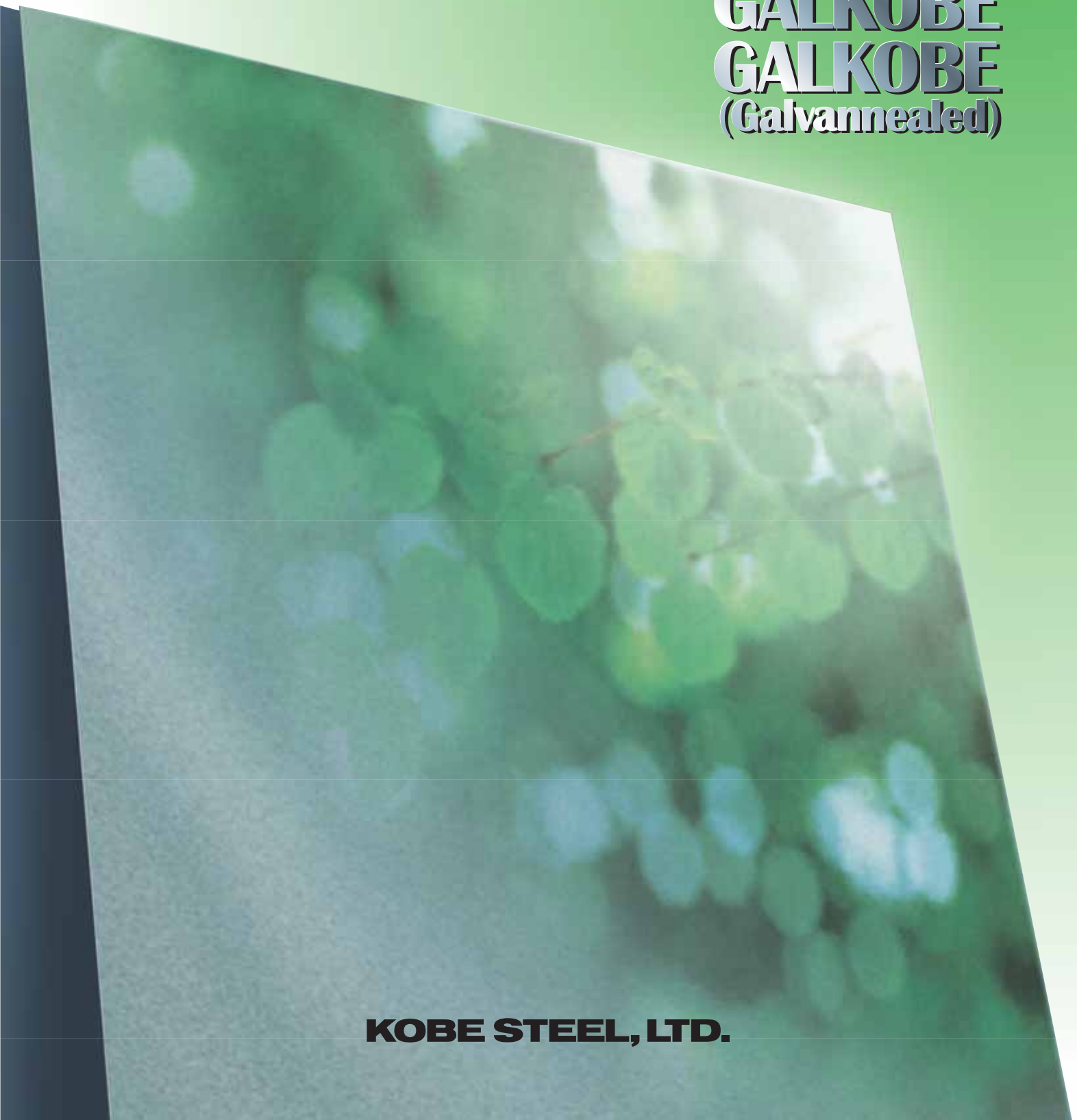
KOBELCO

Chromate-free, environment-friendly

GALVANIZED STEEL SHEETS

ZINKOBELLA
GALKOBE
GALKOBE
(Galvannealed)



KOBE STEEL, LTD.

With enhanced needs of higher quality of products, labor saving in manufacturing processes and pollution prevention, galvanized steel sheets have been extensively used for automobiles, household appliances, and construction materials. The demand has been increasingly expanded along with the improvement of peoples' living and culture.

Kobe Steel has devoted itself to improve the quality of galvanized steel sheets, and develop proprietary products to meet the customer needs.

This catalog covers various types of galvanized steel sheets manufactured by Kobe Steel. We hope this helps you to select appropriate galvanized steel sheets for your particular application.

Contents

Features

Environment-friendly, complete chromate-free

Kobe Steel commercialized the world first chromate-free galvanized steel sheet in 1998, and today all the galvanized steel sheets are chromate-free. The chromate-free steel sheet is environment-friendly, and complies with various regulations, such as RoHS and ELV, which can be used extensively without problems.

Excellent corrosion resistance

The steel sheet is covered with a uniform zinc-plated layer by controlling the amount of zinc coating. The zinc-plated layer itself is chemically treated, which ensures excellent corrosion resistance.

Outstanding appearance and workability

The galvanized surface is smooth and uniform, thanks to advanced production facilities and a sophisticated quality control system that guarantee excellent workability, paintability, and weldability.

Wide product range

We supply different grades of galvanized steel sheet for various uses, including automobiles, electrical appliances, and construction materials. The quality of the base steel, the amount and composition of the zinc coating, and the subsequent chemical conversion coatings are all specifically designed to provide optimum performance for each application.

Timely technical services

For use of galvanized steel sheets, please consult our sales or technical service section. Kobe Steel provides timely customer-oriented technical services, based on plenty of experience.

Cautions

The technical information contained in this catalog is to illustrate general characteristics and/or performances, but not to guarantee anything.
The technical information contained in this catalog may not be applicable depending on the purpose, environment, or conditions of use.
This catalog is subject to change without notice. For updated information, please consult our relevant section.

Galvanized steel sheet products

Kobe Steel manufactures and markets the following galvanized steel sheet products for a wide variety of industrial applications.

