated steel mill and iron ore mines in Orissa State CR mill with a capacity of 1.8mtpa CGL mill with a capacity of 0.3mtpa
Indonesia	JV with Krakatau Steel Construction of Integrated steel mill with a capacity of 6mtpa
Vietnam	CR mills with a capacity of 1.2mtpa
Turkey	Construction of STS CR mill a with capacity of 0.2mtpa
Korea	<Pohang Works> Capacity of 15.0mtpa <Gwangyang Works> Capacity of 18.0mtpa

STEEL PLATE HISTORY

POHANG WORKS

Jul. 1972	Plate Mill 1 / Pohang Works completed
Feb. 1978	Plate Mill 2 / Pohang Works completed
Nov. 1988	Plate Mill 2 Accelerated Cooling Control Facilities completed
Jun. 1990	Production of STS plate began
Sep. 1997	Plate Mill 3 / Pohang Works completed
Jul. 2001	ERP(Enterprise Resource Planning) introduced
Nov. 2003	Plate Mill 3 Accelerated Cooling Control Facilities completed
Jun. 2005	Revamping of Plate Mill 2 completed

GWANGYANG WORKS

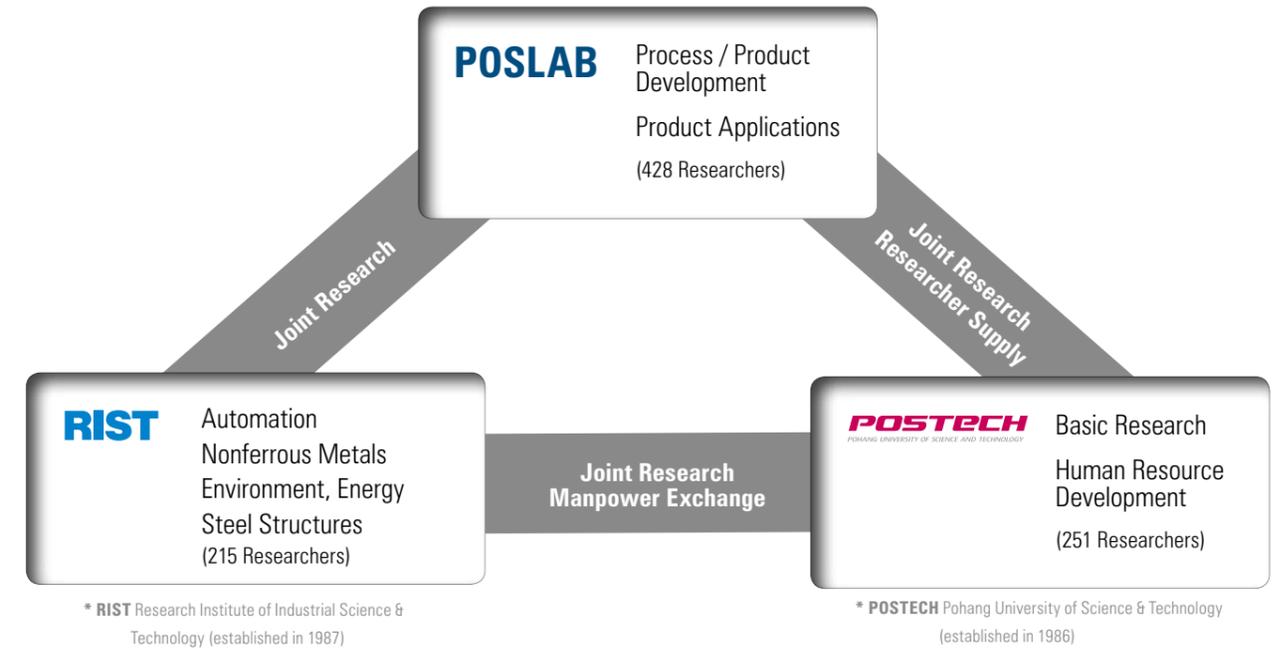
Aug. 2010	Plate Mill completed
Jul. 2011	Heat Treatment Equipment completed

R&D System

During the period of economic downturn, POSCO increased its R&D investments to enhance its competitiveness of key products in preparation for business recovery in the global market



Organization



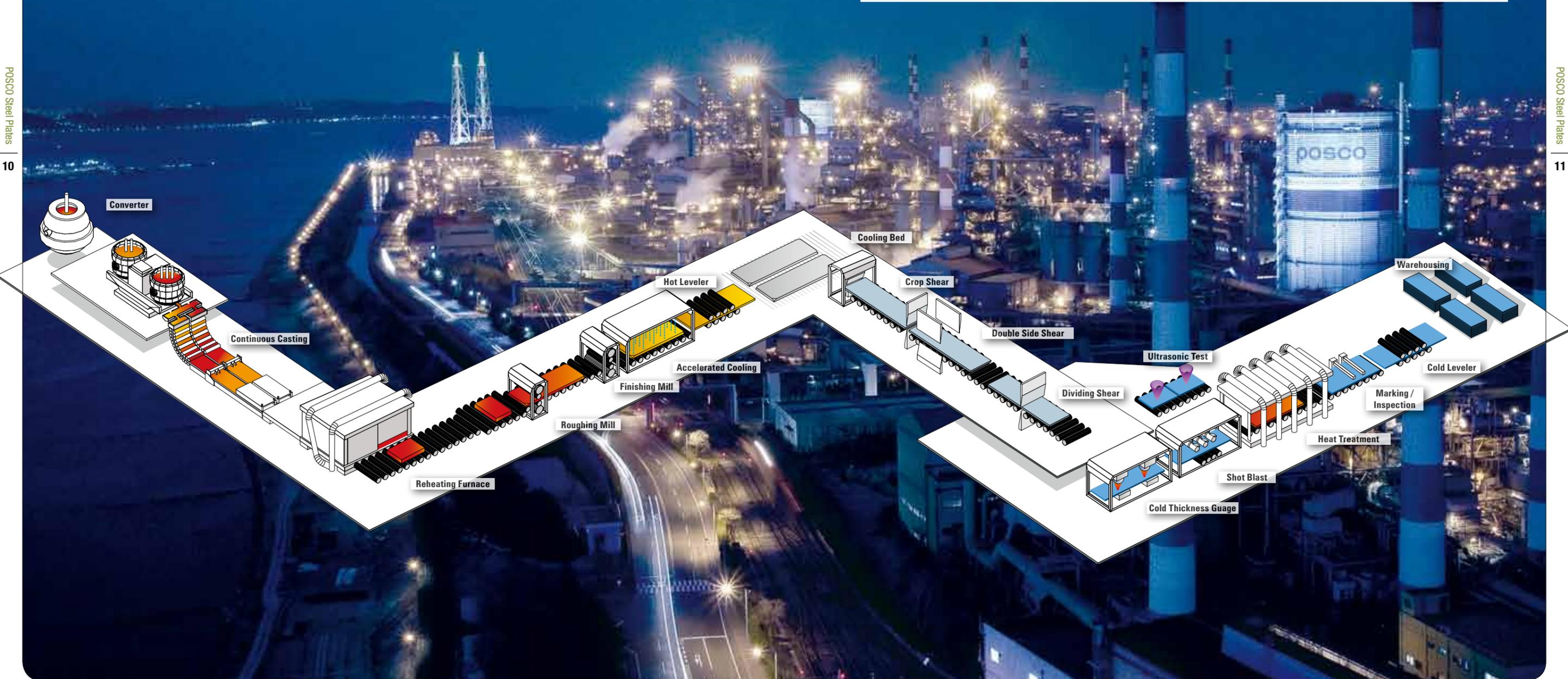
Goal : Joint research and nurturing of outstanding researchers based on industry-university-institute collaboration

Testing Facilities

Instrumented Charpy Impact Tester	Evaluation of Brittle Crack Initiation Resistance
Instrumented DWTT Tester (Drop Weight Tear Test)	Evaluation of Brittle Crack Propagation Resistance
Large Tensile Test Machine	Large Scale Tension or Compression Test
Automatic Macro Etching System	Evaluation of Internal Defects of Cast Products
High Temp. High Pressure Corrosion Test System	Qualifying of CO ₂ or H ₂ S Corrosion Properties of Linepipe Steel under HT/ HP
Ultrasonic Test System	Non-destructive Detection of Defects and Flaws in Metal
Hydrogen Induced Cracking Test System	Evaluation of the Hydrogen Induced Cracking Resistance of Plate/Pipe
Sulfide Stress Corrosion Cracking Test System	Evaluation of the Sulfide Stress Corrosion Cracking Resistance of Plate/Pipe

POSCO produces a variety of steel plates with the state-of-the-art facilities

Facilities	Pohang Works			Gwangyang Works
	Plate Mill 1	Plate Mill 2	Plate Mill 3	Plate Mill 4
Operation	Jul. 1972	Feb. 1978	Nov. 1997	Aug. 2010
Capa'(ton/y)	620,000	2,700,000	1,180,000	2,500,000
Thickness(mm)	6~120	6~200	4.5~200	8~200
Max. Width(mm)	3,100	4,500	4,000	5,300
Max. Length(mm)	15,500	25,000	25,000	25,000
Max.(Net Weight)	-	25ton	-	28ton
Mill Power	3,600ton X 1	7,200ton x 1(RM) 9,000ton x 1(FM)	8,000ton X 1	12,000ton X 2
Accelerated Cooling Control System	-	Multi Jet Type (4.7m x 28m)	Multi Jet Type (4.2m x 24m)	Multi Laminar Jet Type (5.5m x 24m)
Mechanical Shear	-	50mmt	-	50mmt/Slitter
UT	Transverse Tester(SMT)	Transverse Tester(SMT)	Transverse Tester(SMT)	Longitudinal Tester (NDT)
Heat Treatment Equipment	-	NQT x 1, Nor' Only x 1 (400,000ton) Batch(30,000ton)	Nor' Only x 1 (200,000ton)	NQT x 1 (200,000ton, Oct. 2011) Batch(30,000ton)
Main Product	Mild Steel	High Strength Steel (TMCP, Nor', QT)	High Strength Steel (TMCP, Nor')	High Strength Steel (TMCP, Nor', QT)



Quality Management System



POSCO guarantees quality products under its well-organized production system

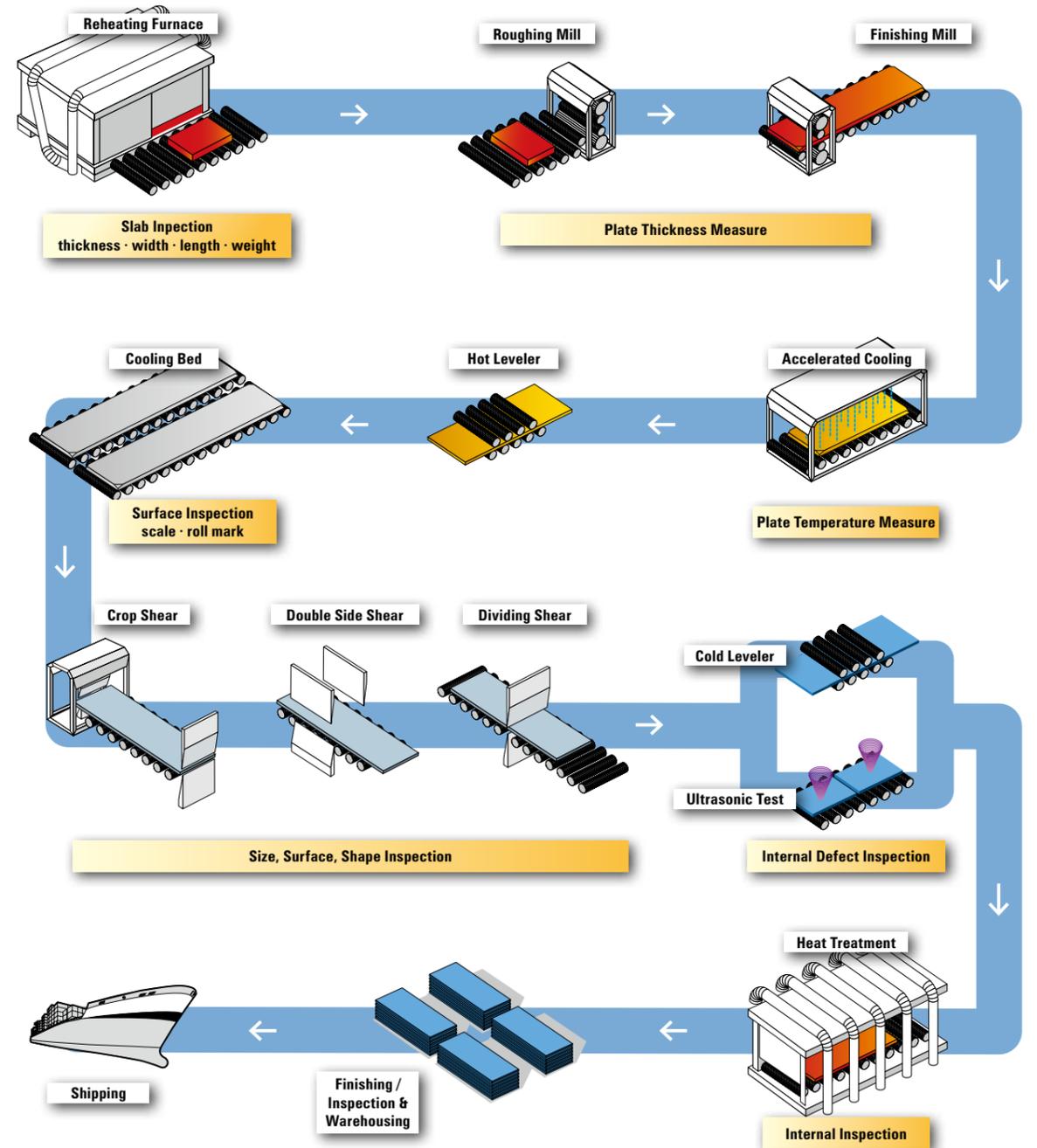
Certification of Quality Management System

	Application Product	Institute	Renewal
ISO9001	Flat Product	LRQA(UK)	Every year Regular Inspection Every 3 years, Certificate renewal
ISO14001	Environmental Management System	LRQA(UK)	Every year Regular Inspection Every 3 years, Certificate renewal

Certification of compliance of the quality system with ISO 9001, 14001



Inspection Flow of Steel Plate





Steel Plate for Shipbuilding

POSCO produces mild and high strength steel approved by 11 classification societies

POSCO has provided the global Big 3 shipyards with all the required steel as main supplier

Approved Steel Grades

Unit: max. thickness(mm)

Grade Classification Society	Non-TMCP		TMCP				Low Temperature Service Different Standards per CS
	Normal Strength	High Strength	Normal Strength	High Strength		Low Temperature Service	
	A,B,D,E	AH32~EH32 AH36~EH36	A,B,D,E	AH32~EH32 AH36~EH36	AH40~EH40		
KR(Korea)	100	83	100	100	100	80	RL37 (50)
ABS(USA)	100	83	100	100	100	80	VH-060 (50)
LR(UK)	100	90	100	100	100	80	LTFH36 (50)
DNV(Norway)	100	90	100	100	100	80	NV4-4 (50)
NK(Japan)	100	83	100	100	100	80	KL37 (40)
GL(Germany)	100	90	100	100	100	80	-
BV(France)	100	90	100	100	100	80	510LF (40)
CR(Taiwan)	100	90	100	100	100	-	-
RINA(Italy)	100	90	100	100	100	-	460LE/LF (40)
CCS(China)	100	90	100	100	100	-	-
RS(Russia)	100	100	100	100	100	-	-

Please contact us for more details before ordering EH47 or steel for low temperature service.

Chemical Composition & Mechanical Properties

Unit: weight percent(%)

Grade	Normal Strength				High Strength	
	A	B	D	E	AH~EH32~40	EH47
C	≤ 0.21	≤ 0.21	≤ 0.21	≤ 0.18	≤ 0.18	≤ 0.10
Mn	> 2.5xC	> 0.80	> 0.60	> 0.70	0.90~1.60	≤ 2.00
Si	≤ 0.50	≤ 0.35	≤ 0.35	≤ 0.35	≤ 0.50	≤ 0.55
P	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.030
S	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.035	≤ 0.030
Cu	-	-	-	-	≤ 0.35	≤ 0.35
etc ¹⁾	Cr, Ni, Mo, S-Al, Nb, V, Ti Added					

1) One or more grain refining elements should be added(Al, Nb, V and others)
Ceq AH32~EH32 ≤ 0.38, AH36~EH36 ≤ 0.40, AH40~EH40 ≤ 0.42

Grade	Yield Point (MPa)	Tensile Strength (MPa)	Elongation(%) 5.65√S ₀	Average Absorbed Energy Longitudinal(Joule)		
				t ≤ 50	50 < t ≤ 70	70 < t ≤ 100
A, B, D, E	≥ 235	400~520	≥ 22	≥ 27	≥ 34	≥ 41
AH~EH32	≥ 315	440~570 (440~590) ¹⁾	≥ 22	≥ 31	≥ 38	≥ 46
AH~EH36	≥ 355	490~630	≥ 21	≥ 34	≥ 41	≥ 50
AH~EH40	≥ 390	510~660	≥ 20	≥ 39	≥ 46	≥ 55
EH47	≥ 460	570~720	≥ 17	≥ 64		

1) ABS, CCS, LR, NK

Development of New Product

Development of High Strength Steel

■ **Background** : As the size of containership has been increased, high strength steel is required to obtain structural integrity and weight reduction.

■ Target

Products	Thickness(mm)	Requirements
EH47-TM	80	-10°C CTOD, -40°C HAZ toughness, high strength
EH40-TM for high heat input welding	80	Tandem EG welding over 500KJ/cm
AH40-TM for high strength stiffener	80	Distortion after cutting (≤ 1mm/m, ≤ 10mm in whole length)

■ Mechanical Properties

EH47-TM		Specification
Plate	Yield Strength(MPa)	≥ 460
	Impact Toughness(J)	≥ 54
	CTOD(mm)	≥ 0.38
	Kca(N/mm ^{1.5})	≥ 6,000
Welded Joint	Tensile Strength(MPa)	≥ 570~720
	HAZ Toughness(J, -40°C)	≥ 54
	Preheating Temperature(y-groove, °C)	≤ 75
	HAZ CTOD(mm)	≥ 0.38

EH40-TM for high heat input welding		Specification
Plate	Yield Strength(MPa)	≥ 390
	Tensile Strength(MPa)	510~660
	Impact Toughness(J, -40°C)	≥ 55
Welded Joint	Tensile Strength(MPa)	510~660
	HAZ Toughness(J, -40°C)	≥ 47

AH40-TM for high strength stiffener		Specification
Plate	Yield Strength(MPa)	≥ 390
	Tensile Strength(MPa)	510~660
	Impact Toughness(J, 0°C)	≥ 55
Distortion	50t×3000W×15000L (Cutting Width 500mm, mm)	≤ 10
Characteristic	80t×2500W×10000L (Cutting Width 800mm, mm)	≤ 10

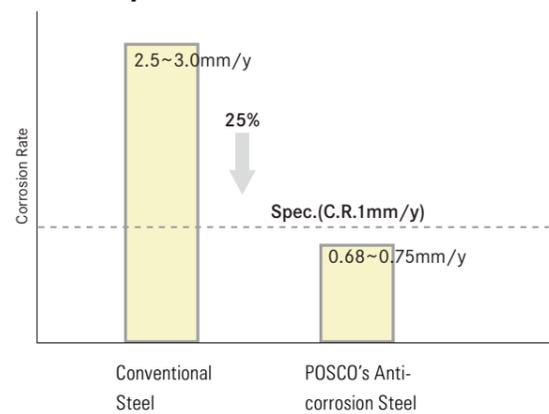
Please contact us for more details.

Development of New Products

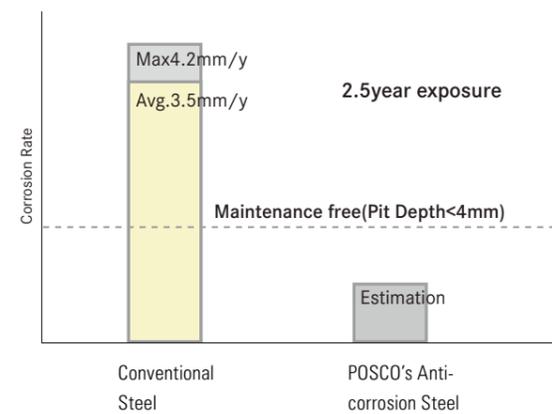
Corrosion resistant steel

- **Overview :** Maintenance and repair is not required for this corrosion resistant steel, even though it is applied to the bottom and deck plate of cargo oil tanker without coating. (An alternative to coating process omission)
- **Concept :** Enhancement of corrosion resistance by optimization of alloy composition.
- **Corrosion Properties (10%NaCl Solution, pH0.85, 30°C, 144 hours digestion)**

■ Laboratory Test



■ On Board Test



■ Welded Joint

Welding condition and consumable : Equivalent to general AH32 grade steel

■ On-board test

Ship : 157,000 DWT Cargo Oil Tanker

Participants : POSCO, DSME, SOVCOMFLOT, DNV

Test Schedule : Start on Sep. 11th, 2009. Analyze 1st specimen 3 years later / Analyze 2nd specimen 5 years later.

Steel Plate for Offshore Structure

Steel plates for offshore structure are used to manufacture facilities for exploration, drilling, production and storage of crude oil and natural gas and marine structures such as offshore windmill, tide power plan and pipe laying vessel



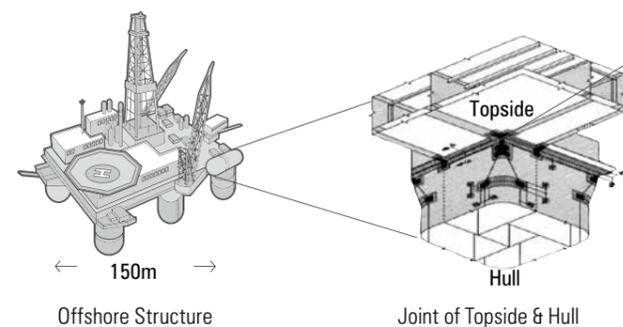
Offshore structure has been used for over 30 years without repair, so one brittle crack can be a significant threat to the structure. Hence steel plate used in offshore structure must have high toughness against fracture. Especially joints of topside and hull, the two most critical parts in structure, require excellent strength.

POSCO has developed high quality and excellent steel plates guaranteeing superb performance and weldability. Due to the outstanding quality and performance of the API 2W Gr. 50/60 steel plates, POSCO has been nominated as an official vendor for API 2W Gr. 50/60 steel plates from major oil companies including ExxonMobil, Shell, BP, Total, etc.

Available Steel Grades

(max. thickness)

YS Class	TMCP Steel		Normalized Steel
	CTOD	Non-CTOD	(Non-CTOD)
YS 355	API-2W-50(-10°C, 100mm)	API-2W-50(120mm)	API-2H-50(100mm)
	API-2W-50(-40°C, 100mm)	EN-S355G10+M(100mm)	EN-S355G10+N(100mm)
	EN-S355G10+M(-10°C, 100mm)	EN-S355ML(100mm)	EN-S355NL(100mm)
	EN-S355G10+M(-20°C, 100mm)	TOTAL S355KT-40(100mm)	PTS-355EMZ(70mm)
YS 420	API-2W-60(-10°C, 100mm)	API-2W-60(100mm)	API-2Y-60(150mm)
	API-2W-60(-20°C, 100mm)	EN-S420G2+M(100mm)	
	API-2W-60(-40°C, 100mm)	EN-S420ML(100mm)	
	EN-S420G2+M(-10°C, 100mm)	TOTAL S420KT-40(125mm)	
	EN-S420G2+M(-20°C, 100mm)	NV-EW420(100mm)	
YS 460	EN-S460G2+M(-20°C, 100mm)	EN-S460G2+M(100mm)	-
		EN-S460ML(120mm)	

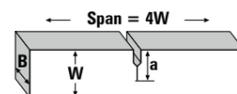


Critical Part(within 10% of total volume)

Even a local damage can be fatal to the entire structure
Thick plates(60~100mm) are applied for critical part

Fracture Resistance Evaluation Method

CTOD Test Required



Mechanical Properties - CTOD

Lowest Anticipated Service Temperature(LAST) -10°C

Grade	Base metal				Welded Joint(HAZ)			
	Strength(MPa)		Toughness	CTOD (-30°C,mm)	Heat Input (kJ/mm)	CTOD(-10°C,mm)		
	YS	TS	vE(J, -40°C)			CGHAZ	SCHAZ	
API-2W-50(100mm)	Spec.	345 ≤	448 ≤	41 ≤	0.25 ≤	0.7	1.71 ≤	1.89 ≤
	Avg.	374	491	377	1.76 ≤	3.0	0.80 ≤	1.48 ≤
API-2W-60(100mm)	Spec.	414 ≤	517 ≤	48 ≤	-	0.8	0.98 ≤	0.73 ≤
	Avg.	444	557	309	-	3.0	2.57 ≤	1.74 ≤
						4.5	2.83 ≤	2.79 ≤

Lowest Anticipated Service Temperature(LAST) -40°C

Grade	Base metal				Welded Joint(HAZ)			
	Strength(MPa)		Toughness	CTOD (-60°C,mm)	Heat Input (kJ/mm)	CTOD(-40°C,mm)		
	YS	TS	vE(J, -60°C)			CGHAZ	SCHAZ	
API-2W-50(100mm)	Spec.	345 ≤	448 ≤	41 ≤	0.38 ≤	0.8	2.36 ≤	0.54 ≤
	Avg.	387	492	383	2.52 ≤	3.0	1.33 ≤	2.19 ≤
API-2W-60(100mm)	Spec.	414 ≤	517 ≤	48 ≤	To be agreed	0.8	0.13	0.12
	Avg.	435	538	314	0.9	3.0	0.51	0.55
						4.5	1.06	0.16

Mechanical Properties - Others

Steel Grades	Supplementary Requirement	Thickness (mm)	Chemical Composition	Mechanical Properties		
				Tensile Test	YS(MPa)	
API-2H-50	CTOD no-guarantee	≤ 100	Ceq ≤ 0.43 Pcm ≤ 0.27	Tensile Test	YS(MPa)	345~420
					TS(MPa)	490~620
					EL(%), GL50	23
					YR(%)	≤ 80
				Charpy Test(J) (-40°C, Transverse)	≥ 50	
API-2W-50	CTOD no-guarantee	≤ 100	Ceq ≤ 0.36 Pcm ≤ 0.19	Tensile Test	YS(MPa)	345~483
					TS(MPa)	485~630
					EL(%), GL50	23
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 50	
API-2W-60	CTOD no-guarantee	≤ 75	Ceq ≤ 0.41 Pcm ≤ 0.20	Tensile Test	YS(MPa)	414~586
					TS(MPa)	517~660
					EL(%), GL50	22
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 80	
API-2W-50	CTOD (-10°C)	≤ 90	Ceq ≤ 0.39 Pcm ≤ 0.19	Tensile Test	YS(MPa)	345~483
					TS(MPa)	485~630
					EL(%), GL50	23
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 50	

$$Ceq = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15$$

$$Pcm = C + Si/30 + (Mn+Cu+Cr)/20 + Ni/60 + Mo/15 + V/10 + 5B$$

Mechanical Properties - Others

Steel Grades	Supplementary Requirement	Thickness (mm)	Chemical Composition	Mechanical Properties		
				Tensile Test	YP(MPa)	
API-2W-60	CTOD (-10°C)	≤ 100	Ceq ≤ 0.42 Pcm ≤ 0.21	Tensile Test	YP(MPa)	414~586
					TS(MPa)	520~665
					EL(%),GL50	22
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 60	
EN-S355G8+M	CTOD no-guarantee	≤ 100	Ceq ≤ 0.36 Pcm ≤ 0.19	Tensile Test	YP(MPa)	345~520
					TS(MPa)	480~620
					EL(%),GL50	22
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 50	
EN-S355ML	CTOD no-guarantee	≤ 100	Ceq ≤ 0.36 Pcm ≤ 0.19	Tensile Test	YP(MPa)	345~520
					TS(MPa)	480~620
					EL(%),GL50	22
					YR(%)	≤ 90
				Charpy Test(J) (-50°C, Longitudinal)	≥ 50	
TOTAL S355KT-40	CTOD no-guarantee	≤ 100	Ceq ≤ 0.36 Pcm ≤ 0.19	Tensile Test	YP(MPa)	345~520
					TS(MPa)	480~620
					EL(%),GL50	22
					YR(%)	≤ 90
				Charpy Test(J) (-40°C, Transverse)	≥ 60	

$$Ceq = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15$$

$$Pcm = C + Si/30 + (Mn+Cu+Cr)/20 + Ni/60 + Mo/15 + V/10 + 5B$$

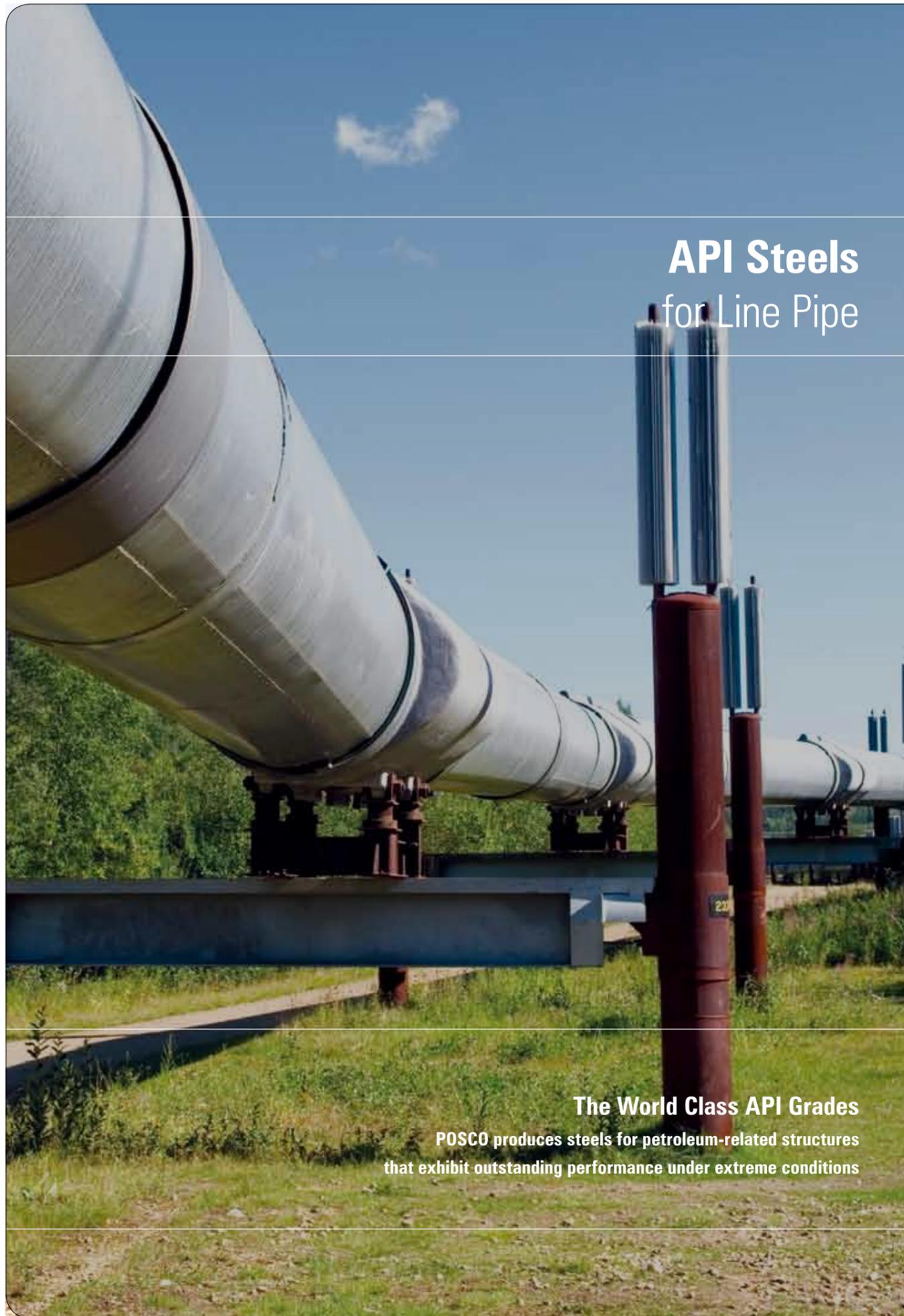
Guaranteed Supplementary Requirement

Supplementary Requirement	CTOD(-10°C)		Non-CTOD		
	YS355-TM	YS420-TM	YS355-TM	YS420-TM	YS355-N
S1 : UT(ASTM A578Level C)	Available	Available	Available	Available	Available
S2 : Impact Test at Low Temp(-60°C)	Available	Available	Available	Available	Available
S3 : Additional Tension Test	Available	Available	Available	Available	Available
S4 : Through Thickness Test	Min. 35%	Min. 35%	Min. 35%	Min. 35%	Min. 35%
S5 : Low Sulfur(Max. 0.006%)	Max. 0.005	Max. 0.005	Max. 0.005	Max. 0.005	Max. 0.005
S7 : Low Nitrogen(Max. 0.0009%)	Max. 0.0007	Max. 0.0007	Max. 0.0007	Max. 0.0007	Max. 0.0007
S8 : Strain-Aged Impact Test (250°C, 1 Hour, Strain : 5%)	Available	Available	Available	Available	Available
S9 : PWHT(600±20°C, 240minutes)	Available	Available	Available	Available	Available
S11 : Pre-Qualification(CTOD)	Max. 100t	Max. 100t	-	-	-
S12 : Drop-Weight Test(-35°C)	Available	Available	Available	Available	-
S91 : Fine Austenitic Grain Size	Grain Size Index above "7"(ASTM E112)				

* Please contact us for details before ordering supplementary requirement

Main Supply Records

Year	Project Name	Client	Fabricator	Grade (Parathe : CTOD Temp)	
2002	Donghae-1 Gas Field	KNOC, Korea	Hyundai Heavy Industries	API 2H Gr.50	
2003	Huizhou	ACTOG, China	Hyundai Heavy Industries	API 2H Gr.50	
2004	South Angsi	PETRONAS, Malaysia	EEW Korea	BS7191 355C	
	9 Well Platform	ONGC, India	EEW Korea	API 2H Gr.50	
	APN Project	BP, UK	EEW Korea	API 2H Gr.50	
	TUNU 10	TotalFinaElf, France	EEW Korea	S355	
	ARTHIT Campaign 1	PTTEP, Thailand	Steel Flower	API 2H Gr.50	
2005	Oveng & Okume	MODEC, USA	Samsung Heavy Industries	API 2W Gr.50T	
	PANNA Field	BG, UK	Steel Flower	API 2H Gr.50	
	KIKEH	MURPHY, USA	EEW Korea	API 2W Gr.50Z	
	Qatar Gas 3+4	ConocoPhillips, USA	EEW Korea	BS7191 355EM, BS7191 355EMZ	
	SISI-NUBI	TotalFinaElf, France	EEW Korea	S355KT-40	
2006	9 WELLHEAD	ONGC, India	EEW Korea	API 2H Gr.50	
	B&S-NH4	NPCC, UAE	EEW Korea	API 2H Gr.50, S355K2G3	
	SHENZI	MODEC, USA	Samsung Heavy Industries	API 2W Gr.50T	
	Vasai East Mosbold	Petronet	Samsung Heavy Industries	API 2W Gr.50	
	Pecikot	Total E&P, Indonesia	Sam Kang	API 2W Gr.50	
2007	NCP-8335	British Petroleum	Steel Flower	S355 G8M, S355 G7M	
	Al Shaheen	NPCC, UAE	EEW Korea	API 2H Gr.50,	
	Bohai Phase II	Conocophillips, UK	EEW Korea	API 2H Gr.50,	
	Northern Arthit	PTTEP	Steel Flower, Sam Kang	API 2H Gr.50, API 2W Gr.50Z	
	Tombua Landana	Chevron	DSME	API 2W Gr.60	
2008	Umm Shaif	ADMA-OPCO, UAE	Hyundai Heavy Industries	API 2W Gr.50T	
	Pazflor	Total	DSME	API 2W Gr.50, API 2W Gr.60	
2009	DAIHUNG	PETROVIETNAM	Steel Flower	API 2H Gr.50	
	Kipper Tuna Turrum	ExxonMobil	J.Ray McDermott, Sam Kang	API 2W Gr.50, 60, -10°C	
	Gumusut-Kakap	Shell	MMHE	API 2W Gr.50, 60, -10°C	
2010/2011	Platong Gas II	Chevron	J.Ray McDermott	API 2W Gr.50, API 2W Gr.60	
	CLOV	Total	DSME	API 2W Gr.50, 60, -10°C	
	JSM	Chevron	Samsung Heavy Industries	API 2W Gr.50 -10°C	
	Mars B	Shell	Samsung Heavy Industries	API 2W Gr.50,60 -10°C	
	SHWE	Daewoo International	Hyundai Heavy Industries	API 2W Gr.50,60 -10°C	
	Gorgon	Chevron	Hyundai Heavy Industries	API 2W Gr.50T -10°C	
	Goliat	ENI Norge	Hyundai Heavy Industries	EN-S355G9+M(-20°C)	
	Teekay	Teekay Petrozarl	Samsung Heavy Industries	EN-S355G9/10+M(-20°C)	
	Arkutun-Dagi	Exxon-mobil	DSME	API 2W Gr.50,60	
	Osprey	Brunei Shell	BSP, EEW	EN-S355G7,8+M(-10°C)	
	Bulan Bulan	Brunei Shell	BSP, EEW	EN-S355G7,8+M(-10°C)	
	2012	B-23	Brunei Shell	BSP, EEW	EN-S355G7,8+M(-10°C)
		OFON2	Total	Nigerdock	EN-S355/S420
		FLNG1	SBM OFFSHORE	DRYDOCK	S355G10+M(-10°C)
		FLNG	Shell	Samsung Heavy Industries	EN-S420G1,2+M(-10°C)
Yadana		Total	Steel Flower	S355,S420	
Wheatstone		Chevron	DSME	API 2W Gr.50/60(-10°C)	
B-23		Brunei Shell	BLNG/EEW	S355G7,8+M(-10°C)	
MALAMPAYA		Shell PHILIPPINES	FLUOR	S355G7,8+M(-10°C)	
2013	MALIKAI	PETRONAS	TECHNIP/MMHE	GR345, GR414(-10°C)	
	Heborn	Exxon-mobil	Hyundai Heavy Ind.	API-2W-60(-20°C)	
	Ichthys	INPEX	Samsung Heavy Ind.	EN-S460G2M(-10°C)	
	Ichthys	INPEX	Mcdermott	API-2W-60(-10°C)	
	Ichthys	INPEX	DSME	S355	
	Point thomson	Exxon-mobil	Hyundai Heavy Ind.	API-2W-50(-10°C)	
	SK316	Petronas	MMHE/EEWM	EN-S460G2M(-10°C)	



API Steels for Line Pipe

The World Class API Grades
 POSCO produces steels for petroleum-related structures
 that exhibit outstanding performance under extreme conditions

Available Sizes : HRC Products

■ Sweet Service Material

Unit: mm

Thickness Steel Grade	5 ≤ T < 7	7 ≤ T < 9	9 ≤ T < 18.5
B, X42~X56	880 ≤ W ≤ 1750	880 ≤ W ≤ 1945	880 ≤ W ≤ 1945
X60	880 ≤ W ≤ 1750	880 ≤ W ≤ 1945	880 ≤ W ≤ 1945
X65	880 ≤ W ≤ 1750	880 ≤ W ≤ 1945	880 ≤ W ≤ 1945
X70	880 ≤ W ≤ 1600	880 ≤ W ≤ 1945	880 ≤ W ≤ 1945
X80	-	880 ≤ W ≤ 1600	880 ≤ W ≤ 1750

T : Thickness, W : Width, "-" : Not-Available
 Over 18.5mm in thickness (T > 18.5) should be discussed before ordering.

■ Sour Service Material

Spiral Type

Unit: mm

Grade	Thickness	Width
X52	7~19	880~1930
X56~X65	9~14	880~1600

ERW Type

Unit: mm

Grade	Thickness	Width
X52	7~19	880~1930
X56/X60/X65	7~22	

T : Thickness, W : Width



Available Sizes : Plate Products

■ Non Sour Service Material (DWTT, 0°C, TMCP Delivery)

Unit: mm

Thickness Steel Grade	Thickness				
	12.7 ≤ T < 15.9	15.9 ≤ T < 17.5	17.5 ≤ T < 25.4	25.4 ≤ T < 32.5	32.5 ≤ T < 41
B	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X52M	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X56M	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X60M	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X65M	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X70M	W ≤ 4800	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000
X80M	W ≤ 4000	W ≤ 4800	W ≤ 4800	W ≤ 4500	W ≤ 4000

T : Thickness, W : Width, "-" : Not-Available

Low temperature (Below 0°C) assurance should be discussed before ordering.

Below 12.7mm in thickness (t<12.7) should be discussed before ordering.

■ Sour Service Material (DWTT, 0°C, TMCP Delivery)

Unit: mm

Thickness Steel Grade	Thickness				
	14.3 ≤ T < 17.5	17.5 ≤ T < 22.2	22.2 ≤ T < 25.4	25.4 ≤ T < 32.5	32.5 ≤ T < 39
X52MS	W ≤ 4100	W ≤ 4400	W ≤ 4000	-	-
X56MS	W ≤ 4100	W ≤ 4400	W ≤ 4000	W ≤ 3200	W ≤ 2400
X60MS	W ≤ 4100	W ≤ 4400	W ≤ 4000	W ≤ 3200	W ≤ 2400
X65MS	W ≤ 4100	W ≤ 4400	W ≤ 4000	W ≤ 3200	W ≤ 2400
X70MS	W ≤ 4100	W ≤ 4400	W ≤ 4000	W ≤ 3200	W ≤ 2400

T : Thickness, W : Width, "-" : Not-Available

Low temperature (Below 0°C) assurance should be discussed before ordering.

Below 14.3mm in thickness (t<14.3mm) should be discussed before ordering.

Over 32.5mm in thickness (t<32.5mm) should be discussed ordering.