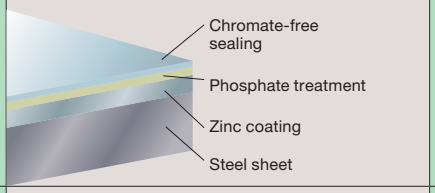
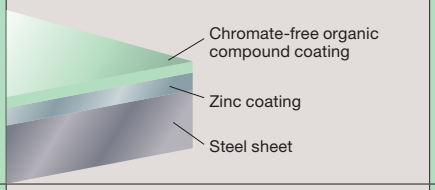
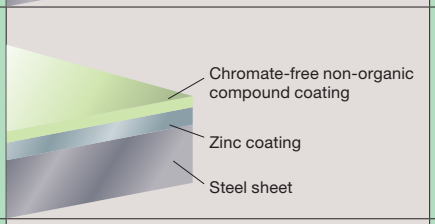
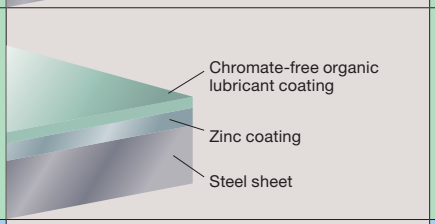
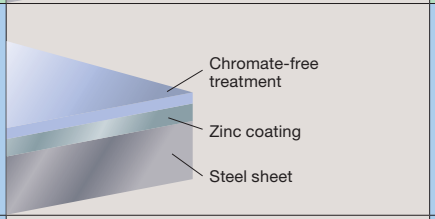
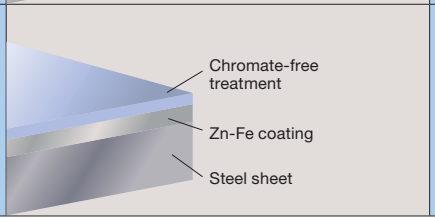
Product list

Type of coating	Product name	Zinc coating mass		Chemical conversion coating
Electrogalvanized steel sheet	**ZINKOBELLA**	30g/m^2 or less (one side) Note 1)	JIS classification: ES-E24 Note 1	Phosphate treatment…**GREEN COTE GX-GP** Anti-fingerprint treatment…**GREEN COTE GX-K2** Anti-fingerprint treatment…**GREEN COTE GX-KS** Lubricant treatment…**GREEN COTE GX-J2** * All are chromate-free treatment.
Hot-dip galvanized steel sheet	**GALKOBE**	30g/m^2 - 150g/m^2 (one side)	JIS classification: Z06-Z27 Note 2	Chromate-free Treatment **GREEN COTE GX-GC**
	GALKOBE (Galvannealed)	30g/m^2 - 90g/m^2 (one side)	JIS classification: F04-F12	Chromate-free Treatment **GREEN COTE GX-GC**

G90, G60 and A60 are approved by UL (Underwriters Laboratories, Inc.) of the U.S.
Note 1: For electrogalvanized steel sheets over 30 g/m^2 on one side, or JIS E24, please consult us.
Note 2: For hot-dip galvanized steel sheets over JIS Z27, please consult us.

Features
•Steel sheet featuring excellent workability is uniformly galvanized to produce a smooth, attractive surface finish. •A chemical conversion coating applied after galvanizing provides added protection against corrosion and improves paintability. •Because the galvanized coating is thin, the finished steel sheet is easily welded. •Chemical conversion coatings are also applied for high corrosion resistance, and good anti-fingerprint and lubrication characteristics. •Conforms to JIS G3313 and equivalent standards.
•Because the galvanized coating is thick, the finished steel sheet is particularly resistant to corrosion. •Has an attractive metallic luster. •Zero-minimized spangle only. •Conforms to JIS G3302 and equivalent standards.
•Heat-treated to produce a zinc-iron alloy surface for excellent paintability, weldability, and particularly outstanding corrosion resistance after painting. •Conforms to JIS G3302 and equivalent standards.

Chemical conversion coating

Type of coating	Product name	Type of coating	Symbol	Coating structure	Features					
					Corrosion resistance	Pain ability	Anti-finger print properties	Lubricant properties	Weldability	Electric conductivity
Electrogalvanized steel sheet	ZINKOBELLA	Phosphate treatment	GX-GP			◎				
		Anti-fingerprint treatment	GX-K2		◎	○	◎	○	○	○
			GX-KS		○	○	◎	○	○	◎
		Lubricant treatment	GX-J2		◎	○	◎	◎		
Hot-dip galvanized steel sheet	GALKOBE	Chromate-free treatment	GX-GC		○	○	◎		○	○
	GALKOBE (Galvannealed)	Chromate-free treatment	GX-GC		○	◎	○		○	◎

Note 1: Electorgalvanized and hot-dip galvanized steel sheets with no chemical conversion coatings are oiled (symbol M), as a standard.
Note 2: Paint ability depends on the type of paint used and the chemical treatment applied before painting. A paint test should be conducted prior to painting.