Main Supply Records

■ HRC Products

Unit : Thousand tons

Spec	Size(mm)	Piping Type	Quantity	Period
Non Sour Service				
X80	11/14.45*1530	Spiral (42")	13	'07
X70	22.22*1530	Spiral (42")	10	'08
X70	12.91~22.22*1645	Spiral (48")	47	'09~'10
X80	17.5*1500	Spiral (48")	73	'10
X70	14.1~19.7*1500	Spiral (48")	164	'11
X70	17.5*1450	Spiral (48")	10	'11
X70	13.08~19.56*1800	Spiral (36")	38	'11
X70	22.2*1600	Spiral (20")	3	'12
Sour Service				
X60	6.35~15.88* 851~1710	ERW	107	'06~'09
X52	7.1*1595	ERW	21	'08~'09
X52	11.1~15.9*1500 / 11.1*1865	Spiral	70	'10
X60	17.5*1210	LSAW(JCO)	7	'10
X65	19.1*1539	LSAW(JCO)	2	'11
X60	17.5/20.6*1214/1519	LSAW(JCO)	6	'11
X60	17.5*1211	Spiral	8	'12
X60	14.3*1868	Spiral	9	'12

■ Plate Products

Unit : Thousand tons

Spec	Size(mm)	Piping Type	Quantity	Period
Non Sour Service				
X70M	26.4*4338	JCO	20	'08
X80M	21.0*3295	JCO	3	'08
X70M	19.8*4382	JCO	58	'09~'10
X70M	26.4*4332	JCO	9	'10
X65M	20.6~30.2*2477	JCO	47	'10~'11
X80M	23.0*4343	JCO	20	'11
X80M	22.2*1361	UOE	7	'11
X60M	14.3*3275	R/B	75	'11
X65M(offshore)	25.4*1663	JCO	10	'12
X70M(offshore)	31*2235 / 27.4*2226	JCO	23	'13
Sour Service				
X65MS	22.2*4369	R/B	5	'07
X65MS	25.4*2305	JCO	6	'08
X65MS	19.1~24.03*3775	JCO	34	'08
X60MS	15.9/19.1*2800	R/B	7	'08~'09
X52MS	14.3*1860	R/B	41	'10
X60MS	11.4*2024	UOE	3	'11
X65MS	14.3~22.2*2145~2753	JCO	59	'11
X65MS	23.8~28.5*2845	UOE	3	'12
X65MS	11.13*1546	JCO	18	'13

Testing and Evaluation Methods

UOE Simulator

Test Features

Integrated Simulator for U-O Forming + Expanding

Test Equipment Specifications

Press Capacity	· 4,000 Ton
System Overview	· Full Automation system (U→O Forming)
Others	· Expander can be installed at O die position

Pipe Making Capability

Grade	API X70~X120
Pipe length	1m
Pipe diameter	20"~56"
Pipe thickness	Max. 35mmt (@70)



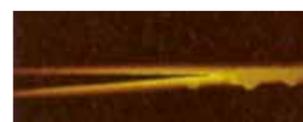
ERW Simulator

ERW Mechanism

Sweeping distance vs. Narrow gap length
Bridge sweeping velocity
Arcing frequency

Test Equipment Specifications

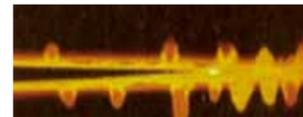
Material	<ul style="list-style-type: none"> · Strength: T. S. \leq 800 MPa · Thickness: 1.5 ~ 16 mm · Skelp width: 80 ~ 100mm
ERW power	<ul style="list-style-type: none"> · Power: Max. 475 kW · Frequency: 150 ~ 350 kHz
Welding point adjustment	<ul style="list-style-type: none"> · V-angle: 2 ~ 8° · Tilting angle: -5 ~ +10° · Pull-out speed: 4 ~ 40 m/min



Low heat input



Moderate heat input



High heat input

Testing and Evaluation Methods

Drop Weight Tear Test (DWTT)

Test Features

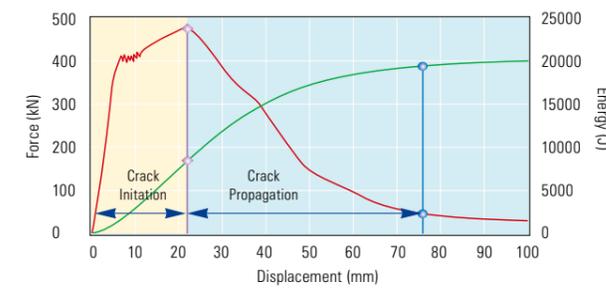
Test the resistance to brittle fracture propagation with the same specimen thickness as in the actual pipe

Test Equipment Specifications

Capacity	<ul style="list-style-type: none"> · Impact Energy: 10,000J ~ 100,000J · Load Cell: 1,500kN
Temperature Control	<ul style="list-style-type: none"> · Cooling Media: Gaseous / Liquid Nitrogen · Temperature Range: -196°C ~ 100°C
Specimen Loading	<ul style="list-style-type: none"> · Weight Capacity Robot: 90Kgf · Specimen Thickness: 6mm ~ 50mm

Test Results

Load-Displacement: Fracture Energy

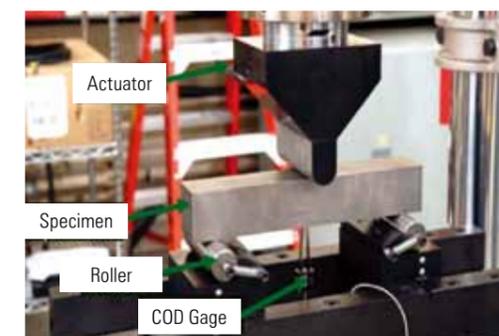


Model: DWTT-100 (IMATEK, UK)

Crack Tip Opening Displacement (CTOD)

Test Features

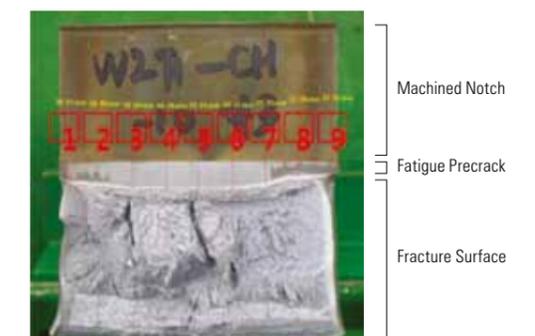
Test measures the resistance of a material to the propagation of a crack. It is used on materials that can show some plastic deformation before failure occurs causing the tip to stretch opening.



Instrumented CTOD Tester

Quality Assessment Method

ASTM E1290, BS7448



Machined Notch
Fatigue Precrack
Fracture Surface

Steel Plate for Pressure Vessel

POSCO produces various kinds of steel plates for pressure vessels such as LNG storage tank, boiler, heat exchanger and reactor

POSCO steel plate for pressure vessel shows excellent cold and hot formability and guarantees mechanical properties after post welding heat treatment(PWHT)

	Standard Abbreviation	Standard
Low Temperature	A516-55, 60, 65, 70 SA516-55, 60, 65, 70, A537-1.2	KS-SB410, 450, 480 / JS-SB410, 450, 480
Extreme Low Temperature	A553-TY1(9%Ni), A203-D,E JS-SLA235A,B	JS-SL2N255, SL3N255, SL3N275, SL9N520
Vessel	A537-1,2 / A204-A,B	JS-SPV235, 315, 355, 450, 490 / STH750Q, STH890CM, 34CRMO4
Intermediate Temperature	A515-55, 60, 65, 70 / SA515-55, 60, 65, 70, A204-A,B, A285-A,B,C	JS-SB450M, 480M, JS-SGV410, 450, 480
High Temperature	A387-11-C1, C2, A387-12-C1, C2, A387-22-C1, C2, SA387-11 (12, 22)-C1,C2	JIS G 4109(SCMV), G 4110(SCMQ)

Available Steel Grades

Grades	Requirement		
	ASME	ASTM	JIS
YS 220	SA516-60 (T ≤ 133t)	A516-60 (T ≤ 133t)	JS-SB410 (T ≤ 93t)
	SA387-22-C1 (T ≤ 65t)	A387-22-C1 (T ≤ 65t)	
YS 240	SA516-65 (T ≤ 133t)	A516-65 (T ≤ 133t)	JS-SB450 (T ≤ 93t)
	SA387-11-C1 (T ≤ 133:NACT Type)	A387-11-C1 (T ≤ 133:NACT Type)	JS-SB450M (T ≤ 90t)
	SA387-12-C1 (T ≤ 65t)	A387-12-C1 (T ≤ 65t)	
YS 260	SA516-70 (T ≤ 133t)	A516-70 (T ≤ 133t)	JS-SB480 (T ≤ 60t)
	SA387-12-C2 (T ≤ 65t)	SA387-12-C2 (T ≤ 65t)	JS-SB480M (T ≤ 70t)
YS 310	SA387-11-C2 (T ≤ 100t : NACT Type)	A387-11-C2 (T ≤ 100t : NACT Type)	
	(T ≤ 65t : NT Type)	(T ≤ 65t : NT Type)	
	SA387-22-C2 (T ≤ 133t : NACT Type)	A387-22-C2 (T ≤ 133t : NACT Type)	
	(T ≤ 65t : NT Type)	(T ≤ 65t : NT Type)	
YS 345	SA537 Class 1 (T ≤ 100t)	A537 Class 1 (T ≤ 100t)	JS-SLA365 (T ≤ 38t)
			JS-SLA365TM (T ≤ 38t)
YS 415	SA537 Class 2 (T ≤ 100t)	A537 Class 2 (T ≤ 100t)	-
YS 450~			JS-SPV450 (T ≤ 70t)
			JS-SPV490 (T ≤ 70t)

Characteristics (non-HIC guaranteed)

Steel Grades	Elements	Mechanical Properties		Thickness (Max. mm)	Additional Service
		YS(MPa, Min.)	TS(MPa)		
(S)A516-60	C,Ni,Nb,V	220	415~550	133	Ceq 0.43% (0.45%)
(S)A516-65		240	450~585	133	SR 6~15hrs.
(S)A516-70		260	485~620	133	Impact Test at -45~-49°C
(S)A537-1		355	485~620	100	SR 3~7hrs.
(S)A537-2		415	550~690	100	Impact Test at -46~-49°C
(S)A515-60		C,Mn	220	415~550	93
(S)A515-65	240		450~585	93	
(S)A515-70	260		485~620	93	
(S)A387-11-C1	Cr,Mo,Mn	240	415~585	65(NT) 133(NACT)	SR 3~20hrs.
(S)A387-11-C2		310	515~690	65(NT) 100(NACT)	J-Factor ¹⁾
(S)A387-22-C1		205	415~585	65	
(S)A387-22-C2		310	515~690	65(NT) 133(NACT)	
(S)A299-B ²⁾	Cu,Ni,Cr,Mo	325	550~690	150	SR 10hrs.
(S)A302-C	Ni,Mo	345	550~690	133	SR 10hrs.

¹⁾ J-Factor=(Si+Mn)x(P+Sn)x10⁴ ≤ 150 (Si,Mn,P and Sn in wt %)

²⁾ 150mm: Possible only when the Rolling Reduction Ratio is 2:1

Characteristics (HIC guaranteed)

Unit: max. percent(%)

Steel Grades	Chemical composition			Thickness(mm)	CLR	Additional Service
	P	S	Ceq(G) t ≤ 40t	NACE TM0177 pH ≤ 4.5		
(S)A516-60	≤ 0.01	≤ 0.002	≤ 0.43	≤ 133	≤ 5~15%	SR: 620±20°C, 3Hr/inch
(S)A516-65						Impact Energy: 27J(Avg., Min.)/24J at -46°C
(S)A516-70				≤ 133		Delivery Condition : NACT or Nor

HIC Test Standards

Test Standards	Test Solution	Terminal pH	Test Conditions
NACE TM0284-sB	Artificial Seawater	8.1~8.3	25°C, 96 hrs.
NACE TM0177(Low pH)	Acid NaCl	≤ 4.5	25°C, 96 hrs.

* NACE:National Association of Corrosion Engineers

** HIC Test frequency: per heat on the same thickness plate

Supplementary Requirement

Supplementary Requirement	SA516-60 / 65 / 70	SA387-11-C1/C2	SA387-22-C1/C2	SA537-1	SA537-2
S1 : Vacuum degassed	0	0	0	0	0
S2 : Product Analysis	0	0	0	0	0
S3 : Simulated PWHT of Test Coupons(1Hr/inch, T>2inches each inch plus 15minutes)	15Hr	3Hr C2: 20Hr(NACT)	3Hr C2: 20Hr(NACT)	7Hr	3Hr
S4 : Additional Tension Test	Not Required	Not Required	Not Required	Not Required	Deviation Need
S5 : CVN Impact Test(-46°C)	0	0	0	0	0
S7 : High Temperature Tension Tests	Reference Data Available	Reference Data Available	Reference Data Available	Reference Data Available	Reference Data Available
S22 : Through Thickness Tension Tests (A770 or EN 10164)	Min. 35%	Min. 35%	Min. 35%	Min. 35%	Min. 35%
Fine Austenitic Grain Size	Grain Size Index above "7"	-	-	Grain Size Index above "7"	Grain Size Index above "7"
Low Phosphorous	Max. 0.01	Max. 0.012	Max. 0.012	Max. 0.012	Max. 0.012
HIC (Total average of 3 specimens)CTR 1.5% CSR 0.5%	CLR 5% Not Required	Not Required	Not Required	Not Required	

9%Ni Steel

Material Characteristics

Low temperature toughness : $\geq 70\text{J @-196}^\circ\text{C}$

High tensile strength $\geq 690\text{MPa}$

Residual magnetization : Flux Density ≤ 50 Gauss

Usage

Liquefied Natural Gas(LNG) Storage Tank

Standard Abbreviation : A553-TY1

Chemical Composition

	C	Si	Mn	P	S	Sol-Al	Cu	Ni
Spec.	≤ 0.08	0.15~0.40	≤ 0.90	≤ 0.008	≤ 0.005	0.005~0.04	≤ 0.10	8.50~9.50
Result	0.04~0.08	0.20~0.30	0.60~0.70	0.005	0.002	0.005~0.040	0~0.10	8.90~9.30

Mechanical Properties

	Yield Strength	Tensile Strength	Impact @ -196°C	CTOD @ -164°C
Spec.	$\geq 585\text{MPa}$	690~825MPa	70Joules \leq	$> 0.17\text{mm}$
Result	657MPa	707MPa	207Joules	0.28~1.29mm

Supply Records (Last 4 years)

Year	Project Name	Client	Construction	Thickness
2008	Tongyeong LNG Terminal(#13, #14)	KOGAS	Daewoo E&C, Hyundai E&C	6~32.9mm
	Pyeongtaek LNG Terminal(#15, #16, #17)	KOGAS	Samsung C&T	6~32.9mm
2009	Gwangyang LNG Terminal(#3)	POSCO	POSCO E&C	6~32.9mm
	Tongyeong LNG Terminal(#15, #16)	KOGAS	Doosan HI&C	6~20mm
	Pyeongtaek LNG Terminal(#18, #19)	KOGAS	Doosan HI&C	6~32.9mm
	Pyeongtaek LNG Terminal(#20, #21)	KOGAS	Hyundai E&C	10~29.5mm
2010	Pyeongtaek LNG Terminal(#22, #23)	KOGAS	Daewoo E&C, Samsung C&T	10~32.9mm
2011	Gwangyang LNG Terminal(#4)	POSCO	POSCO E&C	6~32.9mm
2013	Samcheok LNG Terminal(#8, #9)	KOGAS	Doosan HI&C	6~32.9mm

High Mn Cryogenic Steel

Recently, the new high manganese austenitic steel plate and welding consumables with an excellent combination of strength and cryogenic toughness were developed without additional costly element, Ni, and they offer an attractive alternative for cryogenic applications.

Chemical Composition and Mechanical Properties of Plate

Chemical Composition

Unit: wt.%

C	Si	Mn	P	S	Others
0.2~0.6	0.1~1.0	22.0~26.0	≤0.03	≤0.01	Cr equiv. 0~20.0 Ni equiv. 28.0~48.0

1) Cr equivalent = Cr + 1.5Si + Mo + 5V + 3Al + 0.5Nb + 1.5Ti

2) Ni equivalent = Ni + 0.87Mn + 0.33Cu + 30C + 30(N-0.045) when N is 0~0.2

Note : Alloying elements in Cr equivalent and Ni equivalent can be added to ensure austenite stability.

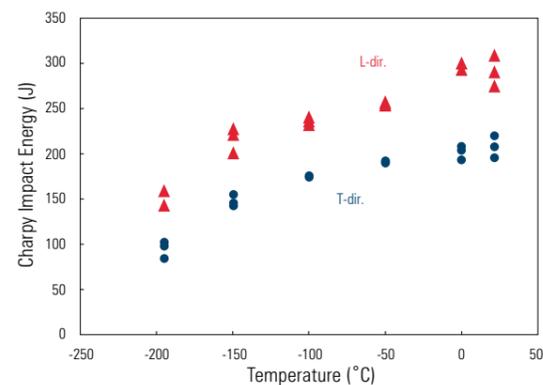
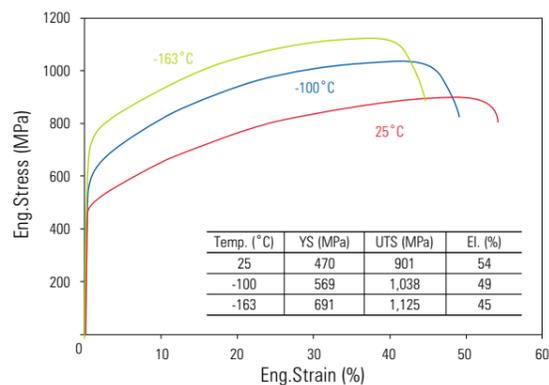
Mechanical Properties

YS (MPa)	UTS (MPa)	El. (%)	Charpy Impact Energy @ -196°C (J)	
			Transverse	Longitudinal
≥360	TS : ≥560	≥22	≥27	≥41

Cryogenic Properties of Plate

Strength and Toughness

The high manganese steel is designed to have high strength and toughness at cryogenic temperature by appropriate strengthening mechanisms and controlled manufacturing processes.

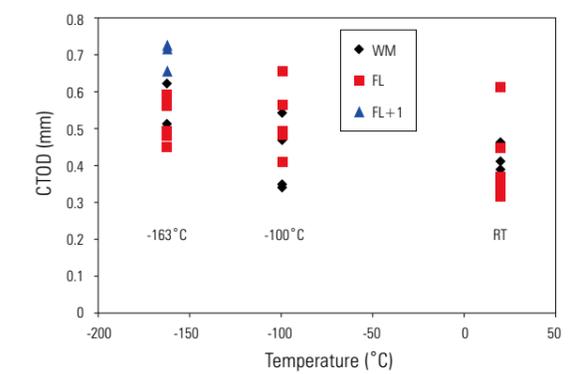
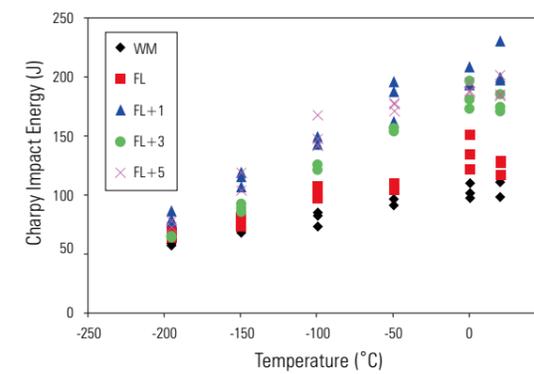


Cryogenic Properties of Welded Joint

Welding Condition

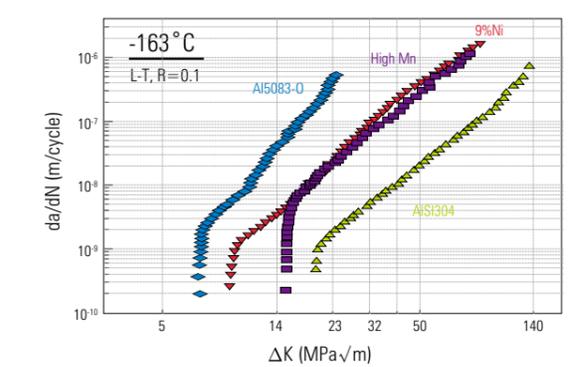
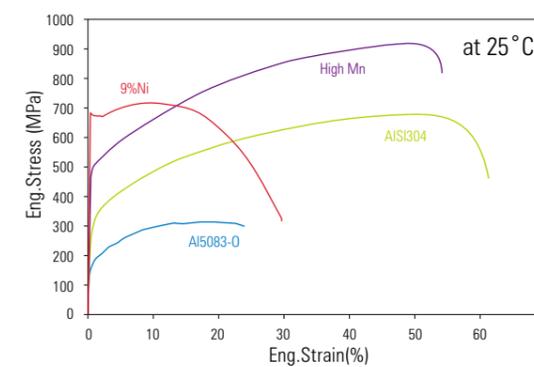
Welding Process	Groove	Current (A)	Voltage (V)	Speed (cpm)	Heat Input (kJ/cm)	Shielding Gas
GMAW		280	28	25	18.8	Ar-20% CO ₂ 20 l/min

Toughness and CTOD

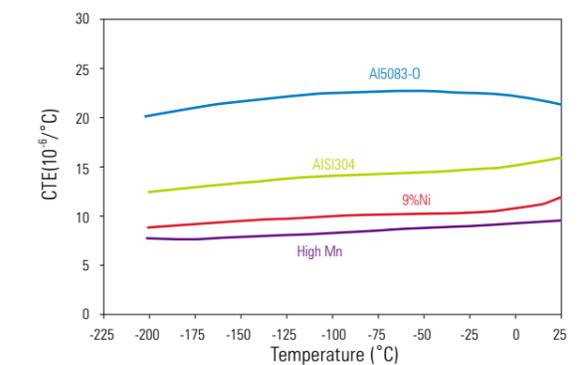
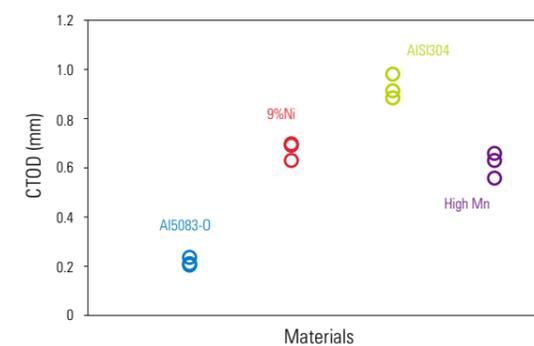


Comparison with Conventional Materials for Cryogenic Applications

Strength and Toughness



CTOD



High Mn Cryogenic Steel

Flux-cored Arc Welding Consumable for High Mn Steel (PT-400MTM)

■ Description and Application

PT-400M™ is an Fe-Ni-Mn based flux-cored wire for welding high Mn steel and Ni-Cr-Mo alloys.

Satisfies stringent toughness requirement at cryogenic temperature

Stable arc with minimal spatter

No need to pre-heat and control maximum interpass temperature at 150°C or lower

■ Welding Position



■ Polarity and Shielding Gas

DCEP (DC+)

100% CO₂

■ Chemical Composition of Wire (wt. %)

Ni equiv.	Cr equiv.
35.0~55.0	≤20.0

■ Mechanical Properties of All-Weld Metal

YS (MPa)	UTS (MPa)	El. (%)	Charpy Impact Energy @ -196°C (J)
≥360	≥600	≥22.0	≥27

■ Packing

Diameter (mm)	1.2	1.4	1.6
Weight (kg)	5, 12.5, 15, 20		



Submerged Arc Welding Consumable for High Mn Steel (PC-400MTM)

■ Description and Application

PC-400M™ is a high Mn based metal-cored wire for welding high Mn steel and Ni-Cr-Mo alloys.

POS-CF1™ is an agglomerated and slightly Mn-alloyed aluminated-basic flux for single/multipass welding.