Applications and optimum grades

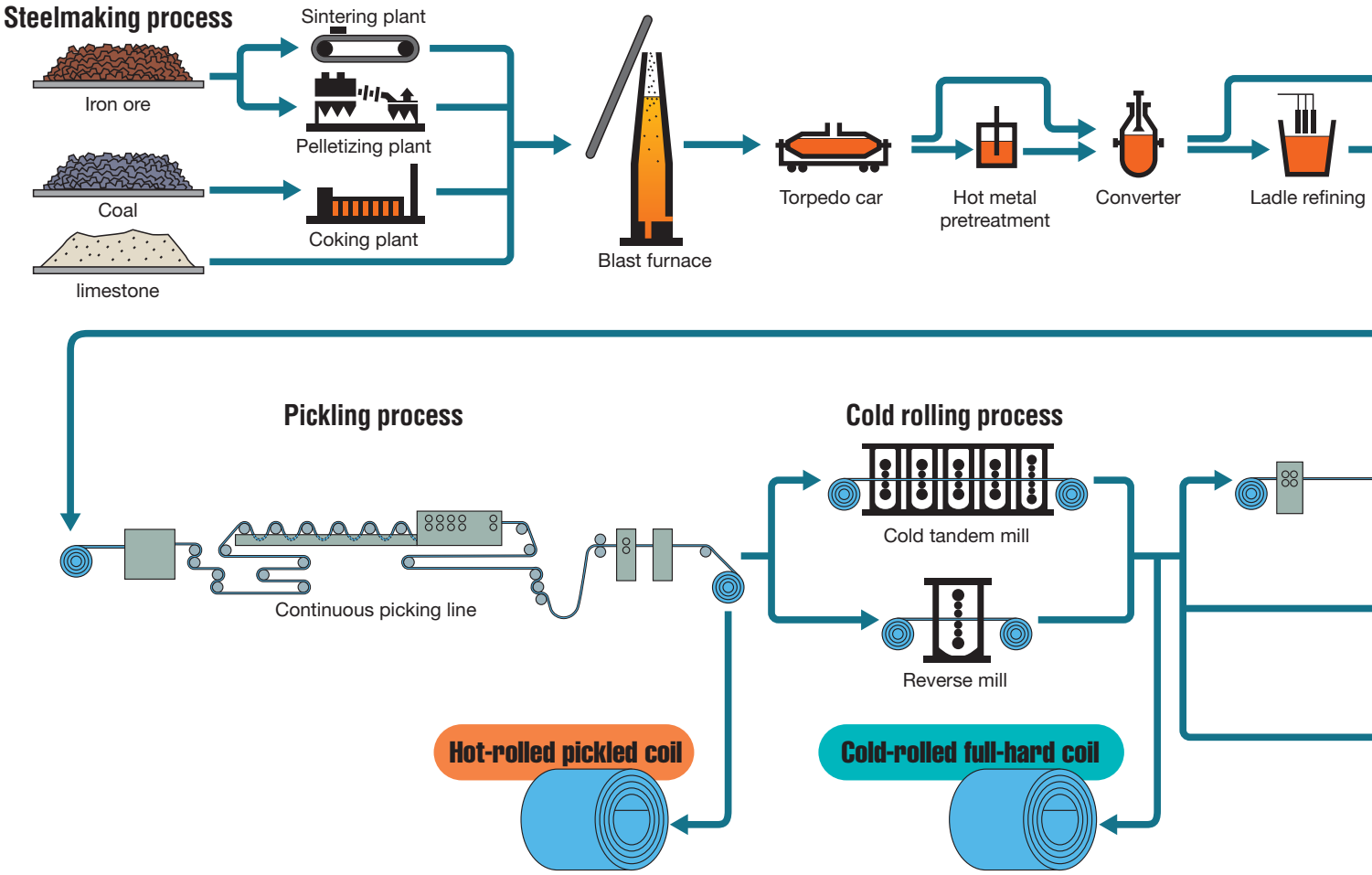
Available in different grades with a variety of specialized coatings, Kobe Steel's galvanized steel sheets offer customized characteristics for an impressive range of applications.
When deciding which type of steel sheet is best for you, please keep the following three points in mind.

Three key points for selection

Will it be used indoors or outdoors?
Will it be painted or unpainted?
What characteristics - corrosion resistance, workability, weldability, etc. - are needed?

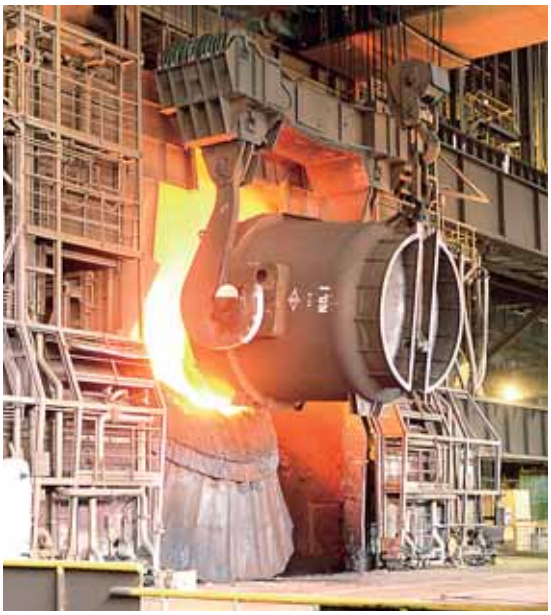
Application		Electrogalvanized steel sheet	Hot-dip galvanized	
		ZINKOBELLA	**GALKOBE**	**GALKOBE (Galvannealed)**
Automobiles	Exterior panels		○	○
	Interior panels		○	○
	Chassis		○	○
	Electrical components	○		
Electrical appliances	Refrigerators, Washing machines	○	○	○
	Vending machines	○	○	○
	Outdoor air-conditioning units		○	○
	Display freezers	○	○	○
	AV & OA equipment	○	○	
	Internal parts for home appliances	○	○	
	Electrical distribution panels	○	○	○
Construction materials	Shutters and doors	○	○	○
	Guard rails			○
	Deck plates		○	○
	Identification plates	○	○	○
	Pipes for construction platforms		○	
	Walls, partitions	○	○	
	Ducts		○	
	Ceilings and floors		○	○
Miscellaneous	Storage sheds	○	○	○
	Furniture	○		○
	Kerosene heaters	○	○	○

Manufacturing processes

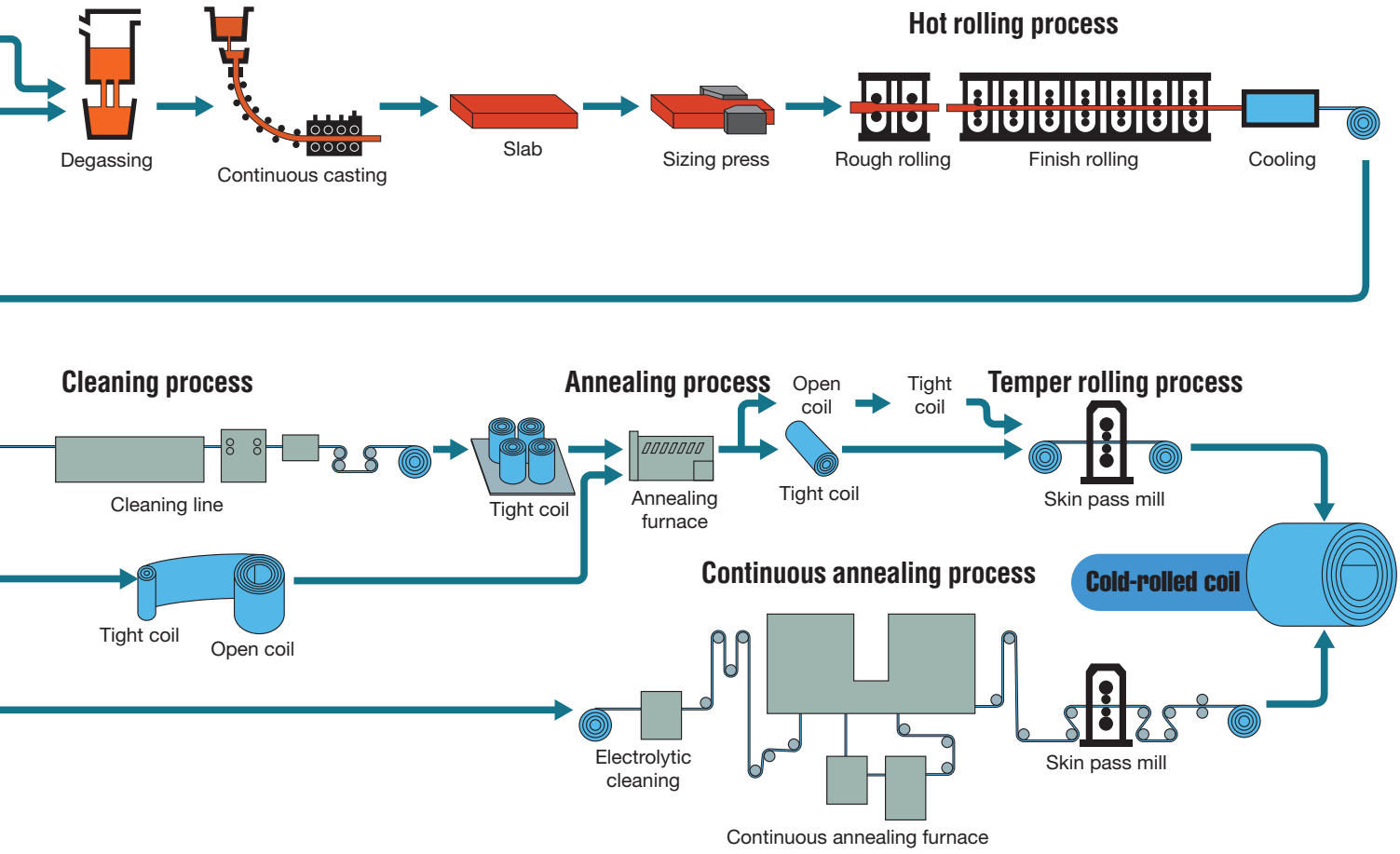


Blast furnace

Converter



Hot finish rolling mill



Continuous annealing furnace

Cold tandem mill (cold tandem mill)

Galvanizing process

Electrogalvanizing line

Welding process

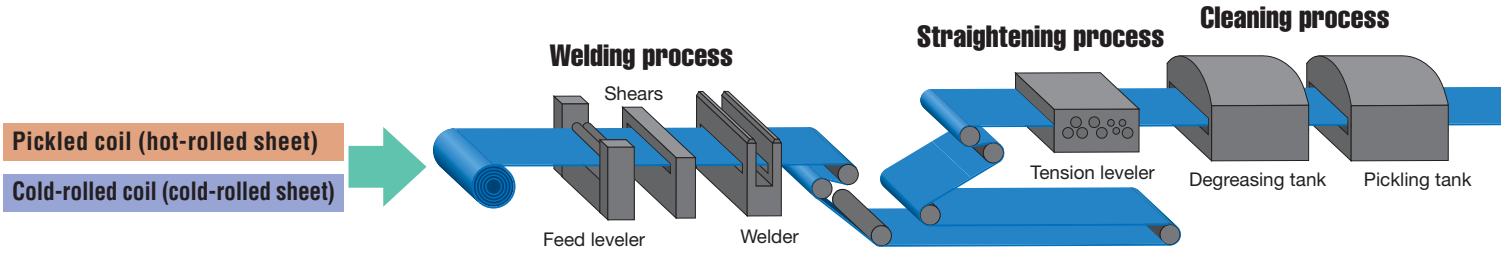
The end of a steel sheet (either hot- or cold-rolled) is sheared and welded to the preceding coil to form one continuous coil.

Straightening process

A high-performance tension leveler is used to straighten the strip, resulting in excellent flatness.

Cleaning process

The strip is dipped in an alkali bath and brushed for preliminary degreasing, and then undergoes alkaline electrolytic degreasing. This removes impurities on the material surface that could harm the zinc coating. The strip is then dipped in a acidic bath to activate the surface.