Satisfies the stringent toughness requirement at cryogenic temperature

Good arc stability and bead appearance with high travel speed

No need to pre-heat and control maximum interpass temperature at 150°C or lower

■ Welding Position



■ Polarity

DC, AC

■ Chemical Composition of Wire (wt. %)

Ni equiv.	Cr equiv.
28.0~48.0	≤20.0

■ Mechanical Properties of All-Weld Metal

YS (MPa)	UTS (MPa)	El. (%)	Charpy Impact Energy @ -196°C (J)
≥360	≥660	≥22.0	≥27

■ Packing (Wire)

Diameter (mm)	3.2	4	4.8
Weight (kg)	25, 50, 100, 200		

■ Packing (Flux)

Type	Can	Bag
Weight (kg)	20, 25	

Testing and Evaluation Methods

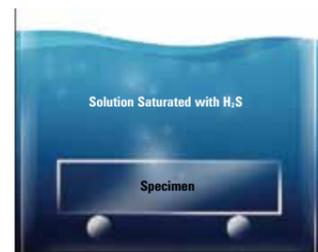
Sour Resistance

Sour Resistance (Resistance to HIC and SSCC)

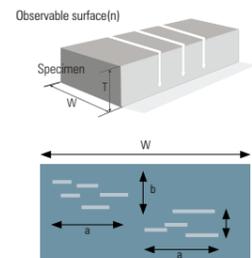
A way to evaluate quality and resistance to hydrogen induced cracking (HIC)

Cracks occur in line pipe steel used in sour gas environment without exterior forces on it.

Quality Assessment Method: NACE TM 0284



Immersed for 96 hours at 25°C



Solution A (strong acid)

5% NaCl + 0.5% CH₃COOH

The pH is 2.7 at first and 4.0 or lower by the end.

Solution B (weak acid)

synthetic seawater

The pH is 8.2 at first and 4.8~5.4 by the end.

$$\text{Crack length ratio (CLR)} = \frac{\sum a}{W} \times 100\%$$

$$\text{Crack thickness ratio (CTR)} = \frac{\sum b}{T} \times 100\%$$

$$\text{Crack sensitivity ratio (CSR)} = \frac{\sum (a \times b)}{W \times T} \times 100\%$$

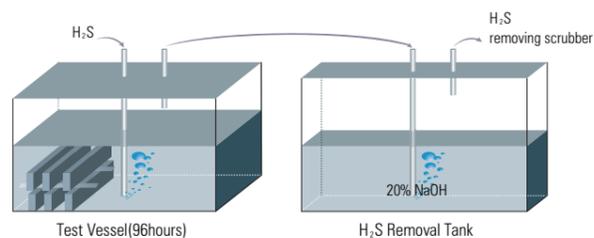
HIC



Hydrogen Induced Cracking Test System

Test Equipment Specifications

Test Method (Standard)	NACE TM0284 or EFC16
Capability	Vessel : 15liter x 20ea 20 specimens/vessel
Test Solution	H ₂ S saturated acidic solution
Others	Temperature control : ±1°C



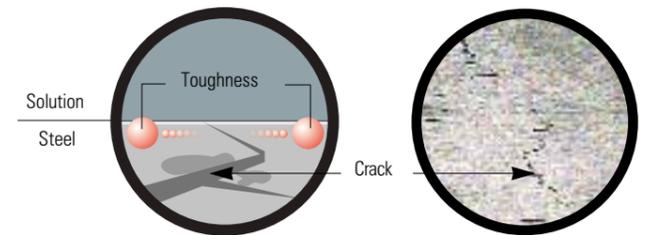
Sulfide Stress Corrosion Cracking(SSCC):R&D



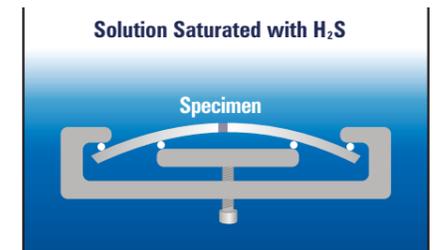
Static load method : proof ring type

Quality Assessment Method : NACE TM 0177

Test for 720 hours at 25°C : static load and bending deformation are typical methods.



Sudden fracture when subjected to tensile stress in a corrosive environment that contains H₂S



Immersion for 720hours at 25°C

ASTM G39(Four Point Load Test)

Many customers require this method for determining SSCC resistance

SSCC Test System

Test Equipment Specifications

Method(Standard)	NACE TM0177 or EFC16
Characteristics	Loading type: dead weight Maximum applied load: 3tons 44 testers
Test Solution	H ₂ S saturated acidic solution
Others	Temperature control: ±1°C



Steel Plate for Structure & Construction

Available Steel Grades

Usage	JIS	KS	ASTM	EN10025	Others	POSCO standards
Structural Steel	SS330, 400, 490, 540	SS330, 400, 490, 540	A36 A283-A,B,C,D A570 Gr.40,50 A572-42,50,60,65 A573 Gr.70	S235 Series S275 Series S355 Series S420 Series E295,355	BS 4360 Gr40A, B, C, D, E Gr.50A, B, C, D, E	
Welding Structural Steel	SM400, 490, 490Y, 520, 570	SM400, 490, 490Y, 520, 570				
Building Structure	SN400,490	SN400,490	-	-	-	PILAC- BT33,36,45
Bridge Structure	-	HSB500,600 800	A709-36 A709-50 A709-50W	-	-	-
Weather Resistant Steel	SMA400, 490, 570	SMA400, 490, 570	A588	-	-	-
Mechanical Structure	S20C~S55C SCM440	-	-	-	SAE 1020, 1022 1030, 1035, 1040 1045, 1049, 4150	POSMOLD1,2
Abrasion Resistant Steel	-	-	-	-	-	POS AR 320, 360, 360LC, 400, 500, 500LC
High Strength Steel	-	-	A514-F A573 Gr. 70	S460 Series	-	POSTEN 55H~100

Steel Plate for Construction Structure

Introduction

Steel plates for construction structure have 300~1000MPa strength.
Generally high tensile strength of higher than 500MPa is produced by TMCP method.

In structures with high occurrence of lamella tear, lamella tear resistance steel is used,
in which sulfur is lowered and Z-direction resistant stress by controlling non-metallic inclusions.

Grade	Standards	Remark
40kg	SN400B/C	PILAC-BT33: SM490TMC
50kg	SN490B/C, PILAC-BT33/36, HSB500	
60kg	PILAC-BT45, HSB600	
80kg	HSB800, HSA800	PILAC-BT66: KS-HSA800

Designation

SS : Steel Structure
SM : Steel Marine
SN : Steel New
SMA : Steel Marine Atmosphere

CVN Grade

- A: No Limits
- B: $\geq 27J(0^\circ C)$
- C: $\geq 47J(0^\circ C)$
- No Designation : A Grade

S M A 4 9 0 B W N Z C

Tensile Strength

400 : 400MPa(41kg/mm²)
490 : 490MPa(50kg/mm²)
520 : 520MPa(53kg/mm²)
570 : 570MPa(58kg/mm²)

Weathering Grade

W: used as-rolled or after rust stabilization
P: used after general painting

Heat Treatment

N: Normalizing
QT: Quenching & Tempering
TMC: Thermo-Mechanical Control
As-Rolled: No Designation

Lamellar Tear Grade

ZA : $S \leq 0.008\%$
ZB : $S \leq 0.008\%$, $RA_{av} \geq 15\%$, $RA_{min} \geq 10\%$
ZC : $S \leq 0.006\%$, $RA_{av} \geq 25\%$, $RA_{min} \geq 15\%$
ZD : Customer's Requirements

SN Steel for Building Structure

Chemical Composition

Grade	Thickness (mm)	Element(% ,Max.)					Ceq (% ,Max.)	Pcm (% ,Max.)	
		C	Si	Mn	P	S			
SN400	A	6 ≤ t ≤ 100	0.24	-	-	0.05	0.05	-	-
	B	6 ≤ t ≤ 50	0.20	0.35	0.60~1.40	0.03	0.015	0.36	0.26
		50 < t ≤ 100	0.22						
C	16 ≤ t ≤ 50	0.20	0.35	0.60~1.40	0.02	0.008	0.36	0.26	
	50 < t ≤ 100	0.22							
	SN490	B	6 ≤ t ≤ 40	0.18	0.55	1.60	0.03	0.015	0.44
40 < t ≤ 50			0.18	0.55	1.60	0.03	0.015	0.44	0.29
50 < t ≤ 100			0.20	0.55	1.60	0.03	0.015	0.46	0.29
C		16 ≤ t ≤ 100	0.18	0.55	1.60	0.02	0.008	0.44	0.29
		40 < t ≤ 50	0.18	0.55	1.60	0.02	0.008	0.44	0.29
		50 < t ≤ 100	0.20	0.55	1.60	0.02	0.46	0.44	0.29

Ceq(%): $C + Mn/6 + Si/24 + Ni/40 + Cr/5 + Mo/4 + V/14$

Pcm(%): $C + Si/30 + Mn/20 + Cu/20 + Ni/60 + Cr/20 + Mo/15 + V/10 + 5B$

Mechanical Properties

Grade	Thickness (mm)	Tensile Test				Impact Test (0°C, J)	
		YS(MPa, Min.)	TS(MPa)	EL(% ,Min.)	YR(% ,Max.)		
SN400	A	6 ≤ t ≤ 16	235	400~510	17	-	-
		16 < t ≤ 40	235	400~510	21	-	-
		40 < t ≤ 100	215	400~510	23	-	-
	B	6 ≤ t < 12	235	400~510	18	-	-
		12 ≤ t ≤ 16	235~355	400~510	18	80	27
		16 < t ≤ 40	235~355	400~510	22	80	27
		40 < t ≤ 100	215~335	400~510	24	80	27
	C	6 ≤ t < 12	235	400~510	18	80	27
		16 ≤ t ≤ 40	235~355	400~510	18	80	27
40 < t ≤ 100		215~335	400~510	24	80	27	
SN490	B	6 ≤ t < 12	325	490~610	17	-	-
		12 ≤ t ≤ 16	325~445	490~610	17	80	27
		16 < t ≤ 40	325~415	490~610	21	80	27
		40 < t ≤ 100	295~415	490~610	23	80	27
	C	T=16	325	490~610	17	80	27
		16 < t ≤ 40	325~445	490~610	21	80	27
40 < t ≤ 100	295~415	490~610	23	80	27		

SN Steel for Building Structure

Comparison with Conventional Steels

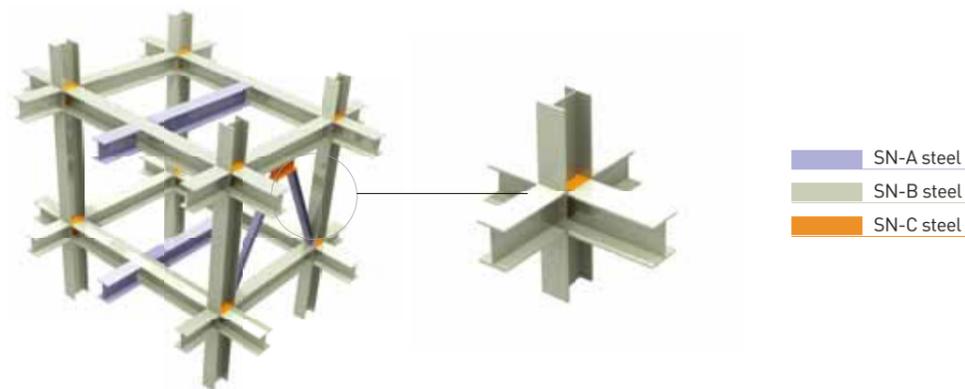
Grade	Struc. Calculation Strict Minus Tolerance	Quality of Weldment				Plastic Deformation		Through Thickness Quality		
		Upper C	Charpy	P _{≤0.030%} S _{≤0.015%}	Ceq, P _{CM}	Yield Ratio	Upper Y.S.	P _{≤0.030%} S _{≤0.015%}	Reduction of Area	UT
SS400	-	-	-	-	-	-	-	-	-	-
SM400A, SM490A	-	●	-	-	-	-	-	-	-	▲
SM400B, SM490B	-	●	●	-	-	-	-	-	-	▲
SM400A	●	●	-	-	-	-	-	-	-	-
SN400B, SN490B	●	●	●	●	●	●	●	-	-	▲
SN400C, SN490C	●	●	●	●	●	●	●	●	●	●

1) ● = OK, ▲ = not satisfied, - = indefinite

2) SN400B, SN490B yield Point : 120N/mm² at over 12mm thick

SN Steel Usage : Structural Steel for Building

Type A (SN400A)	Applicable for structural members and parts that do not exhibit plastic behavior, such as beam, in-fill beam, roof frame. applicable for, even if limited, structurally significant members welded in field.
Type B (SN400B, 490B)	Applicable for general structural members and connections, except for the members where SN400C and SN490C are utilized.
Type C (SN400C, 490C)	Applicable for skip plates of built-up box columns and structural parts subjected to high-heat-input-welding and high tension force to the direction of thickness, such as diaphragm.



B-H columns with Damper

Details of beam-column Connection

PILAC Steel for Building Structure

PILAC-BT (Posco In Line Accelerated Cooling-Building high Tensile)

Pilac-BT is used primarily in making H-Beam and Box column, which have high yield strength and weldability.

Chemical Composition

Grade	Thickness	Element(%Max.)					Ceq (%Max.)	Pcm (%Max.)
		C	Si	Mn	P	S		
PILAC-BT33(SM490TMC)	6 ≤ t ≤ 50	0.18	0.55	1.60	0.020	0.010	0.38	-
	50 < t ≤ 80	0.20	0.55	1.60	0.020	0.010	0.40	-
PILAC-BT36(SM520TMC)	9 ≤ t ≤ 50	0.18	0.55	1.60	0.020	0.010	0.40	0.26
	50 < t ≤ 80	0.20	0.55	1.60	0.020	0.010	0.42	0.27
PILAC-BT45(SM570TMC)	12 ≤ t ≤ 100	0.18	0.55	1.60	0.020	0.010	0.44	0.28
PILAC-BT66(HSA800)	16 ≤ t ≤ 80	0.20	0.55	3.0	0.015	0.006	0.60	0.30

Ceq(%) = C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14

Pcm(%) = C+Si/30+(Mn+Cu+Cr)/20+Ni/60+Mo/15 + V/10+5B

Mechanical Properties

Grade	Tensile Test						Impact Test(longitudinal) Absorbed Energy	Tensile Test Z-Direction Reduction of Area(Min.)		
	YS (Min.,MPa)	TS (MPa)	YR (Max.,%)	Elongation(Min.)				Thickness	Avg	Individual
				Thickness	Test Piece	%				
PILAC-BT33 (SM490TMC)	325	490~610	80	6 ≤ t ≤ 16	No.1A	≥ 17	≥ 47J@0°C	16 ≤ t ≤ 80	25	15
				16 < t ≤ 40	No.1A	≥ 21				
				40 < t ≤ 80	No.4	≥ 23				
PILAC-BT36 (SM520TMC)	355	520~640	85	9 ≤ t ≤ 16	No.1A	≥ 15	≥ 47J@0°C	16 ≤ t ≤ 80	25	15
				16 < t ≤ 40	No.1A	≥ 19				
				40 < t ≤ 80	No.4	≥ 21				
PILAC-BT45 (SM570TMC)	440	570~720	85	12 ≤ t ≤ 16	No.5	≥ 19	≥ 47J@-5°C	16 ≤ t ≤ 80	25	15
				16 < t ≤ 20	No.5	≥ 26				
				20 < t ≤ 80	No.4	≥ 20				
PILAC-BT66 (HSA800)	650~770	850~950	85	t ≤ 16	No. 5	≥ 15	≥ 47J @ -5°C	16 ≤ t ≤ 80	25	15
				16 < t ≤ 20	No. 5	≥ 22				
				t > 20	No. 4	≥ 16				

HSB Steel for Bridge Structure

HSB (High-performance Steel for Bridge structure)

HSB, customized plate for bridge structures has excellent weldability, strength, toughness compared to previous bridge structure steel.

Chemical Composition

Grade	Thickness (mm)	Element(% ,Max.)								Ceq (% ,Max.)	Pcm (% ,Max.)
		C	Si	Mn	P	S	Cu	Cr	Ni		
HSB500,500L	≤ 100mm	0.18	0.55	1.80	0.020	0.006	-	-	-	0.40	0.20
HSB500W	≤ 100mm	0.18	0.55	1.80	0.020	0.006	0.10~0.50	0.45~0.75	0.05~0.80	0.47	0.22
HSB600,600L	≤ 100mm	0.10	0.55	1.80	0.020	0.006	-	-	-	0.42	0.20
HSB600W	≤ 100mm	0.10	0.65	1.80	0.020	0.006	0.10~0.50	0.45~0.75	0.05~0.80	0.47	0.22
HSB800,800L	≤ 50mm	0.10	0.55	2.20	0.015	0.006	-	-	-	0.55	0.25
HSB800W	≤ 50mm	0.10	0.65	2.20	0.015	-	0.10~0.50	0.45~0.75	0.05~0.80	0.60	0.27
HSA800	≤ 60mm	0.20	0.55	3.0	0.015	0.006	-	-	-	0.60	0.30

Ceq(%) = C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14

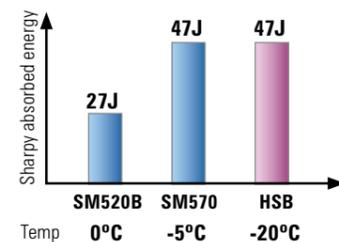
Pcm(%) = C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B

* L : Low Temperature, W: Weathering

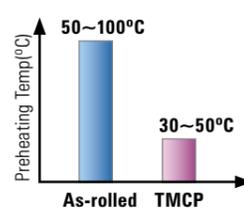
Mechanical Properties

Grade	Thickness (mm)	Tensile Test					Impact Test (longitudinal)	
		YS (Min.,MPa)	TS (MPa)	Elongation(Min.)			Absorbed Energy	
				Thickness	Test Piece	%		
HSB500	t ≤ 100	≥ 380	≥ 500	t ≤ 16	1A	≥ 15	≥ 47J @-5°C	
HSB500L				16 < t ≤ 40	1A	≥ 19	≥ 47J @-20°C(Low Temp)	
HSB500W				t > 40	No. 4	≥ 21	≥ 47J @-5°C	
HSB600	t ≤ 100	≥ 450	≥ 600	t ≤ 16	No. 5	≥ 19	≥ 47J @-5°C	
HSB600L				16 < t ≤ 20	No. 5	≥ 26	≥ 47J @-20°C(Low Temp)	
HSB600W				t > 20	No. 4	≥ 20	≥ 47J @-5°C	
HSB800	t ≤ 50	≥ 690	≥ 800	t ≤ 16	No. 5	≥ 15	≥ 47J @-20°C	
HSB800L				16 < t ≤ 20	No. 5	≥ 22	≥ 47J @-40°C(Low Temp)	
HSB800W				t > 20	No. 4	≥ 16	≥ 47J @-20°C	
HSA800	t ≤ 60	650~770	800~950	t ≤ 60	No. 4	≥ 16	≥ 47J @-5°C	

Charpy Test



Weldability



* More than TMCP 600MPa grade high strength materials must conform y-groove test results.

Additional Guaranteed Quality

Grade	Z-direction Characteristics(Z-RA, %)			Ultrasonic Test Thickness Test Method* (mm)	Additional Guarantee	Manufacturing Method
	Thickness (mm)	Individual Min.	Average Min.			
SS490	Not evaluated			Upon customer's request	-	As-Rolled
SM490	Upon customer's request			Upon customer's request	-	As-Rolled
SM520(B,C)	Upon customer's request			Upon customer's request	-	As-Rolled(Nor')
PILAC-BT33	16 ≤	15	25	Upon customer's request	YR,Ceq	TMCP
PILAC-BT36	16 ≤	15	25	Upon customer's request	YR,Ceq	TMCP
SN490 B	16 ≤	15	25	13~100 KS D 0040 Upon customer's request	YR,Ceq	As-Rolled
SN490 C	16 ≤	15	25	16~100 KS D 0040(mandatory)	YR,Ceq	(B,C Nor')
HSB500	Upon customer's request			Upon customer's request	-	TMCP
HSB500L	Upon customer's request			Upon customer's request	-	TMCP
SS540	Not evaluated			Upon customer's request	-	As-Rolled
SM570(QT)	Upon customer's request			Upon customer's request	-	QT
PILAC-BT45	16 ≤	15	25	Upon customer's request	Ceq	TMCP
HSB600 HSB600L	Upon customer's request			Upon customer's request	-	TMCP
HSB800 HSB800L	Upon customer's request			Upon customer's request	-	TMCP
PILAC-BT66 HSA800	16 ≤	15	25	Upon customer's request	YR,Ceq	TMCP

KS D0040 is equivalent to JIS G 0901.