Hot-dip galvanizing line

Welding process

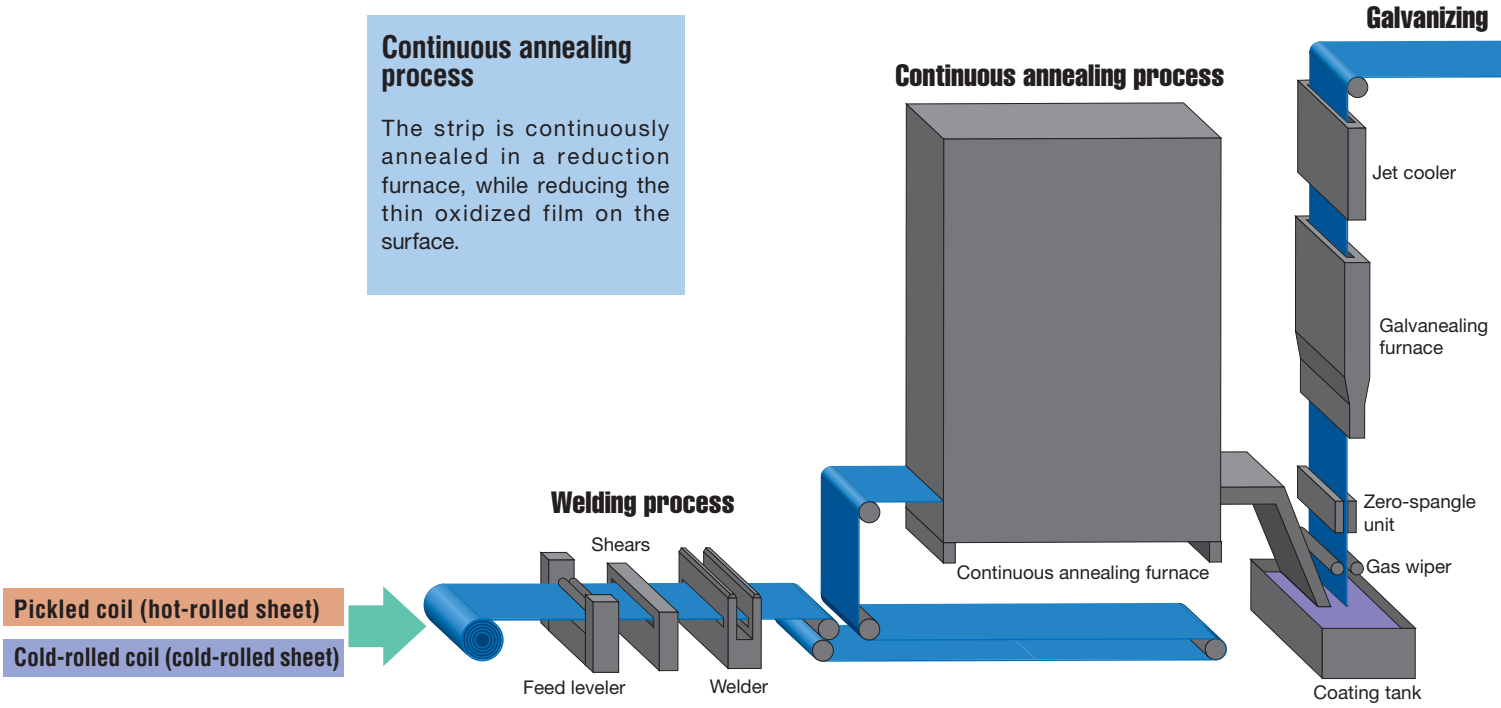
The end of a steel sheet (either hot- or cold-rolled) is sheared and welded to the preceding coil to form one continuous coil.

Galvanizing process

After annealing, the strip remains in a reduction atmosphere and is dipped directly into a bath of molted zinc. The amount of zinc coating is controlled by means of the gas wiping method. Depending on the intended application, alloying treatment may be applied to the strip.

Continuous annealing process

The strip is continuously annealed in a reduction furnace, while reducing the thin oxidized film on the surface.



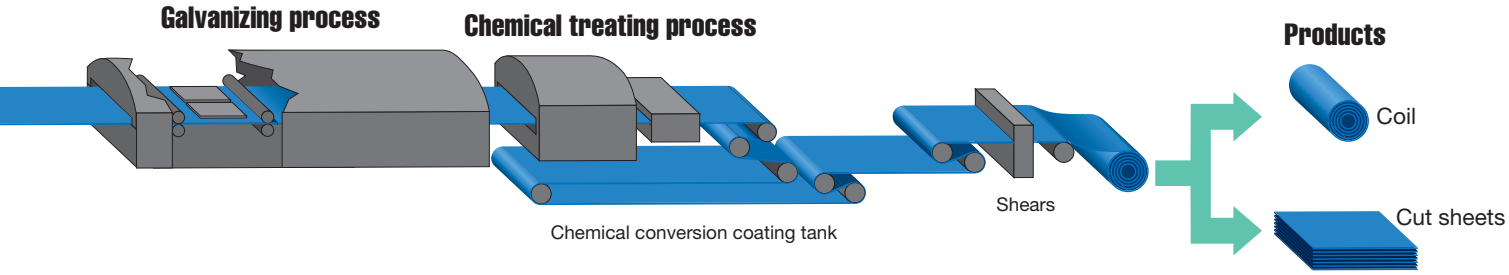
Galvanizing process

The cleaned strip enters the coating tank, where plating is carried out under strict bath control.

Chemical treating process

The zinc-coated strip is given various chemical treatments according to intended use, including phosphate treatment for excellent paintability, and chromate-free special treatment for good corrosion resistance.

Electrogalvanizing line



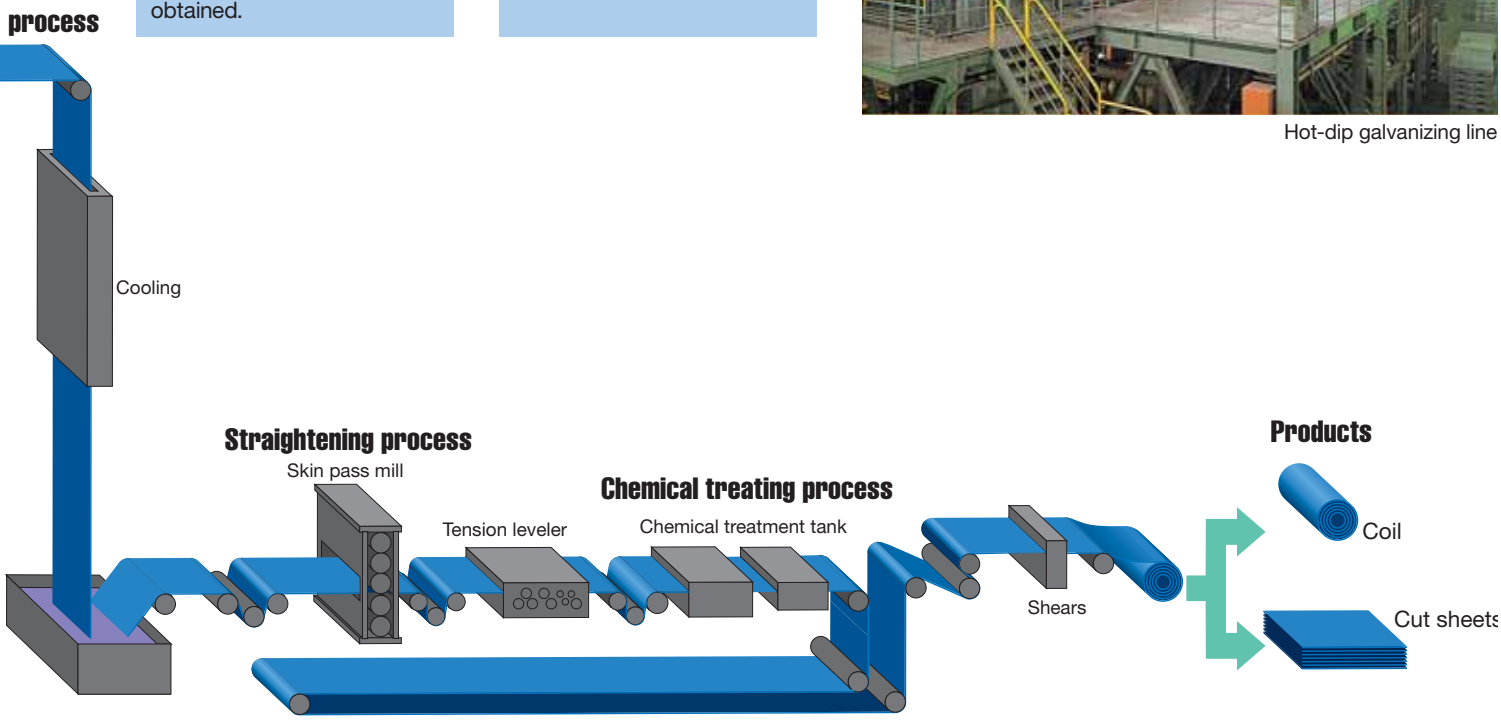
Straightening process

Through the combined use of a high-performance tension leveler and skin pass mill, a product with excellent flatness and a smooth, attractive surface finish are obtained.

Chemical treating process

A chromate-free special treatment is then applied to the zinc-coated strip, in accordance with the intended use.

Hot-dip galvanizing line



Product characteristics

Excellent corrosion resistance

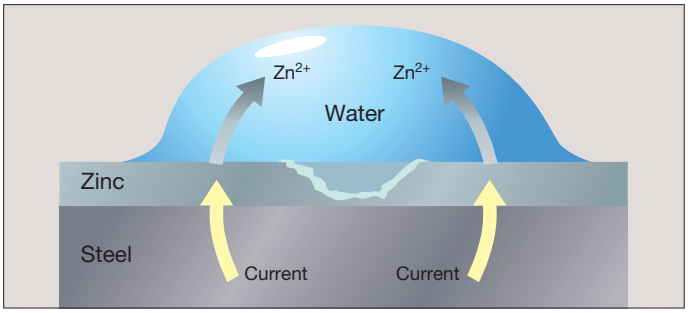
The uniform zinc coating protects the base steel from corrosion, and can withstand long-term use without generating rust.

- Zinc ionizes more easily than steel, and therefore acts as a sacrificial anode to protect the base steel from corrosion. This is called galvanic action. Even if the base steel is exposed, as for example at the sheet end or through a surface damage, the zinc coating surrounding the exposed part continues to protect the steel from rust.
- When zinc reacts to moisture in the air, it generates white rust. To prevent this, chromate-free and other special treatments are applied to the galvanized sheet.
- The time to take for red rust to develop on the base steel is proportional to the amount of zinc coating.

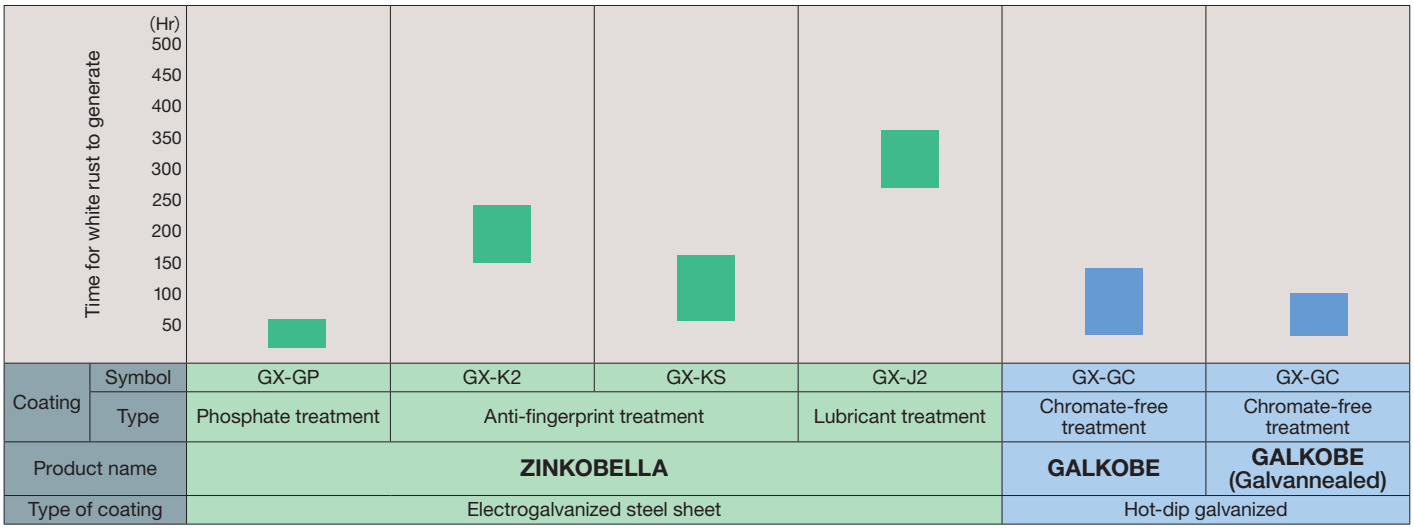
Estimated zinc life under various environmental conditions (years)