EN10025 Structural Steel

Chemical Composition

Grade	Element (max., %)										CEV (Max.,%) t=30t
	C			Si	Mn	P	S	N	Cu	Others	
	16 ≤ t	16 < t ≤ 40	40 < t								
S235JR	0.17	0.17	0.20	-	1.40	0.035	0.035	0.012	0.55	-	0.35
S235J0	0.17	0.17	0.17	-	1.40	0.030	0.030	0.012	0.55	-	0.35
S235J2	0.17	0.17	0.17	-	1.40	0.025	0.025	-	0.55	-	0.35
S275JR	0.21	0.21	0.22	-	1.50	0.035	0.035	0.012	0.55	-	0.40
S275J0	0.18	0.18	0.18	-	1.50	0.030	0.030	0.012	0.55	-	0.40
S275J2	0.18	0.18	0.18	-	-	0.025	0.025	-	0.55	-	0.40
S355JR	0.24	0.24	0.24	0.55	1.60	0.035	0.035	0.012	0.55	-	0.45
S355J0	0.20	0.20	0.22	0.55	1.60	0.030	0.030	0.012	0.55	-	0.45
S355J2	0.20	0.20	0.22	0.55	1.60	0.025	0.025	-	0.55	-	0.45
S355K2	0.20	0.20	0.22	0.55	1.60	0.025	0.025	-	0.55	-	0.45
S355NL	0.18	0.18	0.18	0.50	0.90~1.65	0.025	0.02	0.015	0.55	Ti,Al,V,Nb	0.45
S355ML	0.14	0.14	0.14	0.50	1.60	0.025	0.02	0.015	0.55	Ti,Al,V,Nb	0.45
S420ML	0.16	0.16	0.16	0.50	1.70	0.025	0.02	0.025	0.55	Al,Nb,Ni,Cr,Ti	0.45
S450J0	0.20	0.20	0.22	0.55	1.70	0.030	0.030	0.025	0.55	-	0.47
S460ML	0.16	0.16	0.16	0.60	1.70	0.025	0.02	0.025	0.55	Al,Nb,Ni,Cr,Ti	0.46

Mechanical Properties

Grade	Strength at t=16t		Charpy V-Notch longitudinal		Elongation (L ₀ =5.65√S ₀)			EN10025 :1993	BS4360 :1990			
	YP(Reh) (MPa)	TS(Rm) (MPa)	Temp (°C)	Absorbed Energy(J)	Position	L ₀ =5.65√S ₀		Grade	Grade			
						t≤40	40<t≤63					
S235JR	235	360/510	20	27	L	26	25	S235JR(G1/G2/AR)	40B			
S235J0			0	27				T	24	23	S235J0(AR)	40C
S235J2			-20	27							S235J2(G3/G4/AR)	40D
S275JR	275	410/560	20	27	L	23	22	S275JR	43B			
S275J0			0	27				T	21	20	S275J0	43C
S275J2			-20	27							S275J2G3/G4	43D
S355JR	355	470/630	20	27	L	22	21	S355JR	50B			
S355J0			0	27				T	20	19	S355J0	50C
S355J2			-20	27							S355J2G3/G4	50D
S355K2			-20	40							S355K2G3/G4	50DD
S355NL	355	470/630	-50	27	T	22	22	S355NL	-			
S355ML			-50	27				S355ML	-			
S420ML	420	520/680	-50	27	T	19	19	-	-			
S450J0	450	550/720	0	27	L	17	17	-	-			
S460ML	460	540/720	-50	27	T	17	17	-	-			

Steel Plate for Mechanical Structure

Usage	Spec	Thickness	Manufacturing method
Mechanical Structure	S10C	≤ 105t	As-rolled
	S20C	≤ 100t	
	S30C	≤ 70t	
	S40C, S50C	≤ 105t	
	S40C, S45C, S55C	≤ 200t * Strict internal quality assurance : ≤ 150t	
	SCM440	≤ 80t	As-rolled
Mold	POSMOLD1	≤ 70t	Normalized
	POSMOLD2	≤ 80t	

[POSMOLD] Steel for Mold

Grade	Element (%Max.)					Remark (POSMOLD)
	C	Si	Mn	P	S	
POSMOLD1	0.47~0.53	0.15~0.35	0.60~0.90	0.030	0.020	POSCO MOLDBASE
POSMOLD2	0.38~0.43	0.15~0.35	0.60~0.85	0.030	0.020	

[POS-AG] Steel Plate for Zinc Pot

Grade	Thickness(mm)	Element (%Max.)				
		C	Si	Mn	P	S
POS-AG	6~80	0.20	0.05	0.20~0.40	0.010	0.010

Abrasion-Resistant Steel

Chemical Composition

Grade	Thickness(mm)	Element(% ,Max.)								Ceq (% ,Max.)
		C	Si	Mn	P	S	Cu	Cr	Others	
POS-AR320	9~50	0.20	0.5	1.5	0.025	0.015	0.5	0.8	Mo, Ni, Cu, V, Ti, B Added	0.56
POS-AR360LC	12~40 +(6~10T)	0.18	0.5	1.4	0.025	0.015	0.1	0.8		0.53
POS-AR400	12~50	0.25	0.5	1.5	0.025	0.015	-	0.8		0.58
POS-AR500LC	12~50	0.35	0.5	1.4	0.025	0.015	0.1	0.8		0.65

*Ceq(%) : C+Mn/6+(Cu+Ni)/15+(Cr+Mo+V)/5

Mechanical Properties

Grade	Tensile Test			Impact Test	Surface Hardness(HB)	Bendability	Heat Treatment
	YS(Min., MPa)	TS(MPa)	El(%)	CVN@-40°C(J)			
AR360LC	≥ 1000	≥ 1200	≥ 15	≥ 27(reference)	360~440	180°, r=3.0t	Q

Equivalent Standard

Company	Spec	Thickness(mm)	POSCO Equivalent Spec
SSAB (Sweden)	HARDOX 400	3~130	POS AR360LC

High Strength Steel for Welded Structure (POSTEN)

Chemical Composition

Grade	Thickness(mm)	Element(% ,Max.)								Ceq (% ,Max.)
		C	Si	Mn	P	S	Cr	Others		
POSTEN55H	9~17	0.18	0.55	1.6	0.035	0.035	-	-	-	0.47
POSTEN60	6~80	0.16	0.15~0.55	1.50	0.030	0.025	0.30	-	Ni,Mo,V Added	(t ≤ 50) 0.44 (T > 50) 0.47
POSTEN60RE	6~25	0.12	0.15~0.55	2.0	0.030	0.030	-	-	Ti,Nb,V Added	0.45
POSTEN60FW	6~40	0.08	0.15~0.55	1.60	0.030	0.030	0.25	-	Ni,Mo,V,Ti Added	0.43
POSTEN70TM	10.01~40	0.1	0.5	2.8	0.025	0.030	-	-	Nb,Ni,Ti,Cr Added	0.60
POSTEN80	8~70	0.16	0.15~0.35	1.20	0.030	0.030	0.4~0.8	-	Cu,Ni,Mo, V Added	0.60
POSTEN80TM	16~60	0.10	0~0.55	2.2	0.030	0.030	0.8	-	Cu,Nb,Ni,Mo, V,Ti Added	0.55
POSTEN100	10~50	0.16	0.15~0.35	1.20	0.030	0.030	0.4~0.8	-	Cu,Nb,B,Ni,Mo, Ti,V Added	0.70
POSTEN100TM	8~70	0.16	0.15~0.35	1.20	0.030	0.030	0.4~0.8	-	Cu,Nb,Ni,Cr, Mo,Ti,V Added	0.60

Ceq(%)=C+Mn/6+Si/24+Ni/40+Cr/5+Mo/4+V/14

Pcm(%)=C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B

Mechanical Properties

Grade	Tensile Test					Impact Test		Heat Treatment
	YS (Min.,MPa)	TS (MPa)	EL			Temp (°C)	Energy (J)	
			Thickness	TestPiece	%			
POSTEN55H	393	540(Min.)	t ≤ 16	No.4	19	-5	49(>12t)	TMCP
			16 < t	No.4	26			
POSTEN60	450	590/710	t ≤ 16	No.4	20	-5	47(>12t)	QT/DQT
			16 < t ≤ 20	No.4	28			
			20 < t	No.4	20			
POSTEN60RE	450	590/710	t ≤ 16	No.4	20	-5	47(>12t)	TMCP
			16 < t	No.4	20			
			t ≤ 16	No.4	18			
POSTEN60FW	491	609/735	16 < t ≤ 20	No.4	25	-10	47(>12t)	QT
			20 < t	No.4	19			
			6 ≤ t ≤ 16	No.4	11			
POSTEN70TM	550	550(Min.)	16 < t ≤ 20	No.4	16	-40	10	TMCP
			20 < t ≤ 40	No.4	12			
			t ≤ 16	No.4	16			
POSTEN80	686	785/930	16 < t ≤ 20	No.4	24	-20	36	QT/DQT
			20 < t ≤ 65	No.4	16			
			65 < t	No.13	16			
			t ≤ 16	No.4	16			
POSTEN80TM	690	795/930	16 < t ≤ 20	No.4	16	-20	36	TMCP
			20 < t	No.13	16			
POSTEN100	885	950/1130	6 ≤ t ≤ 16	No.4	14	-20	27	QT
			16 < t ≤ 20	No.4	22			
			20 < t ≤ 50	No.4	14			
POSTEN100TM	885	950/1130	10 ≤ t ≤ 16	No.4	11	-20	27	TMCP
			16 < t ≤ 20	No.4	16			
			20 < t ≤ 35	No.13	12			

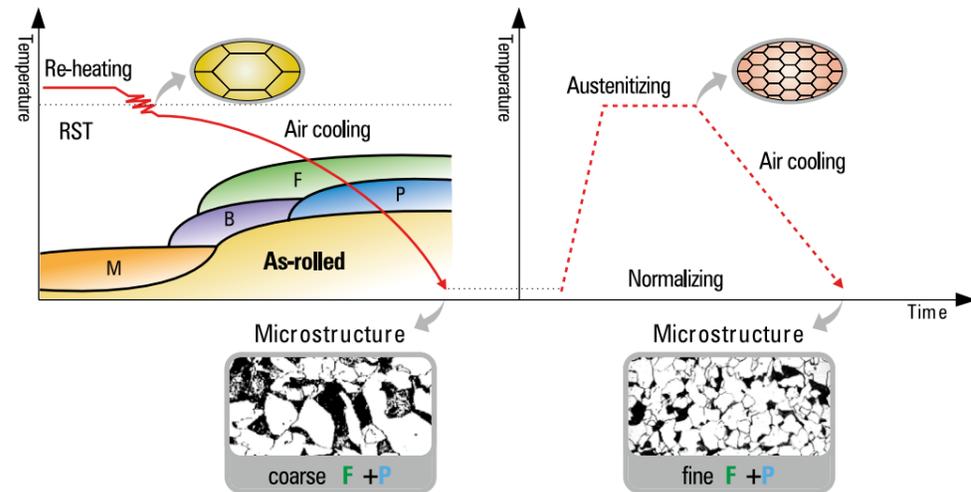
TMCP Steel

Introduction

TMCP(Thermo-Mechanical Control Process) Steel for construction and shipbuilding is manufactured by controlled rolling and subsequent rapid cooling with low alloy contents.

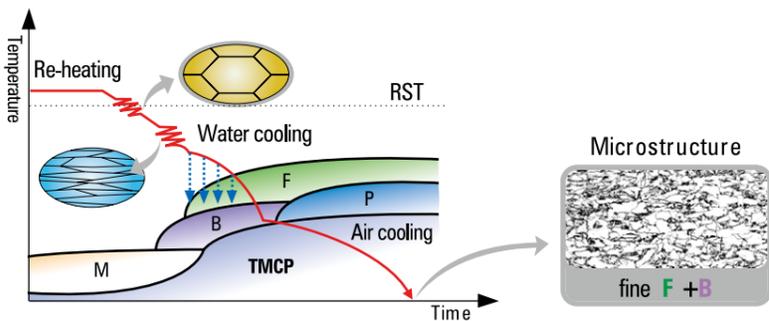
TMCP steel shows excellent strength, toughness and weldability superior to conventional high strength steels produced by heat treatment(normalizing).

Conventional Process (Normalizing)



* RST: Recrystallization Stop Temperature F Ferrite P Pearlite B Bainite M Martensite

TMCP

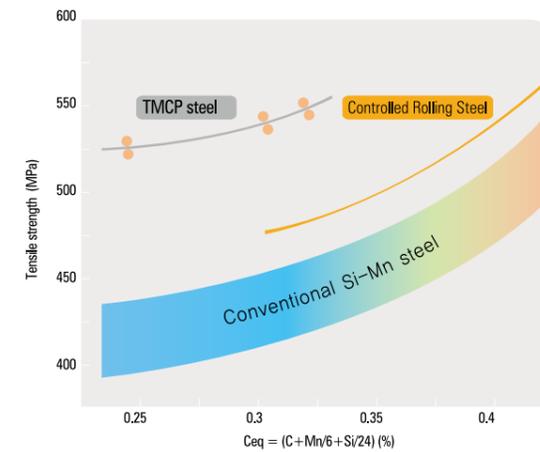


Controlled rolling and cooling processes enable TMCP steel to improve both strength and toughness effectively by refining the microstructures.

Advantages

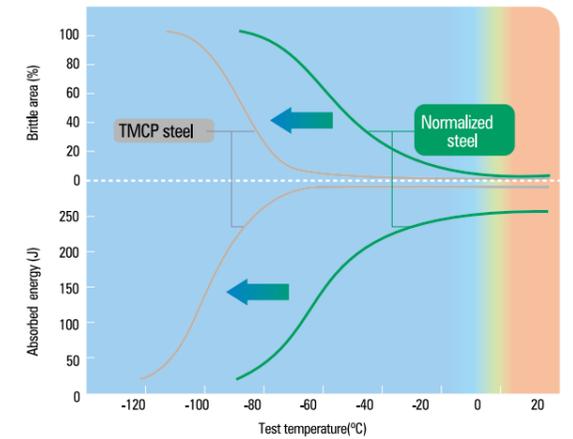
Advantages for manufacturer(shipbuilders) include the lower production costs, higher productivity and shorter project period.

Increased strength by controlled rolling and cooling



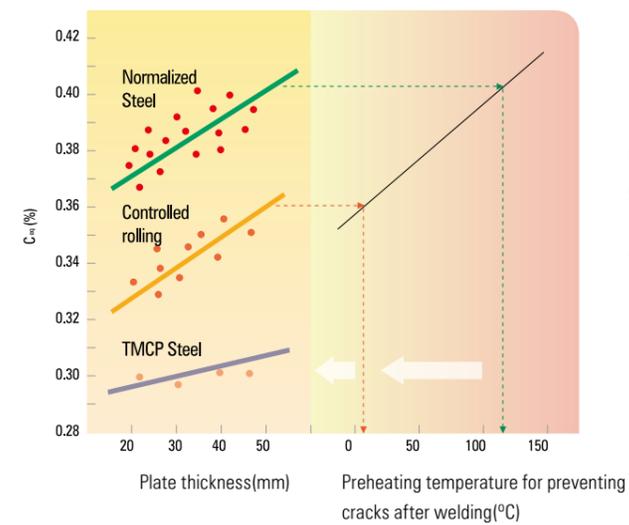
Relation between carbon equivalent and strength by production process.

Improvement of base metal toughness



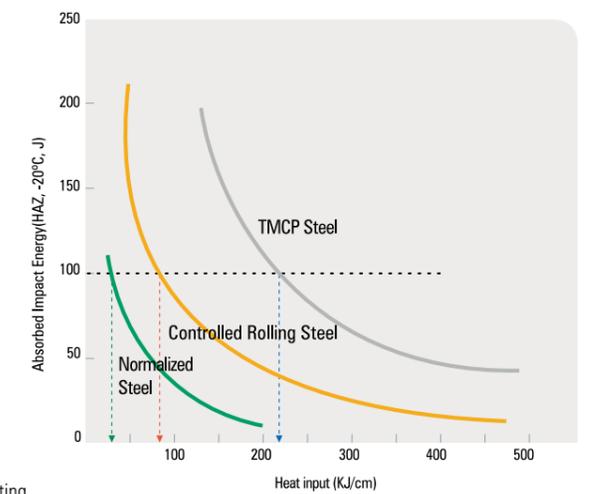
Toughness comparison between TMCP and normalizing process.

No preheating required in welding



HAZ : Heat Affected Zone

Improved HAZ toughness for high heat input welding



List of Mechanical Tests

List	Test	Guaranteed				Reference (R&D Lab's Test)	
		Ship	Offshore	Line Pipe	Pressure Vessel		
Material	Strength, Ductility	Tensile Test	○	○	○	○	-
		Large Scale Tensile Test	-	-	-	-	○
	Formability	UOE Forming Simulator	-	-	-	-	○
	Toughness	Charpy Impact Test	○	○	○	○	-
		Strain Aging Impact Test	○	○	△	-	-
		DWTT(Drop Weight Tear Test)	-	-	△	-	-
		NRL Drop Weight Test	○	○	-	-	-
	Resistance to Lamellar Tear	Through Thickness Tensile Test	○	○	-	○	-
	Abrasion Resistant	Hardness Test	○	○	○	○	-
	Resistance to HIC	Hydrogen Induced Cracking Test	-	-	○	○	-
	SSCC	Sulfide Stress Corrosion Cracking Test	-	-	△	△	○
	High Temperature Strength	High Temperature Tensile Test	○	○	○	○	-
	Creep Characteristic	Creep Test	-	-	-	-	○
	Fracture Toughness	CTOD Test	-	○	○	-	○
		Deep Notch Test	-	-	-	-	○
ESSO Test(Kca)		-	-	-	-	○	
Fatigue Strength & Life	Fatigue Test(S-N curve)	-	-	-	-	○	
Internal Soundness	Internal Defect	Ultrasonic Test(UST)	○	○	○	○	-
	Inclusion	Micrographs	○	○	○	○	○
	Segregation	S-print	-	-	-	-	○
Macro Etching Test		-	△	△	△	○	
Weldability	Welding Hardness	Welding HAZ's Max. Hardness	-	-	-	-	○
		Taper Test	-	-	-	-	○
	Welding Crack	Hardness γ-groove	-	-	-	-	○
	Susceptibility	Weld Bead Bend Test	-	○	-	-	-
Specimen Simulated Heat Treatment	PWHT, SR, HF, Nor'	-	○	△	○	○	

○ Available △ Further Discussion Required

Marking

Marking

Starting Position : 100mm, 360mm or 1,000mm

Marking	Size(mm)	No. of Characters	No. of Lines
Small	34 x 24	24	12
Medium	49 x 34	16	9
Large	69 x 49	12	6
Special	79 x 79	8	6

Side Label Contents

Mandatory : Plate No. + Order No. + Specification + Size

Optional : Stock Lot No., Marking PO, Customer Code, Destination Code, POSCO, Heat No., Net Weight

Color Stroke Method

Color : Yellow, White, Red

Number of Lines : Max. 3 Lines/color

Die Stamping Contents

Mandatory : Plate No.

Optional : Heat No., Classification Society Mark, Grade, POSCO

* Grade marking is available only for Shipbuilding Steel



Unit mm

POSCO Mill Test Certificate

POSCO guarantees to provide mill test certificate to its customers.

The original copy of mill test certificate is available at www.steel-N.com



Mill Test Certificate/검사증명서

Order No./계약번호 : *****
 Supplier /수급사 : *****
 Customer /고객사 : *****

Certificate No./증명서번호 : *****
 Date of Issue/발령일자 : *****

PO No./주문번호 : *****
 Commodity : STEEL PLATES
 Spec & Type : TOTAL S355KT-40 Z35

PO No./주문번호 : *****
 Commodity : STEEL PLATES
 Spec & Type : TOTAL S355KT-40 Z35

Spec/과구	Product No. 제품번호	Quantity 수량	Weight 중량 (kg)	Heat No. 재열번호	Position	Tensile Test 인장시험				Z-Direction Tensile Test			Impact Test 충격시험 V Notch -40°C Energy (Joules)	U.S.T	Division	Chemical Composition/화합성분 (%)										
						YP (MPa)	TS (%)	EL (%)	YR (%)	TS (MPa)	RA (%)	1				2	3	Avg	C	Si	Mn	P	S	Cr	Ni	B
4003000000	*****	1	9,194	SJ06289	I	495	568	25	87.1	537.9	74	75	74	75	1.314	Good	L	0.0788	0.291	1.554	0.0065	0.0214	0.014	0.011	3	0.012
<p>--- Specimen No: Tension --> KP03000000 Z-Tension --> KP03000000 Impact --> KP03000000</p> <p>--- Sub Total (kg) --- 1 9,194 (kg)</p> <p>--- Heat Treatment ---> Thermo Mechanical Rolling + Accelerated Cooling</p> <p>--- Lot Total --- 1 9,194 (kg)</p> <p>--- Grade Total --- 1 9,194 (kg)</p> <p>--- Grand Total --- 1 9,194 (kg)</p> <p>--- Last Item ---</p>																										

Sample

This Mill Test Certificate can be used only for reference.

본 문서는 견본문서로서 용도 외 사용을 엄격히 금합니다.

* Position : T : Top, M : Middle, B : Bottom
 * Tensile Test : Direction : Transversal, Gauge Length : 5.65 x L₀ (Rectangular),
 YP Method : Upper Point
 * Z-Direction Tensile Test (TTT or TTP) : Dia : 10mm
 * Impact Test : Direction : Surface Transversal, Full Size : 10mmX10mm
 * U.S.T (Ultrasonic Test)
 * Division - L : Ladle Analysis, P : Products Analysis
 * Supply Condition : As-Rolled unless otherwise Heat Treated.

We hereby certify that the material herein has been made in accordance with the order and above specification.
 This material has been fully killed and made by basic oxygen process.
 No repair welding was performed to the products.
 This material has been made by vacuum degassing, calcium treated process. This material is fine grained steel.
 Test Certificate is issued according to EN 10204 3.2.

This Mill Test Certificate cannot be copied for any purpose.

Surveyor To : BV(INDUSTRY)

Lee, Yong-Heon

Chief of material testing section Lee, Yong Heon

POSCO Gwangyang Works, 20-26, Pokpocwang-gil, Gwangyang-si, Jeollanam-do, 545-711, Korea

~ PAGE : 1 ~



Mill Test Certificate/검사증명서

Order No./계약번호 : *****
 Supplier /수급사 : *****
 Customer /고객사 : *****

Certificate No./증명서번호 : *****
 Date of Issue/발령일자 : *****

PO No./주문번호 : *****
 Commodity : STEEL PLATES
 Spec & Type : TOTAL S355KT-40 Z35

PO No./주문번호 : *****
 Commodity : STEEL PLATES
 Spec & Type : TOTAL S355KT-40 Z35

Product No. 제품번호	Division	Mo	N	Nb	Ti	V	Total-N	ClO	PCM	Chemical Composition/화합성분 (%)	
										C	S
*****	L	0.021	27	0.020	0.0109	0.002	0.026	0.393	0.170	0.002	0.100
*****	P	0.002	26	0.019	0.0108	0.002	0.026	0.393	0.160	0.002	0.100
<p>--- Sub Total (kg) --- 1 9,194 (kg)</p> <p>--- Lot Total --- 1 9,194 (kg)</p> <p>--- Grade Total --- 1 9,194 (kg)</p> <p>--- Grand Total --- 1 9,194 (kg)</p> <p>--- Last Item ---</p>											

Sample

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~ PAGE : 2 ~

Global Sales Network (Plate)

We designate one trading company per customer.

● POSCO Sales Corp.