	Rural	Seaside	Urban	Industrial
610 (Both sides) (g/m²)	50	35	25	15
381 (Both sides)	35	25	17	9
305 (Both sides)	25	15	10	7
90 (One side)	10	7	4	3
60 (One side)	7	5	3	2

Galvanic action

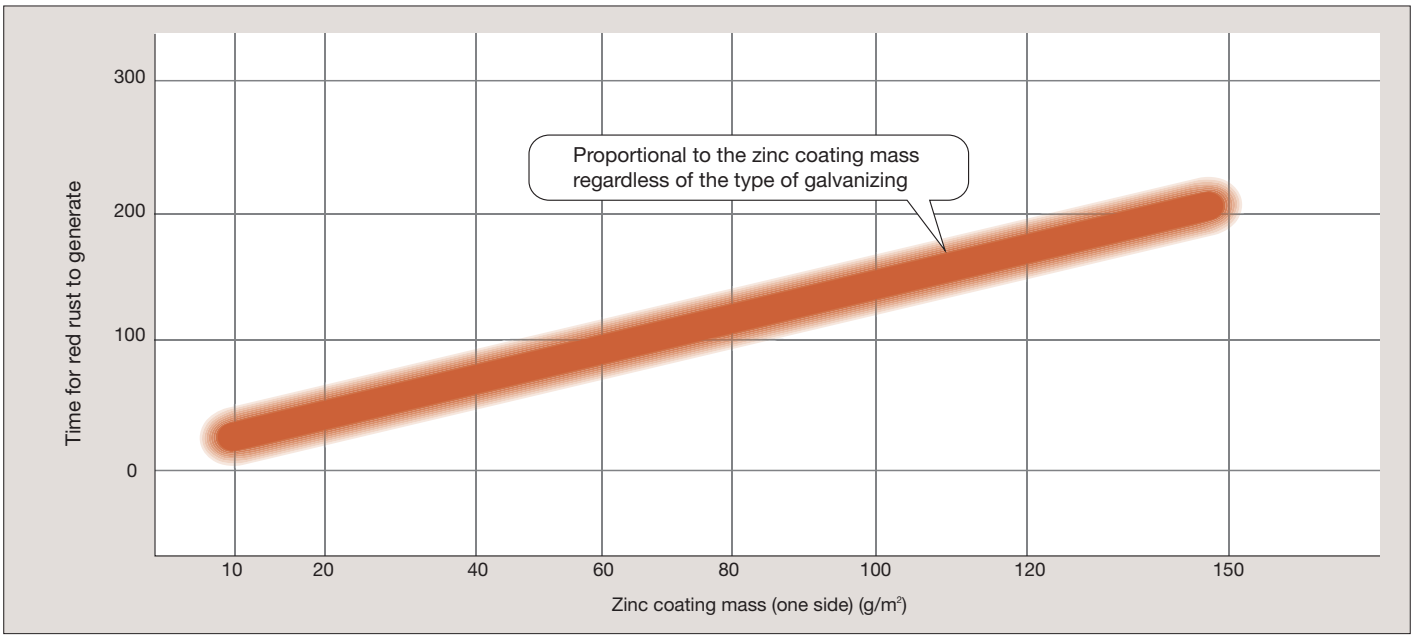


Relationship between surface treatments and white rust (flat sheet, saltwater spray)



Coating	Symbol	GX-GP	GX-K2	GX-KS	GX-J2	GX-GC	GX-GC
	Type	Phosphate treatment	Anti-fingerprint treatment		Lubricant treatment	Chromate-free treatment	Chromate-free treatment
Product name		ZINKOBELLA				GALKOBE	GALKOBE (Galvannealed)
Type of coating		Electrogalvanized steel sheet				Hot-dip galvanized	

Relationship between zinc coating mass and red rust (flat sheet, saltwater spray)



Outstanding paintability

Excellent paintability is assured through appropriate pre-paint treatment.

Galvanized steel sheet is most often painted before use.
To ensure proper paint adhesion, the surface must be thoroughly degreased and an appropriate chemical treatment shall be applied. The same fine, uniform chemical coatings as for cold-rolled sheet can be applied to all varieties of galvanized sheet.

Product type	Product name	Paint adhesion	Corrosion resistance of painted surface (external rust)
Electrogalvanized steel sheet	**ZINKOBELLA**	◎	○
Hot-dip galvanized steel sheet	**GALKOBE**	◎	○
	GALKOBE (Galvannealed)	◎	◎
Cold-rolled steel sheet		◎	×

Decreasing

Chemical conversion coating

Paint
(Melamine alkyd coating, 20μm thickness)

Paint adhesion test
(Primary adhesion)

Corrosion resistance of painted surface
(Saltwater spray test after cross-cutting, 240 hours)

Paint adhesion

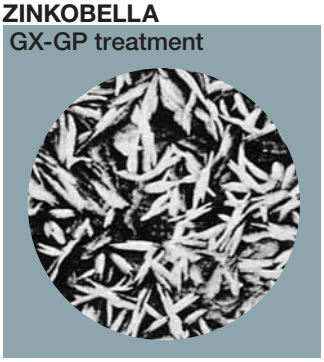
ZINKOBELLA

Corrosion resistance with standard paint coating

ZINKOBELLA, GALKOBE | **GALKOBE** (Galvannealed) | **Cold-rolled steel sheet**

To reduce costs and environmental hazards, Kobe Steel also supplies galvanized steel sheet that has been chemical treated at the factory so that there is no need to prime the material before painting. In general, ZINKOBELLA (GX-GP treatment) and GALKOBE (Galvannealed) are most suitable for painting applications. For best results, choose a paint that is compatible with the chemical treatment applied.

ZINKOBELLA
GX-GP treatment



The phosphate film generated on the sheet surface assures outstanding paint adhesion, with an extremely smooth and attractive paint finish that only electrogalvanizing can provide.