POSCO-China	Beijing	+86-10-5166-6677
	Shanghai	+86-21-6091-2788(ext200)
	Qingdao	+86-532-8683-8362
	Guangzhou	+86-2-3891-1630
POSCO-CDPPC	Dalian	+86-411-3911-3601
POSCO-Asia	Hongkong	+852-9469-4546
POSCO-Japan	Osaka	+81-6-6214-1622
	Tokyo	+81-3-3546-1234
	Nagoya	+81-52-219-9231
POSCO-America	New Jersey	+201-585-3064
POSCO Southasia	Bangkok	+66-2-654-3600
	Jakarta	+62-21-3000-3809
	Kuala Lumpur	+603-2260-3226
	Delhi	+91-12-4476-7500
	Chennai	+91-98400-50545
	Hanoi	+84-4-3771-3208

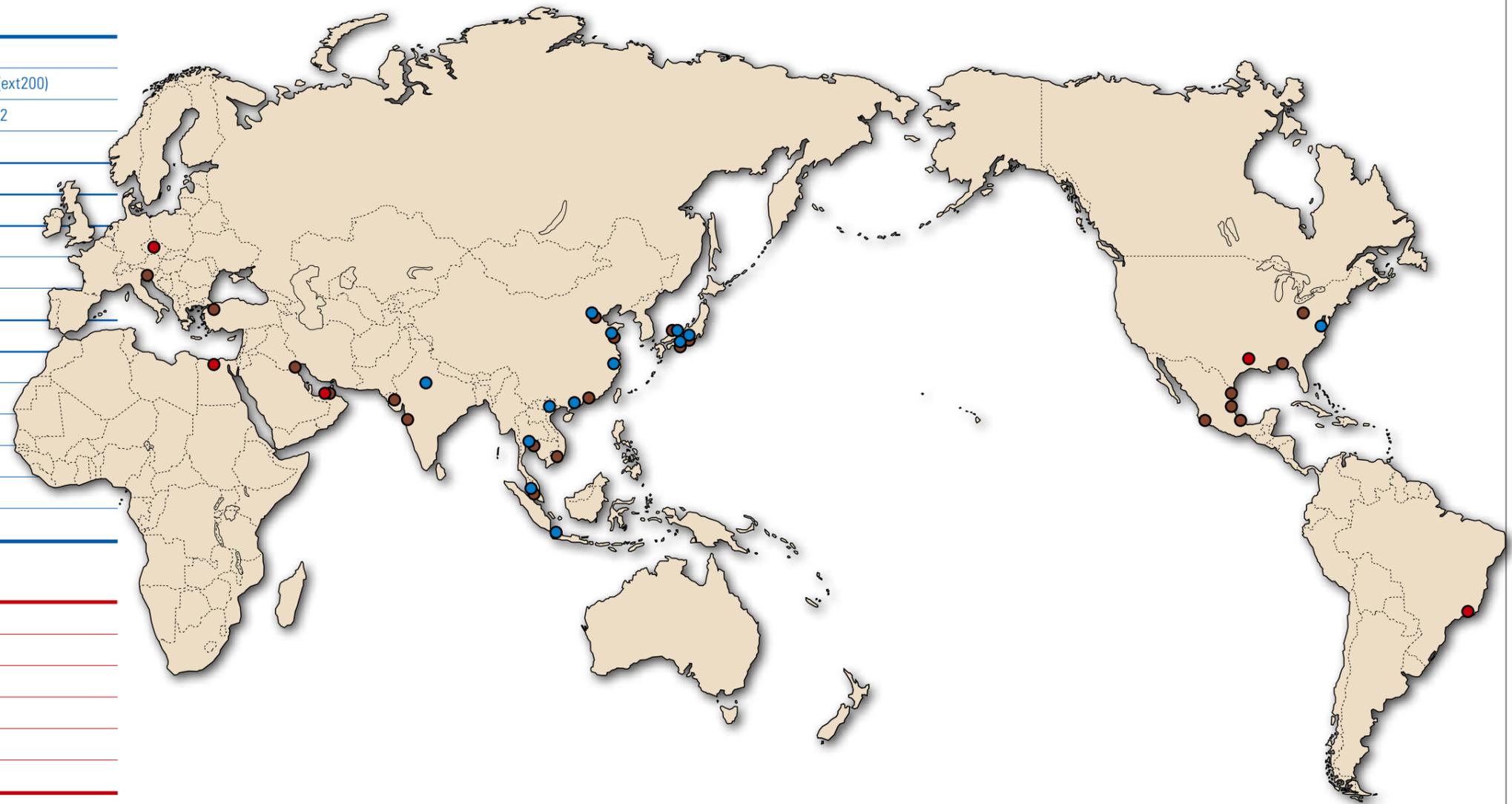
● POSCO Overseas Office

EU	+49-211-435-300
Prague	+420-246-088-360
Dubai	+971-4-221-8280
Cairo	+20-2-2750-7436
Rio de Janeiro	+55-21-2543-6132
Houston	+1-713-979-3946

Providing technical services only

Trading Corp.

POSCO P&S	+82-2-3469-6214
Daewoo International	+82-2-759-2847, 2312
Samsung Corporation	+82-2-2145-3280
Hyosung	+82-2-707-8631
SK Networks	+82-70-7800-2325
Hyundai Corporation	+82-2-390-1677
GS Global	+82-2-2005-5202
LG International Corp.	+82-2-3773-5417
Trans-Pacific Resource Ltd.	+82-2-773-9210(209)
Yoosung Corp.	+82-2-756-6573
KS International	+82-2-551-2803
Steel N People	+82-2-508-5157



● Allocation Pattern by Export Region(CNF)

Region	Main Port	Allocation Cycle	Vessel Size(DWT-base)
China	Beijing, Shanghai, Hong Kong	3times/month	3~5 thousand tons
Japan	Osaka, Tokyo, Nagoya	3times/month	2~3 thousand tons
Southeast	Vung Tau, Laem Cha Bang, Port Kelang	1~3times/month	25~30 thousand tons
Southwest	Bombay, Kandla, Mundra, Chennai	2 times/month	20~30 thousand tons
Middle-east	Kuwait, Dubai	once/month	40~50 thousand tons
Europe	Koper, Ravenna, Gemlik	once/month	40~50 thousand tons
North America	Mobile, Pittsburgh, Brownsville	once/month	40~50 thousand tons
Latin America	Manzanillo, Veracruz, Altamira	2 times/month	40~50 thousand tons

Negotiation with POSCO Salesman is needed regarding discharging port and maritime transportation terms.

Freight rate : Quarter-based rate reflecting oil price and shipping market conditions

STEEL PLATES

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Jeollanam-do 545-711, Korea
TEL 061) 790-0114
FAX 061) 790-7000

posco

www.posco.com

www.steel-n.com

WIRE ROD



WIRE ROD



Contents

Pohang Steelworks	04
Manufacturing Process & Equipment	06
Introduction to POSCO Wire Rod Plants	08
Quality Testing	09
Applications	10
Quality Assurance	12
Specifications	14
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The POSCO Quality

Ultra-High Quality Products Which Touch the Customer's Soul

- **Customer Inside:** We create the best value for customers by keeping their needs foremost.
- **Basic Inside:** We focus on fundamentals and principles, eliminating deviation and waste.
- **Synergy Inside:** We seek to grow alongside our supplier chain through trust and communications.

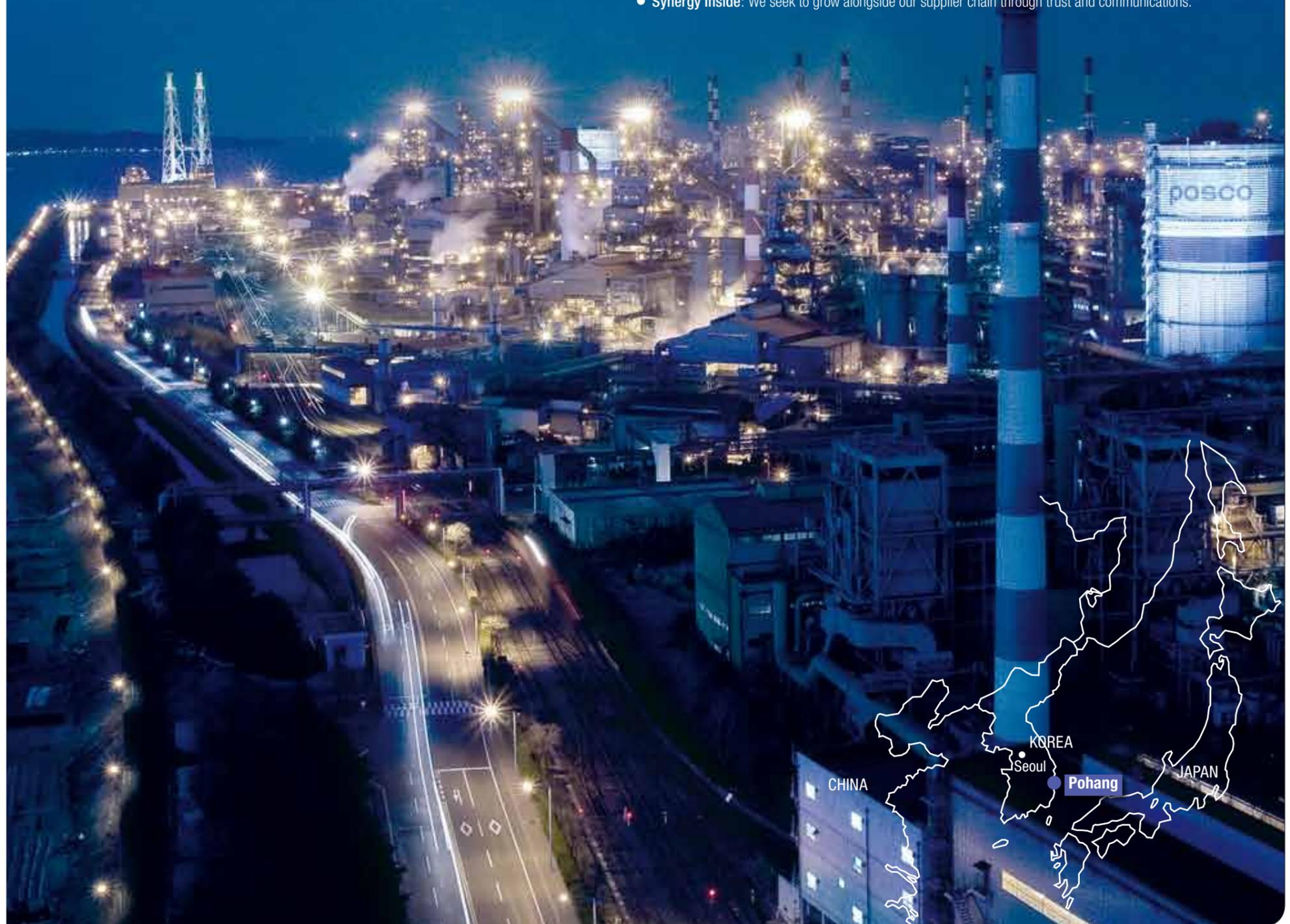


Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.

POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products hot-rolled steel, plate, cold-rolled steel, wire rod, electrical steel, stainless steel, API steel, etc.

Crude steel production 16.185 million tons (as of 2013)



Manufacturing Processes & Equipment

In order to deliver quality products POSCO is equipped with the latest fully-automated, computer-controlled, cutting-edge facilities and technologies. These tools guarantee products of the highest precision and quality for our customers.



Billet Conditioning

To improve the surface quality of wire rods, billets are descaled by shot blasting, and inspected for surface flaws by magnetic particle tester. Grinding machines are used to remove any surface flaws. In addition, continuous ultrasonic testing is conducted to guarantee the prime quality



Reheating

Reheating furnace is carefully examined, to produce prime materials in customers' desired properties. To prevent decarburization, billets are preheated at a low temperature, followed by a full heating process, to suit a right temperature for billets' rolling procedure. The rolling speed and fuel-to-air ratio in the reheating furnaces are fully controlled.



Rolling

The rolling procedure must be carefully controlled, to adjust temperature, pressure and deformation rate to form customers' desired characteristics. Moreover, surface roughness, sizes, and deviations are subject to adjustment to prevent any flaws.



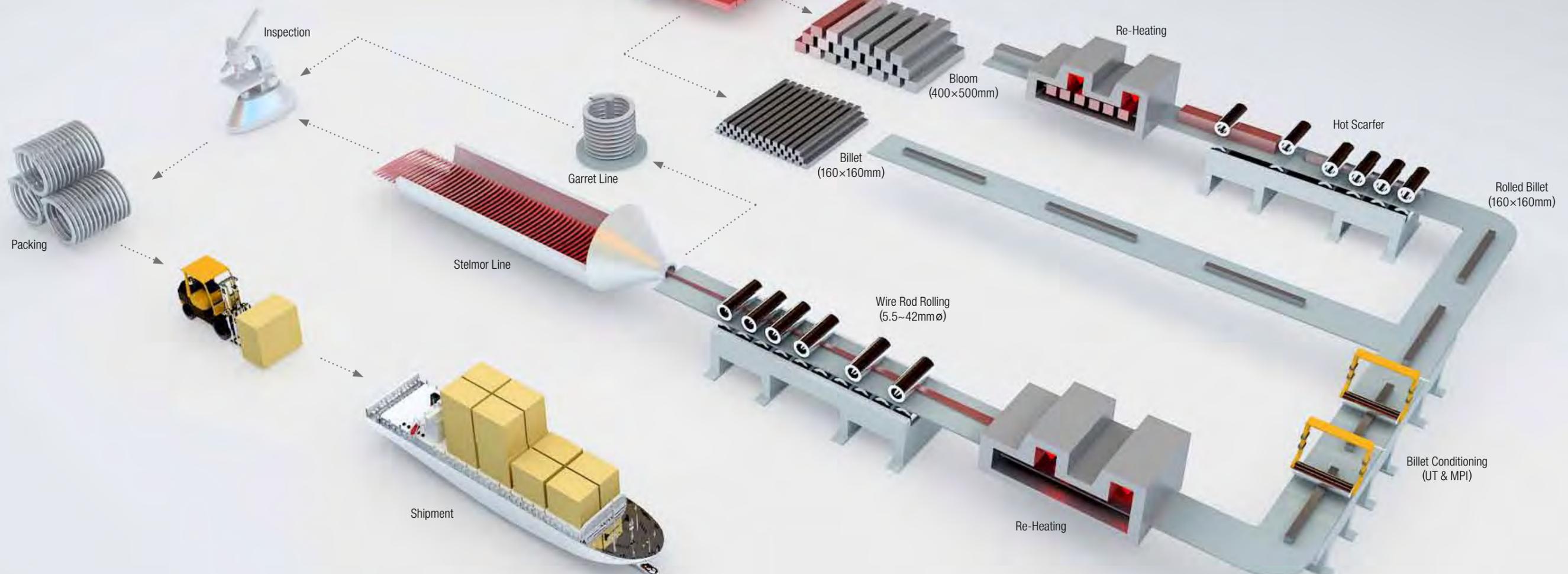
Cooling

Precise control of temperature, air volume, speed, opening and closing of slow-cooling sections are all variables that affect physical properties. Uniform fast-cooling methods are used for high carbon steel wires, and slow-cooling method is applied for alloy and low-carbon steel.



Inspection

Samples of leading and trailing edges of wire rods are collected for quality assurance tests, which include surface flaw detection. Once wire rods are deemed prime, products are then packaged and tagged to clients' requirements.



In order to produce high-quality products, our plants are equipped with state-of-the-art facilities and utilize the latest processing techniques.

POSCO's wire rod products, renowned for their quality, are used in a number of areas, ranging from very basic industrial materials to specialized manufacturing facilities equipment. Through the use of cutting-edge facilities and automated systems, POSCO maintains consistent efforts in the development and manufacture of higher quality wire rod products.

Division		#1 Wire Rod Mill	#2 Wire Rod Mill	#3 Wire Rod Mill	#4 Wire Rod Mill
Production Capacity (10 thousand tons)		70	55	88	80
Billets	Unit Weight (tons)	2	2	2	2
	Size(mm)	160×160×10,200	160×160×10,200	160×160×10,200	160×160×10,200
Wire Rod Size(mmΦ)		5.5~13.0	5.5~42.0	5.5~16.0	5.5~22.0
Rolling Mills' Strand	Strand	2	1	2	1
	Type	Horizontal	Horizontal, Vertical	Horizontal, HV	Horizontal, Vertical
	Pass	30	31	31	30
	Line Speed (m/sec)	75	95	110	110
Size(mm)	Capacity(T/H)	110	80	140	150
	Type	Walking Beam	Walking Beam	Walking Beam	Walking Beam
Cooling Equipments		Stelmor	Stelmor, Garret	Stelmor	Stelmor
Major Products		Low Carbon Steel / High Carbon Steel / High Tensile Steel / Free-cutting Steel / Tire Cord Steel	Piano Wire Rods / Bearing Steel / Spring Steel / Welding Steel / Free-cutting Steel / Tire Cord Steel / Carbon Steel for Cold Heading & Forging, Low-alloyed Steel / Carbon Steel for Machine Structural Use		

Accurate Inspection Conducted Prior to Delivering Good Quality Products.

Since the inspections during all the production processes from steelmaking via billet rolling to wire rod rolling are accurately conducted by the computers, All the products are produced in prime. Dimensional accuracy of the end product is assured through continuous, automated inspection processes. In addition, in order to produce superior wire rods, it goes through various kind of final product.

Test Item	Up-Set	Tensile Strength	Reduction of Area	Segregation	Decarburization	Cleanness Level	Structure
Low Carbon Steel Wire Rod	○	-	-	-	-	-	-
High Carbon Steel Wire Rod Piano Wire Rods	○	○	△	○	△	○	○
	○	○	○	○	○	○	○
Steel for Cold Heading & Forging							
Carbon Steel for Machine Structural Use	○	△	-	△	○	○	-
Free-Cutting Steel							
Bearing Steel	○	△	△	○	○	○	○
Spring Steel							

Applications

Low Carbon Steel

As a low carbon steel product containing 0.06~0.22% of C-content, it is used for producing various kinds of galvanized steel wires, nails and iron nets, etc.

- **POSCO** POSFIS5M1, 6M1, 6B
- **JIS** SWRM6~22
- **SAE** 1006~1022
- **DIN** D5-1, D9-1
- **ASTM** A510

High Carbon Steel

As a high carbon steel product, it is required to control the fine pearlite, in order to secure the maintenance of high strength and wire extendibility. It is used for wire ropes, precision springs, bead wires and common PC steel wires, etc.

- **JIS** SWRH27~82A/B
- **SAE** 1026~1095
- **BS** D26-2, 95-2

Piano Wire Steel

It is mainly used in applications for high-strength bead wires, LR PC steel wires, and music wires. It is a high carbon clean steel with extendibility of micro-wire, high strength and superior fatigue resistance.

- **POSCO** POSCABLE82, 86, 90, 92
POSMICRO62
- **JIS** SWRS62A/B~92A

Low-alloyed Steel

Material used for tightening major machine parts such as high strength bolts, nuts shafts & etc. Therefore, it is made with a high strength product added with alloying elements Cr, Ni and Mo and, etc.

- **POSCO** POSCM435, 440C, POSCH45FCR, POSCM13
POSMA45RM, POSTEN20W, 30W
- **JIS** SCR415~440/H, SCR415, 420, 440
- **SAE** 1541, 4037, 4140, 8740H

High Tensile Strength Steel

PC steel bar used for concrete utility poles and piles. It is the carbon steel for machine structural application added with small quantity of Boron or large quantity of Si. And it has a high elastic constraint and good tension release capability compared to common steel products.

- **POSCO** PSPC22, 30B~35B, 30SI~35SI, 32SIB/32SIBM
- **SAE** 10B30~35

Steel for Welding Wire

It is necessary to micro-control the elements to guarantee the welding performance and the material characteristics of deposited metal. And in order to secure the wire extendibility, TS bias control and slow-cooling of wire rods are applied. This product is used for CO2 electrodes, submerged and common ones, etc.

- **POSCO** POSWELD1A/1B/1CM, 2A/2B/2J/2S, 4B/4D, 23/41/50/60
- **JIS** SWRY11, SWRY11L

Carbon Steel for Cold Heading & Forging

Carbon steel wire rods made from cold forging are used for a wide range of applications, such as automobile components, industrial machinery, bolt, nut screw, in ways of cold-rolling, forging and extrusion, etc.

- **POSCO** POSCH6ASP
- **JIS** SWRCH6A~22A, 10K~50K
- **SAE** 1006~1060

Free-cutting Steel

As a kind of steel with which the machine capability is enhanced with some added free-cutting P and S etc., it is used for some materials of automobiles and home electronics parts.

- **POSCO** POSCUT1B, 2B, 3B, 1S
- **JIS** SUM11~43
- **SAE** SAE1215, 1146, 1151

⚠ These applications are for general reference only. For your specific application, please consult with our representative specializing in the products you wish to order.

Tire Cord Steel

It is used for automobile tire reinforcement materials, made of stranded codes after a wire extending process, that makes high carbon steel wire rods into micro wires. Diameter range from 0.4~0.15mm, and a strict quality control is implemented to endure the stress incurred from high speed processing.

- **POSCO** POSCORD70, 80, 90, 92CR, 92Si
- **AISI** 1069, 1070, 1080, 1090

Bearing Steel

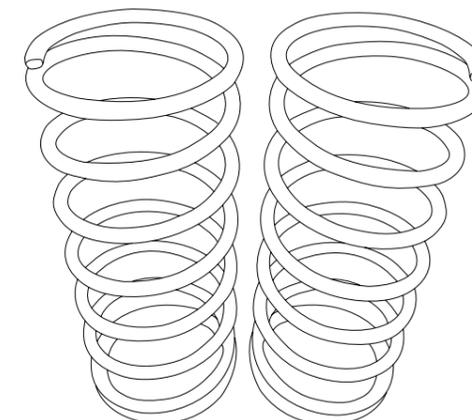
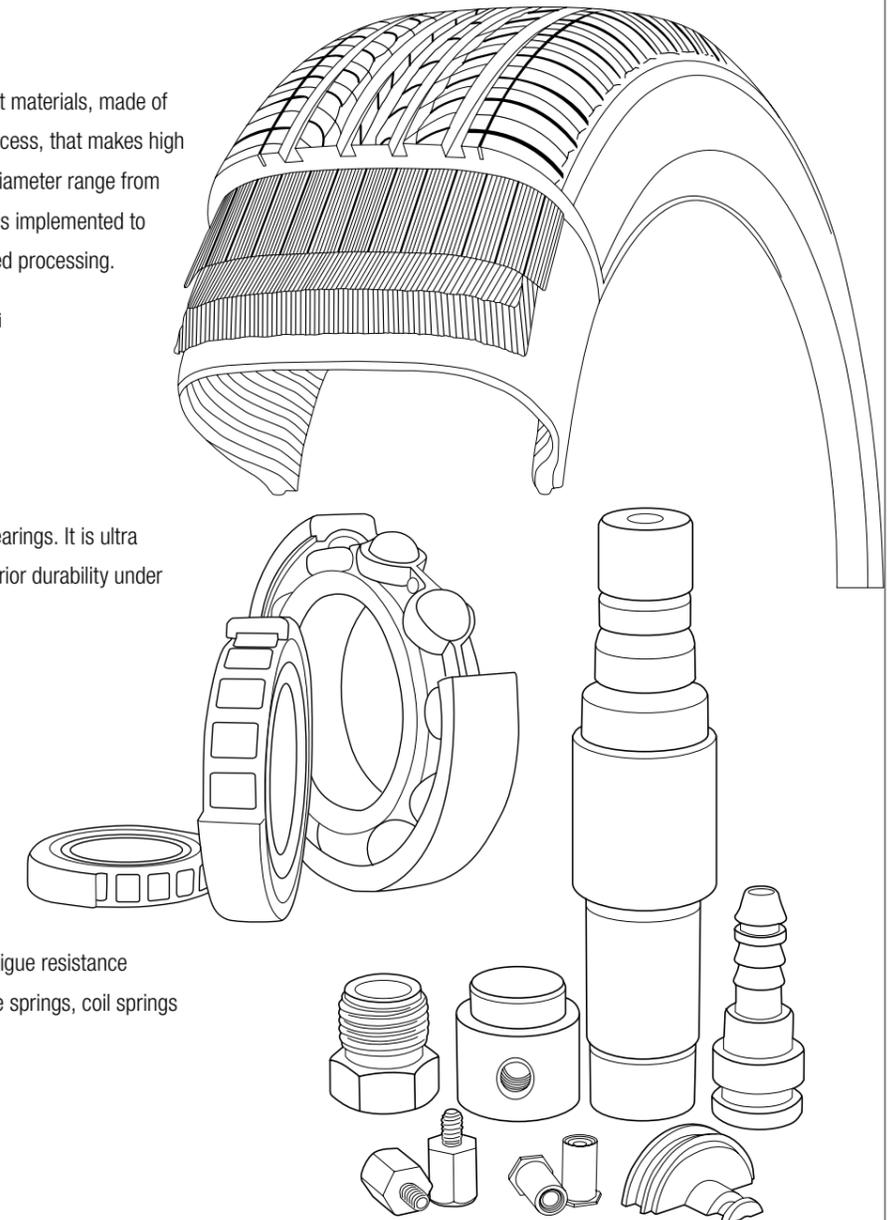
It is used for balls, rollers, and races of bearings. It is ultra clean high alloy steel materials, with superior durability under heavy loading.

- **POCO** POS55CR
- **JIS** SUJ1~5
- **SAE** 52100

Spring Steel

Ultra clean alloying steel, with superior fatigue resistance property. It is mostly used for engine valve springs, coil springs for suspensions and stabilizer bar.

- **POSCO** POSHIS120D/S,130D
- **JIS** SUP6, 7, 9/A/D, 11A, 12/12V
- **SAE** 9254/D/S/V/HV
- **DIN** 50CrV4, 54SiCrV6



Carbon Steel for Machine Structural Use

Carbon Steel for Machine Structural Use transmitting the drive-power of various kinds of shafts of machine parts, after being produced through hot working environment and surface finishing process.

- **JIS** S10~55C
- **SAE** 1022~1060

Quality Assurance

Tire Cord Steel

■ Tensile strength

Specification	Wire Rod	Steel Cord
POSCORD70S	961~1108MPa	2800MPa
POSCORD80S	1078~1216MPa	3200MPa
POSCORD92CR	1147~1274MPa	3600MPa

■ Internal Quality

Center Segregation	Micro Structure	Decarburization Depth
≤ 1(Grade)	Fine Pearlite (Resolvable Pearlite, Cementite, Martensite : Zero)	DM-T ≤ 0.10mm

Spring Steel

■ For Engine Valve

Size of Non-Metallic Inclusions	Decarburization Depth	Surface Defects
Max-T ≤ 15μm	DM-T ≤ 0.05mm	≤ 0.05mm

■ For Suspension

Specification	Decarburization Depth		Surface Defects
SAE9254	DM-F ≤ 0.03mm	DM-T ≤ 0.20mm	≤ 0.08mm
SAE9254S		DM-T ≤ 0.15mm	≤ 0.05mm
POSHS120D	DM-F ≤ 0.03mm	DM-T ≤ 0.20mm	≤ 0.08mm
POSHS120S		DM-T ≤ 0.15mm	≤ 0.05mm

Bearing Steel

■ Surface Quality

Wire rod size	Decarburization Depth / Surface Defects	Quality	Diameter tolerance
5.5~13.5mmΦ	≤ (0.01×Diameter)mm	≤ 0.30mm	±0.20mm
14.0~25.0mmΦ	≤ (0.008×Diameter)mm	≤ 0.35mm	±0.25mm
25.5~35.0mmΦ		≤ 0.40mm	±0.30mm
35.5~42.0mmΦ		≤ 0.50mm	±0.35mm

■ Non-metallic inclusion (ASTM E45 Method A)

(Unit : Grade)

Division	Sulfide		Alumina		Silicate		Oxide		DS Type	T(O)
	Thin	Heavy	Thin	Heavy	Thin	Heavy	Thin	Heavy		
*Special	1.5	1.0	1.0	0	0	0	0.5	0	1.5	≤ 10ppm
Common	2.0	1.0	1.5	0.5	0	0	1.0	0.5	1.5	≤ 12ppm

* Please consult with your POSCO representative before ordering this product.

Carbon Steel for Cold Heading & Forging

■ Surface Quality

Wire rod size	Quality	Diameter tolerance
5.5~13.5mmΦ	≤ 0.35mm	±0.25mm
14.0~25.0mmΦ	≤ 0.40mm	±0.30mm
25.5~33.5mmΦ	≤ 0.50mm	±0.40mm
34.0~42.5mmΦ	≤ 0.60mm	±0.50mm

Wire rod size	Surface Defects	
	Y1*, Y2*, Y4* Use	Y7* Use
5.5~13.5mmΦ	≤ 0.05mm	±0.03mm
14.0~34.0mmΦ	≤ 0.07mm	±0.05mm

Wire rod size	Decarburization Depth
5.5~14.5mmΦ	DM-T ≤ 0.15mm, DM-F ≤ 0.02mm
15.0~25.0mmΦ	DM-T ≤ 0.20mm, DM-F ≤ 0.03mm
25.5~42.0mmΦ	DM-T ≤ 0.25mm, DM-F ≤ 0.04mm

Specifications: Chemical Composition

Low Carbon Steel

■ JIS

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cu
SWRM6	0.08 Max.	-	0.60 Max.	0.045 Max.	0.045 Max.	-
SWRM8	0.10 Max.	-	0.60 Max.	0.045 Max.	0.045 Max.	-
SWRM10	0.08~0.13	-	0.30~0.60	0.045 Max.	0.045 Max.	-
SWRM12	0.10~0.15	-	0.30~0.60	0.045 Max.	0.045 Max.	-
SWRM15	0.13~0.18	-	0.30~0.60	0.045 Max.	0.045 Max.	-
SWRM17	0.15~0.20	-	0.30~0.60	0.045 Max.	0.045 Max.	-
SWRM20	0.18~0.23	-	0.30~0.60	0.045 Max.	0.045 Max.	-
SWRM22	0.20~0.25	-	0.30~0.60	0.045 Max.	0.045 Max.	-

Remarks) In case, it is specified as a kind of killed steel, the letter, 'K', is attached after the end of the marking word.

■ SAE/AISI

Product code	Chemical Compositions(%)				
	C	Si	Mn	P	S
1005	0.06 Max.		0.35 Max.	0.040 Max.	0.050 Max.
1006	0.08 Max.		0.25~0.40	0.040 Max.	0.050 Max.
1008	0.10 Max.		0.30~0.50	0.040 Max.	0.050 Max.
1010	0.08~0.13		0.30~0.60	0.040 Max.	0.050 Max.
1012	0.10~0.15		0.30~0.60	0.040 Max.	0.050 Max.
1013	0.11~0.16		0.50~0.80	0.040 Max.	0.050 Max.
1015	0.13~0.18	0.10 Max.	0.30~0.60	0.040 Max.	0.050 Max.
1016	0.13~0.18	0.10~0.20	0.60~0.90	0.040 Max.	0.050 Max.
1017	0.15~0.20	0.15~0.30	0.30~0.60	0.040 Max.	0.050 Max.
1018	0.15~0.20	0.20~0.40	0.60~0.90	0.040 Max.	0.050 Max.
1019	0.15~0.20	0.30~0.60	0.70~1.00	0.040 Max.	0.050 Max.
1020	0.18~0.23		0.30~0.60	0.040 Max.	0.050 Max.
1021	0.18~0.23		0.60~0.90	0.040 Max.	0.050 Max.
1022	0.18~0.23		0.70~1.00	0.040 Max.	0.050 Max.
1023	0.20~0.25		0.30~0.60	0.040 Max.	0.050 Max.
1025	0.22~0.28		0.30~0.60	0.040 Max.	0.050 Max.
1026	0.22~0.28		0.60~0.90	0.040 Max.	0.050 Max.

Remarks) The silicon content is different from specifications. Thus, please confirm it by consulting our associates.

High Carbon Steel

■ JIS

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cr
SWRH27	0.24~0.31	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH37	0.34~0.41	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH42A	0.39~0.46	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH42B	0.39~0.46	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH47A	0.44~0.51	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH47B	0.44~0.51	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH52A	0.49~0.56	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH52B	0.49~0.56	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH57A	0.54~0.61	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH57B	0.54~0.61	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH62A	0.59~0.66	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH62B	0.59~0.66	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH67A	0.64~0.71	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH67B	0.64~0.71	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH72A	0.69~0.76	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH72B	0.69~0.76	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH77A	0.74~0.81	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH77B	0.74~0.81	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-
SWRH82A	0.79~0.86	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.	-
SWRH82B	0.79~0.86	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.	-

Remarks) The carbon content specified (in the table) can be reduced by 0.01% from the maximum or increased by 0.01% from the minimum subject to customer agreement.

Specifications: Chemical Composition

■ SAE/AISI

Product code	Chemical Compositions(%)				
	C	Si	Mn	P	S
1029	0.25~0.31		0.60~0.90	0.040 Max.	0.050 Max.
1030	0.28~0.34		0.60~0.90	0.040 Max.	0.050 Max.
1035	0.32~0.38		0.60~0.90	0.040 Max.	0.050 Max.
1037	0.35~0.38		0.70~1.00	0.040 Max.	0.050 Max.
1038	0.35~0.42		0.60~0.90	0.040 Max.	0.050 Max.
1039	0.37~0.44		0.70~1.00	0.040 Max.	0.050 Max.
1040	0.37~0.44		0.60~0.90	0.040 Max.	0.050 Max.
1042	0.40~0.47		0.60~0.90	0.040 Max.	0.050 Max.
1043	0.40~0.47		0.70~1.00	0.040 Max.	0.050 Max.
1044	0.43~0.50		0.30~0.60	0.040 Max.	0.050 Max.
1045	0.43~0.50		0.60~0.90	0.040 Max.	0.050 Max.
1046	0.43~0.50	0.10 Max.	0.70~1.00	0.040 Max.	0.050 Max.
1049	0.46~0.53	0.07~0.15	0.60~0.90	0.040 Max.	0.050 Max.
1050	0.48~0.55	0.10~0.20	0.60~0.90	0.040 Max.	0.050 Max.
1053	0.48~0.55	0.15~0.30	0.70~1.00	0.040 Max.	0.050 Max.
1055	0.50~0.60	0.20~0.40	0.60~0.90	0.040 Max.	0.050 Max.
1059	0.55~0.65	0.30~0.60	0.50~0.80	0.040 Max.	0.050 Max.
1060	0.55~0.65		0.60~0.90	0.040 Max.	0.050 Max.
1064	0.60~0.70		0.50~0.80	0.040 Max.	0.050 Max.
1065	0.60~0.70		0.60~0.90	0.040 Max.	0.050 Max.
1069	0.65~0.75		0.40~0.70	0.040 Max.	0.050 Max.
1070	0.65~0.75		0.60~0.90	0.040 Max.	0.050 Max.
1074	0.70~0.80		0.50~0.80	0.040 Max.	0.050 Max.
1075	0.70~0.80		0.40~0.70	0.040 Max.	0.050 Max.
1078	0.72~0.85		0.30~0.60	0.040 Max.	0.050 Max.
1080	0.75~0.88		0.60~0.90	0.040 Max.	0.050 Max.
1084	0.80~0.93		0.60~0.90	0.040 Max.	0.050 Max.
1085	0.80~0.93		0.70~1.00	0.040 Max.	0.050 Max.
1086	0.80~0.93		0.30~0.50	0.040 Max.	0.050 Max.
1090	0.85~0.98		0.60~0.90	0.040 Max.	0.050 Max.
1095	0.90~1.03		0.30~0.50	0.040 Max.	0.050 Max.

Remarks) The silicon content is different from specifications. Thus, please confirm it by consulting our associates.

Piano Steel

■ JIS

Product code	Chemical Compositions(%)						
	C	Si	Mn	P	S	Cu	Cr
SWRS62A	0.60~0.65	0.12~0.32	0.30~0.60	0~0.025	0~0.025	0~0.20	-
SWRS62B	0.60~0.65	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS67A	0.65~0.70	0.12~0.32	0.30~0.60	0~0.025	0~0.025	0~0.20	-
SWRS67B	0.65~0.70	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS72A	0.70~0.75	0.12~0.32	0.30~0.60	0~0.025	0~0.025	0~0.20	-
SWRS72B	0.70~0.75	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS77A	0.75~0.82	0.12~0.32	0.30~0.60	0~0.030	0~0.030	0~0.20	-
SWRS77B	0.75~0.80	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS80B	0.78~0.83	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS82A	0.80~0.85	0.12~0.32	0.30~0.60	0~0.025	0~0.025	0~0.20	-
SWRS82B	0.80~0.85	0.12~0.32	0.60~0.90	0~0.025	0~0.025	0~0.20	-
SWRS92A	0.90~0.95	0.12~0.32	0.30~0.60	0~0.025	0~0.025	0~0.20	-

Specifications: Chemical Composition

Steel for Welding Wire

■ JIS

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Al	Cu	Tl+Zr
SWRY11	0.09 Max.	0.03 Max.	0.35~0.65	0.02 Max.	0.023 Max.	-	0.20 Max.	-
SWRY11L	0.08 Max.	0.03 Max.	0.35~0.65	0.013 Max.	0.010 Max.	-	0.10 Max.	-

Spring Steel

■ JIS

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Cr	Others	
SUP6	0.56~0.64	1.50~1.80	0.70~1.00	0.035 Max.	0.035 Max.	-	-	
SUP7	0.56~0.64	1.80~2.20	0.70~1.00	0.035 Max.	0.035 Max.	-	-	
SUP9	0.52~0.60	0.15~0.35	0.65~0.95	0.035 Max.	0.035 Max.	0.65~0.95	-	
SUP9A	0.56~0.64	0.15~0.35	0.70~1.00	0.035 Max.	0.035 Max.	0.70~1.00	-	
SUP11A	0.56~0.64	0.15~0.35	0.70~1.00	0.035 Max.	0.035 Max.	0.70~1.00	B : 0.0005Min	
SUP12	0.51~0.59	0.20~1.60	0.60~0.90	0.035 Max.	0.035 Max.	0.60~0.90	-	

Remarks) The maximum Cu content is 0.30%.

■ SAE/DIN

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Cr	Others	
SAE9254	0.51~0.59	1.20~1.60	0.60~0.80	0.035 Max.	0.040 Max.	0.60~0.80	-	
DIN-50CRV4	0.47~0.55	0.15~0.40	0.70~1.10	0.030 Max.	0.030 Max.	0.90~1.20	V : 0.10~0.20	
DIN-54SICRV6	0.51~0.59	1.20~1.60	0.50~0.80	0.035 Max.	0.040 Max.	0.50~0.80	V : 0.10~0.20	

Remarks) The maximum Cu content is 0.30%.

Bearing Steel

■ JIS

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Cr	Mo	Others
SUJ1	0.95~1.10	0.15~0.35	0.50 Max.	0.25 Max.	0.25 Max.	0.90~1.20	0.08 Max.	Cu : 0.20 Max. Ni : 0.25 Max.
SUJ2	0.95~1.10	0.15~0.35	0.50 Max.	0.25 Max.	0.25 Max.	1.30~1.60	0.08 Max.	
SUJ3	0.95~1.10	0.40~0.70	0.90~1.15	0.25 Max.	0.25 Max.	0.90~1.20	0.08 Max.	
SUJ4	0.95~1.10	0.15~0.35	0.50 Max.	0.25 Max.	0.25 Max.	1.30~1.60	0.10~0.25	
SUJ5	0.95~1.10	0.40~0.70	0.90~1.15	0.25 Max.	0.25 Max.	0.90~1.20	0.10~0.25	

Remarks) In accordance with the general agreement between producer and customer, non-listed elements may be present in the final product in quantities not to exceed 0.25%.

Free-cutting Steel

■ JIS

Product code	Chemical Compositions(%)			
	C	Mn	P	S
SUM11	0.08~0.13	0.30~0.60	0.040 Max.	0.08~0.13
SUM12	0.08~0.13	0.60~0.90	0.040 Max.	0.08~0.13
SUM21	0.13 Max.	0.70~1.00	0.07~0.12	0.16~0.23
SUM22	0.13 Max.	0.70~1.00	0.07~0.12	0.24~0.33
SUM23	0.09 Max.	0.75~1.05	0.04~0.09	0.26~0.35
SUM25	0.15 Max.	0.90~1.40	0.07~0.12	0.30~0.40
SUM31	0.14~0.20	1.00~1.30	0.040 Max.	0.08~0.13
SUM32	0.12~0.20	0.60~1.10	0.040 Max.	0.10~0.20
SUM41	0.32~0.39	1.35~1.65	0.040 Max.	0.08~0.13
SUM42	0.37~0.45	1.35~1.65	0.040 Max.	0.08~0.13
SUM43	0.40~0.48	1.35~1.65	0.040 Max.	0.24~0.33

Remarks) Silicon content is not specified in principle. Depending on application, the amount will be decided upon by agreement between buyer and supplier. The range or limiting value can be chosen from among three conditions: less than 0.10%, between 0.10~0.20%, or between 0.15~0.35%.

■ SAE/AISI

Product code	Chemical Compositions(%)				
	C	Si	Mn	P	S
1108	0.08~0.13	-	0.50~0.80	0.040 Max.	0.08~0.13
1110	0.08~0.13	0.10 Max.	0.30~0.60	0.040 Max.	0.08~0.13
1117	0.14~0.20	-	1.00~1.30	0.040 Max.	0.08~0.13
1118	0.12~0.20	-	1.30~1.60	0.040 Max.	0.08~0.13
1137	0.32~0.39	0.10 Max.	1.35~1.65	0.040 Max.	0.08~0.13
1139	0.35~0.43	0.10~0.20	1.35~1.65	0.040 Max.	0.13~0.20
1140	0.37~0.44	0.15~0.35	0.70~1.00	0.040 Max.	0.08~0.13
1141	0.37~0.45	-	1.35~1.65	0.040 Max.	0.08~0.13
1144	0.40~0.48	-	1.35~1.65	0.040 Max.	0.24~0.33
1146	0.42~0.49	-	0.70~1.00	0.040 Max.	0.08~0.13
1151	0.48~0.55	-	0.70~1.00	0.040 Max.	0.08~0.13
1211	0.13 Max.	-	0.60~0.90	0.07~0.12	0.10~0.15
1212	0.13 Max.	-	0.70~1.00	0.07~0.12	0.16~0.23
1213	0.13 Max.	-	0.70~1.00	0.07~0.12	0.24~0.33
1214	0.09 Max.	-	0.75~1.05	0.04~0.09	0.26~0.35
1215	0.09 Max.	-	0.75~1.05	0.04~0.09	0.26~0.35

Specifications: Chemical Composition

Carbon Steel for Cold Heading & Forging

■ JIS

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Al
SWRCH6A	0.08 Max.	0.10 Max.	0.60 Max.	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH8A	0.10 Max.	0.10 Max.	0.60 Max.	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH10A	0.08~0.13	0.10 Max.	0.30~0.60	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH12A	0.10~0.15	0.10 Max.	0.30~0.60	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH15A	0.13~0.18	0.10 Max.	0.30~0.60	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH16A	0.13~0.18	0.10 Max.	0.60~0.90	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH18A	0.15~0.20	0.10 Max.	0.60~0.90	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH19A	0.15~0.20	0.10 Max.	0.70~1.00	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH20A	0.18~0.23	0.10 Max.	0.30~0.60	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH22A	0.18~0.23	0.10 Max.	0.70~1.00	0.030 Max.	0.035 Max.	0.02 Min.
SWRCH10K	0.08~0.13	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH12K	0.10~0.15	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH15K	0.13~0.18	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH16K	0.13~0.18	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH17K	0.15~0.20	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH18K	0.15~0.20	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH20K	0.18~0.23	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH22K	0.18~0.23	0.10~0.35	0.70~1.00	0.030 Max.	0.035 Max.	-
SWRCH24K	0.19~0.25	0.10~0.35	1.35~1.65	0.030 Max.	0.035 Max.	-
SWRCH25K	0.22~0.28	0.10~0.35	0.30~0.60	0.030 Max.	0.035 Max.	-
SWRCH27K	0.22~0.29	0.10~0.35	1.20~1.50	0.030 Max.	0.035 Max.	-
SWRCH30K	0.27~0.33	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH33K	0.30~0.36	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH35K	0.32~0.38	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH38K	0.35~0.41	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH40K	0.37~0.43	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH41K	0.36~0.44	0.10~0.35	1.35~1.65	0.030 Max.	0.035 Max.	-
SWRCH43K	0.40~0.46	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH45K	0.42~0.48	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH48K	0.45~0.51	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-
SWRCH50K	0.47~0.53	0.10~0.35	0.60~0.90	0.030 Max.	0.035 Max.	-

Low-alloyed Steel

■ JIS

Product code	Chemical Compositions(%)								
	C	Si	Mn	P	S	Al	Cu	Ti+Zr	
Ni I Cr	SNC236	0.32~0.40	0.15~0.35	0.50~0.80	0.030 Max.	0.030 Max.	1.00~1.50	0.50~0.90	Cu 0.30 Max.
	SNC415	0.12~0.18		2.00~2.50			0.20~0.50		
	SNC631	0.27~0.35		2.50~3.00			0.60~1.00		
	SNC815	0.12~0.18		3.00~3.50			0.70~1.00		
	SNC836	0.32~0.40		3.00~3.50			0.60~1.00		
Ni I Cr I Mo	SNCM220	0.17~0.23	0.15~0.35	0.60~0.90	0.030 Max.	S 0.030 Max. Cu 0.30 Max.	0.40~0.70	0.40~0.65	0.15~0.30
	SNCM240	0.38~0.43		0.70~1.00					
	SNCM415	0.12~0.18		0.40~0.70					
	SNCM420	0.17~0.23		0.60~0.90					
	SNCM431	0.27~0.35							
	SNCM439	0.36~0.43		0.80~1.20					
	SNCM447	0.44~0.50							
	SNCM616	0.13~0.20		0.35~0.60					
	SNCM625	0.20~0.30							
	SNCM630	0.25~0.35							
SNCM815	0.12~0.18	0.30~0.60							
Cr	SCr415	0.13~0.18	0.15~0.35	0.60~0.85	0.030 Max.	0.030 Max.	0.25 Max.	0.90~1.20	Cu 0.30 Max.
	SCr420	0.18~0.23							
	SCr430	0.28~0.33							
	SCr435	0.33~0.38							
	SCr440	0.38~0.43							
	SCr445	0.43~0.48							
Cr I Mo	SCM415	0.13~0.18	0.15~0.35	0.60~0.85	0.030 Max.	0.030 Max.	Ni 0.25 Max.	0.90~1.20	0.15~0.30
	SCM418	0.16~0.21							
	SCM420	0.18~0.23		0.70~1.00					
	SCM421	0.17~0.23		0.60~0.85					
	SCM430	0.28~0.33							
	SCM432	0.27~0.37		0.30~0.60					
	SCM435	0.33~0.38							
	SCM440	0.38~0.43		0.60~0.85					
	SCM445	0.43~0.48							
	SCM822	0.20~0.25							
Mn	SMn420	0.17~0.23	0.15~0.35	1.20~1.50	0.030 Max.	0.030 Max.	0.25 Max.	0.35 Max.	Cu 0.30 Max.
	SMn433	0.30~0.36							
	SMn438	0.35~0.41							
	SMn443	0.40~0.46							
Cr	SMnC420	0.17~0.23	0.15~0.35	1.20~1.50	0.030 Max.	0.030 Max.	0.25 Max.	0.35~0.70	Cu 0.30 Max.
	SMnC430	0.40~0.46		1.35~1.65					

Specifications: Chemical Composition

■ SAE/AISI

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Ni	Cr	Mo
1513	0.10~0.16	0.10 Max.	1.10~1.40	0.40 Max.	0.050 Max.	-	-	-
1522	0.18~0.24	0.15~0.30	1.10~1.40	0.40 Max.	0.050 Max.	-	-	-
1524	0.19~0.25	0.20~0.40	1.35~1.65	0.40 Max.	0.050 Max.	-	-	-
1526	0.22~0.29	-	1.10~1.40	0.40 Max.	0.050 Max.	-	-	-
1527	0.22~0.29	-	1.20~1.50	0.40 Max.	0.050 Max.	-	-	-
1536	0.30~0.37	-	1.20~1.50	0.40 Max.	0.050 Max.	-	-	-
1541	0.36~0.44	0.10~0.20	1.35~1.65	0.40 Max.	0.050 Max.	-	-	-
1548	0.44~0.52	0.20~0.40	1.10~1.40	0.40 Max.	0.050 Max.	-	-	-
4118	0.18~0.23	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.40~0.60	0.08~0.15
4130	0.28~0.33	0.15~0.30	0.40~0.60	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4135	0.33~0.38	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4137	0.35~0.40	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4140	0.38~0.43	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4142	0.40~0.45	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4145	0.43~0.48	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4147	0.45~0.50	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4150	0.48~0.53	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.80~1.10	0.15~0.25
4161	0.56~0.64	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	-	0.70~0.90	0.25~0.35
5115	0.13~0.18	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.70~0.90	-
5120	0.17~0.22	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.70~0.90	-
5130	0.28~0.33	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.80~1.10	-
5132	0.30~0.35	0.15~0.30	0.60~0.80	0.35 Max.	0.040 Max.	-	0.75~1.00	-
5135	0.33~0.38	0.15~0.30	0.60~0.80	0.35 Max.	0.040 Max.	-	0.80~1.05	-
5140	0.38~0.43	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	-	0.70~0.90	-
8620	0.18~0.23	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8622	0.20~0.25	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8625	0.23~0.28	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8627	0.25~0.30	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8630	0.28~0.33	0.15~0.30	0.70~0.90	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8637	0.35~0.40	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8640	0.38~0.43	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8642	0.40~0.45	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25
8645	0.43~0.48	0.15~0.30	0.75~1.00	0.35 Max.	0.040 Max.	0.40~0.70	0.40~0.65	0.15~0.25

Carbon Steel for Machine Structural Use

■ JIS

Product code	Chemical Compositions(%)				
	C	Si	Mn	P	S
S10C	0.08~0.13	0.15~0.35	0.30~0.60	0.030 Max.	0.035 Max.
S12C	0.10~0.15	0.15~0.35	0.30~0.60	0.030 Max.	0.035 Max.
S15C	0.13~0.18	0.15~0.35	0.30~0.60	0.030 Max.	0.035 Max.
S17C	0.15~0.20	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.
S20C	0.18~0.23	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.
S22C	0.20~0.25	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.
S25C	0.22~0.28	0.15~0.35	0.30~0.60	0.030 Max.	0.030 Max.
S28C	0.25~0.31	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.
S30C	0.27~0.33	0.15~0.35	0.60~0.90	0.030 Max.	0.030 Max.
S33C	0.30~0.36	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S35C	0.32~0.38	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S38C	0.35~0.41	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S40C	0.37~0.43	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S43C	0.40~0.46	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S45C	0.42~0.48	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S48C	0.45~0.51	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S50C	0.47~0.53	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S53C	0.50~0.56	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S55C	0.52~0.58	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S58C	0.55~0.61	0.15~0.35	0.60~0.90	0.030 Max.	0.025 Max.
S09CK	0.07~0.12	0.15~0.35	0.30~0.60	0.025 Max.	0.025 Max.
S15CK	0.13~0.18	0.15~0.35	0.30~0.60	0.025 Max.	0.025 Max.
S20CK	0.18~0.23	0.15~0.35	0.30~0.60	0.025 Max.	0.025 Max.

Remarks) 1. Cu, Ni, Cr and Ni + Cr amounts included in S09CK, S15CK and S20CK steels must not exceed 0.25%, 0.20%, 0.20% and 0.30% respectively.

For all other steels these amounts must not exceed 0.30%, 0.20%, 0.20% and 0.35% respectively.

2. In the case that a buyer requests a chemical analysis, the tolerances of the product analysis follow the specifications listed in Table 2 of JIS G 0321.

Specifications: Chemical Composition

POSCO Standard

Low Carbon Steel

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cu
POSFIS5M1	0.02 Max.	0.07 Max.	0.10~0.40	0.030 Max.	0.030 Max.	-
POSFIS6M1	0.04 Max.	0.07 Max.	0.20~0.50	0.040 Max.	0.040 Max.	-
POSFIS6B	0.05 Max.	0.07 Max.	0.60 Max.	0.040 Max.	0.040 Max.	-

High Carbon Steel for Micro Cable

Product code	Chemical Compositions(%)						
	C	Si	Mn	P	S	Cu	Cr
POSMICRO62	0.58~0.66	0.10~0.30	0.30~0.70	0.020 Max.	0.020 Max.	0.020 Max.	0.020 Max.

High Carbon Steel for Bridge Cable

Product code	Chemical Compositions(%)						
	C	Si	Mn	P	S	Cu	Cr
POSCABLE82	0.79~0.86	0.70~1.10	0.60~0.90	0.020 Max.	0.020 Max.	0.020 Max.	0.10 Max.
POSCABLE86	0.82~0.89	0.70~1.10	0.60~0.90	0.020 Max.	0.020 Max.	0.020 Max.	0.10 Max.
POSCABLE90	0.87~0.94	1.00~1.40	0.30~0.60	0.020 Max.	0.020 Max.	0.020 Max.	0.15~0.45
POSCABLE92	0.89~0.96	1.10~1.50	0.30~0.60	0.020 Max.	0.020 Max.	0.030 Max.	0.15~0.45

Tire Cord Steel

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cr
Class1 POSCORD70S	0.65~0.75	0.15~0.30	0.30~0.60	0.030 Max.	0.030 Max.	-
Class2 POSCORD80S	0.75~0.88	0.15~0.30	0.30~0.60	0.030 Max.	0.030 Max.	-
Class3 POSCORD90 POSCORD92CR	0.90~0.96	0.15~0.30	0.30~0.60	0.030 Max.	0.030 Max.	-
	0.90~0.96	0.15~0.30	0.30~0.60	0.030 Max.	0.030 Max.	0.10~0.30

High Tensile Strength Steel

Product code	Chemical Compositions(%)							
	C	Si	Mn	P	S	Cu	B	Ti
Class1 PSPC22 PSPC30B PSPC32B PSPC35B	0.20~0.25	0.10~0.40	0.70~1.00	0.035 Max.	0.030 Max.	-	50ppm Max.	-
	0.27~0.32	0.15~0.35	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	5ppm Min.	-
	0.29~0.34	0.15~0.35	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	5ppm Min.	-
	0.32~0.38	0.15~0.35	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	5ppm Min.	-
Class2 PSPC30SI PSPC32SI PSPC35SI	0.27~0.32	1.60~1.90	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	-	-
	0.29~0.34	1.60~1.90	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	-	-
	0.32~0.38	1.60~1.90	0.60~0.90	0.035 Max.	0.030 Max.	0.020 Max.	-	-
Class3 PSPC32SIB PSPC32SIBM	0.29~0.36	0.50~2.00	0.55~0.95	0.035 Max.	0.030 Max.	0.020 Max.	5ppm Min.	0.01~0.06
	0.29~0.36	0.50~2.00	0.80~1.20	0.030 Max.	0.025 Max.	0.250 Max.	5ppm Min.	0.01~0.05

Steel for Welding Wire

Product code	Chemical Compositions(%)							Remark
	C	Si	Mn	P	S	Cu		
POSWELD1A	0.15 Max.	0.40~1.00	0.85~1.60	0.030 Max.	0.030 Max.	0.50 Max.	-	
POSWELD1B		0.40~1.00	1.00~1.60				Al : 0.1 Max. Ti+Zr : 0.13 Max	
POSWELD1C	0.07 Max.	0.40~0.70	0.90~1.40	0.030 Max.	0.030 Max.	0.50 Max.	Al : 0.05~0.15 Max. V, Ni : 0.05~0.15 Max. V, Ni : 0.02~0.12 Max.	
POSWELD1CM	0.05~0.15	0.30~0.80	0.60~1.50				Cr : 1.0~1.5 Mo : 0.4~0.65	
POSWELD2A	0.15 Max.	0.55~1.10	1.25~1.90	0.030 Max.	0.030 Max.	0.50 Max.	-	
POSWELD2B	0.15 Max.	0.55~1.10	1.40~1.90				Al : 0.10 Max. Ti+Zr : 0.30 Max	
POSWELD2J	0.08 Max.	0.55~1.10	1.25~1.60	0.030 Max.	0.01~0.03	0.50 Max.	-	
POSWELD2S	0.08 Max.	0.55~1.10	1.25~1.90				-	
POSWELD2MO	0.07~0.12	0.50~0.80	1.60~2.10	0.025 Max.	0.025 Max.	0.50 Max.	Mo:0.40~0.65	
POSWELD3CM	0.05~0.15	0.30~0.80	0.50~0.80	0.025 Max.	0.025 Max.	0.20 Max.	Cr : 1.0~1.5 Mo : 0.4~0.65	
POSWELD4B	0.15 Max.	0.55~1.10	1.40~2.60	0.025 Max.	0.025 Max.	0.50 Max.	Al : 0.10 Max. Ti+Zr : 0.30 Max	
POSWELD4D							Ni : 0.15 Max. Cr : 0.15 Max. Mo : 0.60 Max. Ti+Zr : 0.30 Max.	
POSWELD23	0.13 Max.	0.15~0.45	0.80~1.30	0.030 Max.	0.030 Max.	0.50 Max.	-	
POSWELD41	0.17 Max.	0.05 Max.	1.80~2.20	0.030 Max.	0.030 Max.			
POSWELD50	0.15 Max.	0.05 Max.	1.80~2.20	0.030 Max.	0.030 Max.	0.50 Max.	-	
POSWELD60	0.17 Max.	0.2 Max.	1.65~2.15	0.030 Max.	0.030 Max.		0.35 Max.	Mo:0.45~0.65
POSWELD12K	0.06~0.15	0.20~0.65	1.50~2.00	0.025 Max.	0.025 Max.	0.35 Max.	Mo:0.40~0.60	

Specifications: Chemical Composition

■ Spring Steel

Product code	Chemical Compositions(%)						
	C	Si	Mn	P	S	Cr	Other
POSHIS120D	0.40~0.54	1.80~2.60	0.50~1.00	0.025 Max.	0.025 Max.	0.50~1.50	V, Ni
POSHIS120S	0.46~0.60	1.20~2.00	0.50~1.00	0.025 Max.	0.025 Max.	0.50~1.00	V, Ni
POSHIS130D	0.51~0.59	1.80~2.60	0.50~1.00	0.025 Max.	0.025 Max.	0.50~1.50	V, Ni, B, Ti

■ Steel for Oil Tempered Wire

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cu
POT62C	0.60~0.65	0.15~0.30	0.85~1.15	0.020 Max.	0.020 Max.	0.20 Max.
POT67C	0.65~0.70	0.15~0.30	0.85~1.15	0.020 Max.	0.020 Max.	0.20 Max.
POT70C	0.66~0.71	0.15~0.30	0.80~1.10	0.020 Max.	0.020 Max.	0.15 Max.

■ Free-cutting Steel

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	Cu
POSCUT1A	0.13 Max.	-	1.0~1.50	0.06~0.12	0.24~0.40	0.04~0.30
POSCUT1S	0.09 Max.	0.15 Max.	0.75~2.0	0.04~0.09	0.26~0.60	-
PSW10	0.08~0.13	0.15 Max.	0.60~0.90	0.06~0.10	0.035 Max.	-

■ Steel for Spark Plug

Product code	Chemical Compositions(%)					
	C	Si	Mn	P	S	S-Al
POSCH6ASP	0.08 Max.	0.07 Max.	0.25~0.45	0.030 Max.	0.030 Max.	0.02 Min.

■ Soft Magnetic Iron

Product code	Chemical Compositions(%)				
	C	Si	Mn	P	S
JIS-SUYB1	0.01 Max.	0.05 Max.	0.20~0.30	0.020 Max.	0.015 Max.

■ Weather Resistance Steel

Product code	Chemical Compositions(%)								
	C	Si	Mn	P	S	S-Al	Cu	Ni	Cr
POSTEN20W	0.20~0.25	0.15~0.25	0.70~0.90	0.030 Max.	0.030 Max.	0.03~0.08	0.30~0.50	0.30~0.50	0.60~0.90

■ Micro-alloyed Steel

Product code	Chemical Compositions(%)								
	C	Si	Mn	P	S	S-Al	Ni	V	N(ppm)
POSMA40	0.35~0.45	0.40~0.90	0.80~1.20	0.025 Max.	0.08 Max.	0.01~0.08	-	0.12 Max.	150 Max.
POSMA45R	0.43~0.47	0.20~0.40	1.10~1.50	0.030 Max.	0.060 Max.	0.01~0.07	0.20 Max.	0.11 Max.	120 Max.
POSMA45RS	-	-	-	-	-	-	-	-	-

Manufacturable Dimensions

Available sizes

Wire Rod Mill	Unit	Size(mm, inch)																			
		5.5	6.5	7.0	-	8.0	8.5	9.0	-	10.0	-	11.0	12.0	-	13.0	-	14.0	-	-	-	
#1 Wire Rod Mill	mm	5.5	6.5	7.0	-	8.0	8.5	9.0	-	10.0	-	11.0	12.0	-	13.0	-	14.0	-	-	-	
	inch	0.216	0.256	0.276	-	0.315	0.335	0.354	-	0.394	-	0.433	0.472	-	0.512	-	0.551	-	-	-	
#2 Wire Rod Mill	mm	8.0	9.0	10.0	-	11.0	12.0	13.0	-	14.0	-	15.0	16.0	-	17.0	-	18.0	-	19.0	-	20.0
	inch	0.315	0.354	0.394	-	0.433	0.472	0.512	-	0.551	-	0.591	0.630	-	0.669	-	0.709	-	0.748	-	0.787
	mm	21.0	22.0	23.0	-	24.0	25.0	26.0	-	27.0	-	28.0	30.0	-	32.0	-	34.0	-	38.0	-	42.0
#3 Wire Rod Mill	mm	5.5	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0
	inch	0.216	0.256	0.267	0.295	0.315	0.335	0.354	0.374	0.394	0.413	0.433	0.472	0.492	0.512	0.531	0.551	0.571	0.591	0.610	0.630
#4 Wire Rod Mill	mm	5.5	6.5	7.0	7.5	8.0	8.5	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0
	inch	0.216	0.256	0.267	0.295	0.315	0.335	0.354	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748	0.787	0.827	0.866

※ The available sizes are subject to change. Please consult with the POSCO representative before ordering.

Coil Dimensions

Division	Diameter (mm/inch)	Coil Weight		Min. Inner Dia. / Max. Outer Dia. / Max. Length		Coil Direction
		lbs	Kg	mm	inch	
#1 Wire Rod Mill	5.5~13.0/ 0.216~0.512	4,400	1,300~ 2,000	850/1500/1900		Counter clock wise
#2 Wire Rod Mill	5.5~42.0/ 0.216~1.654			850/1700/1900		
#3 Wire Rod Mill	5.5~16.0/ 0.216~0.630			850/1500/1900		
#4 Wire Rod Mill	5.5~22.0/ 0.216~0.866			850/1250/1900		

Product packaging and Shipping

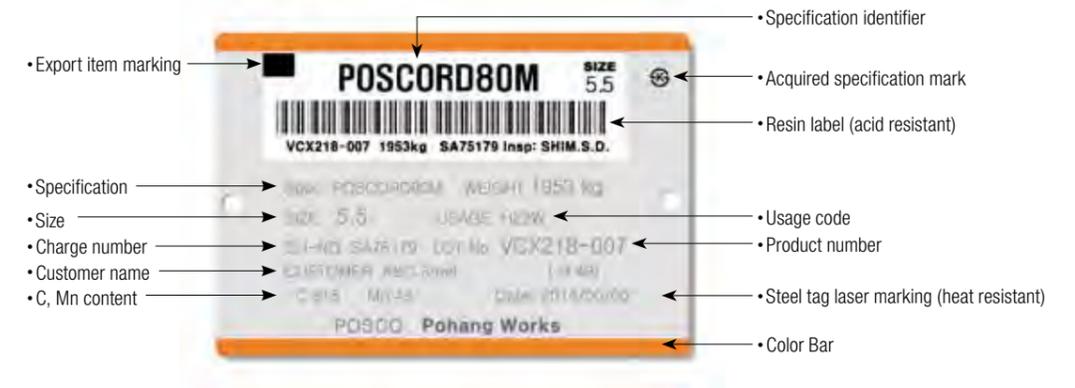
Product packaging

In order to avoid Various damages that can occur during the shipping and handling process, POSCO has adopted the following proven packaging methods. Upon customer request, pre-order information or consultation shall be provided.



Labeling

To provide increased visibility and positive product identification, a resin label with white background is added after the pickling process. Also, a steel tag laser marking is applied as well, in case the resin label should be damaged during a subsequent heating process.

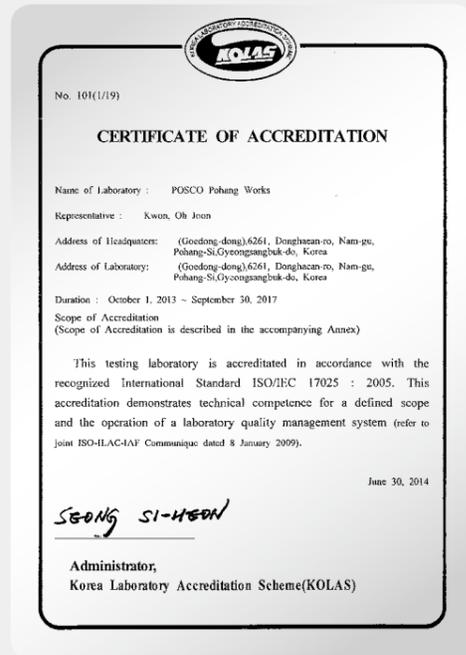


Damage prevented during shipping and handling processes

In order to prevent damages that could occur after wire rod rolling, POSCO uses special equipment and standardized work processes throughout packing, warehousing, transporting and loading.



Certificates



KOLAS



ISO/TS 16949:2009



ISO 9001:2008



ISO 14001:2004

WIRE ROD

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