GALKOBE
(Galvannealed)

The alloying treatment diffuses iron particles in the coated surface to produce fine irregularities that ensure excellent paint adhesion.

Superior workability

Our carefully selected galvanized steel sheets manufactured under strict quality control all feature excellent workability.

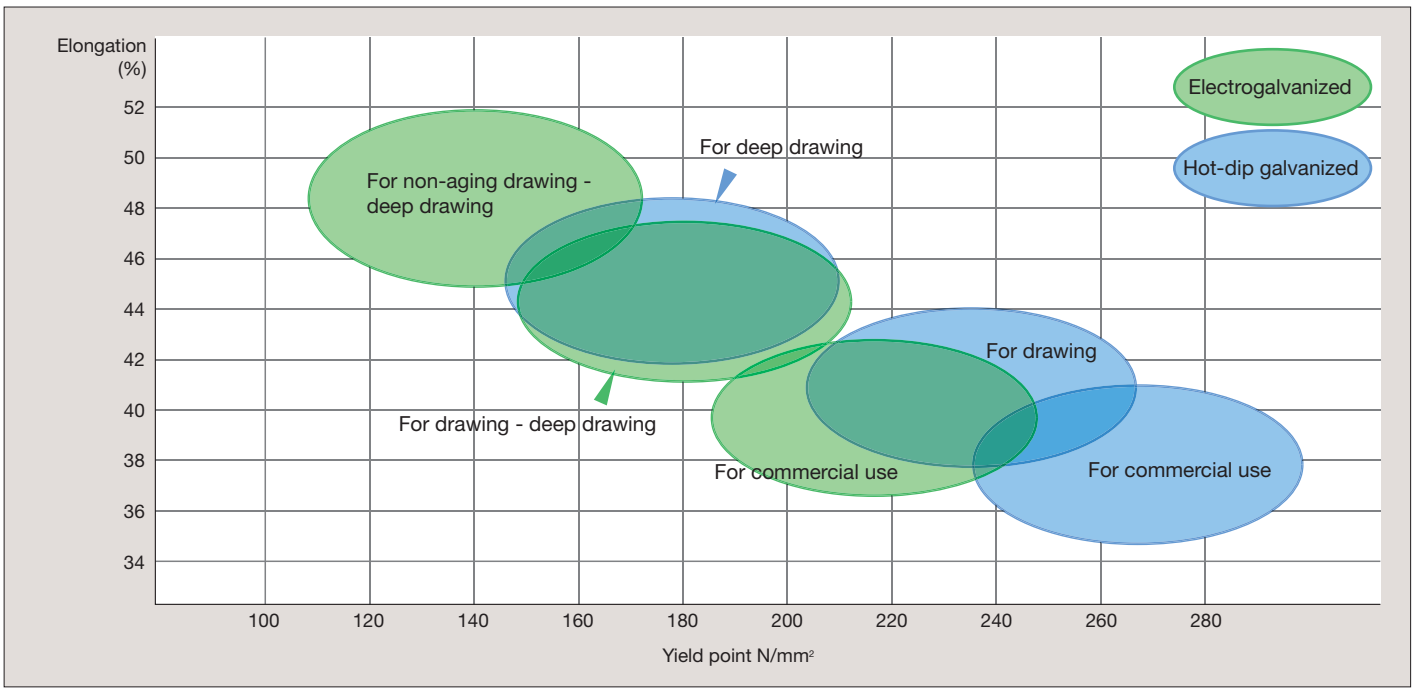
When processing galvanized steel sheet, consideration must be given to the workability of both the base sheet and the coating. Since electrogalvanizing and hot-dip galvanizing are different processes, they result in different kinds of workability.

Deep-drawn GALKOBE

Workability

Type of coating	Product name	Workability of base sheet	Workability of zinc-plated layer	Overall evaluation
Electrogalvanized steel sheet	**ZINKOBELLA**	The galvanizing process does not affect mechanical properties. In the electro-galvanizing process, steel sheets are not heat-affected; therefore, they maintain the same workability as that of hot-rolled and cold-rolled steel sheets.	While hot-dip galvanized steel sheets are composed of zinc and iron-zinc alloy coating, electrogalvanized steel sheets have pure zinc layer with excellent ductility, but no brittle iron-zinc alloy layer, which may cause peeling off with the former sheets.	Has the same workability as hot- and cold-rolled sheets.
Hot-dip galvanized steel sheet	**GALKOBE**	For hot-dip galvanized steel sheets, mechanical properties are given during a short time of the continuous annealing stage in the galvanizing process. However, they are heat-affected during the subsequent galvanizing stage; therefore, they lose some of their normal workability compared to the normal hot-rolled and cold-rolled steel sheets. By using higher-grade materials, products with good workability are available.	The surface layer is pure zinc, with excellent ductility. Between the base metal and the surface layer are thin alloyed-layers of iron and zinc, but their structure and thickness are strictly regulated so that the zinc-plated layer will not peel off.	Standard products are lightly less workable than hot- and cold-rolled sheets, but products with good workability are also manufactured by using higher-grade materials.
	GALKOBE (Galvannealed)		The surface layer consists of high-grade iron and zinc alloy, making it harder and less ductile than pure zinc. When subjected to server processing, tiny cracks can form in the alloyed layer, or the alloyed layer is powdered (this phenomenon is called powdering).	In terms of powdering, alloyed products are less workable than non-alloyed products. However, this rarely causes a problem in actual applications.

Image of mechanical properties (Thickness 0.8mm)



Assured weldability

By maintaining proper welding conditions, you can achieve welding results comparable to those obtained with hot- and cold-rolled sheets.

When electric resistance welding, conditions for galvanized steel sheet differ somewhat from those for hot- and cold-rolled sheet because zinc is a soft metal with a low melting point. Also, when zinc adheres to the electrode, it forms a copper zinc alloy that impairs continuous welding efficiency. The higher the zinc coating, the stronger this tendency becomes. Because GALKOBE features harder surface layer with higher melting points, its welding conditions and continuous welding efficiency approach those of hot- and cold-rolled sheets.

Please keep the following points in mind when spot welding and seam welding galvanized steel sheets.

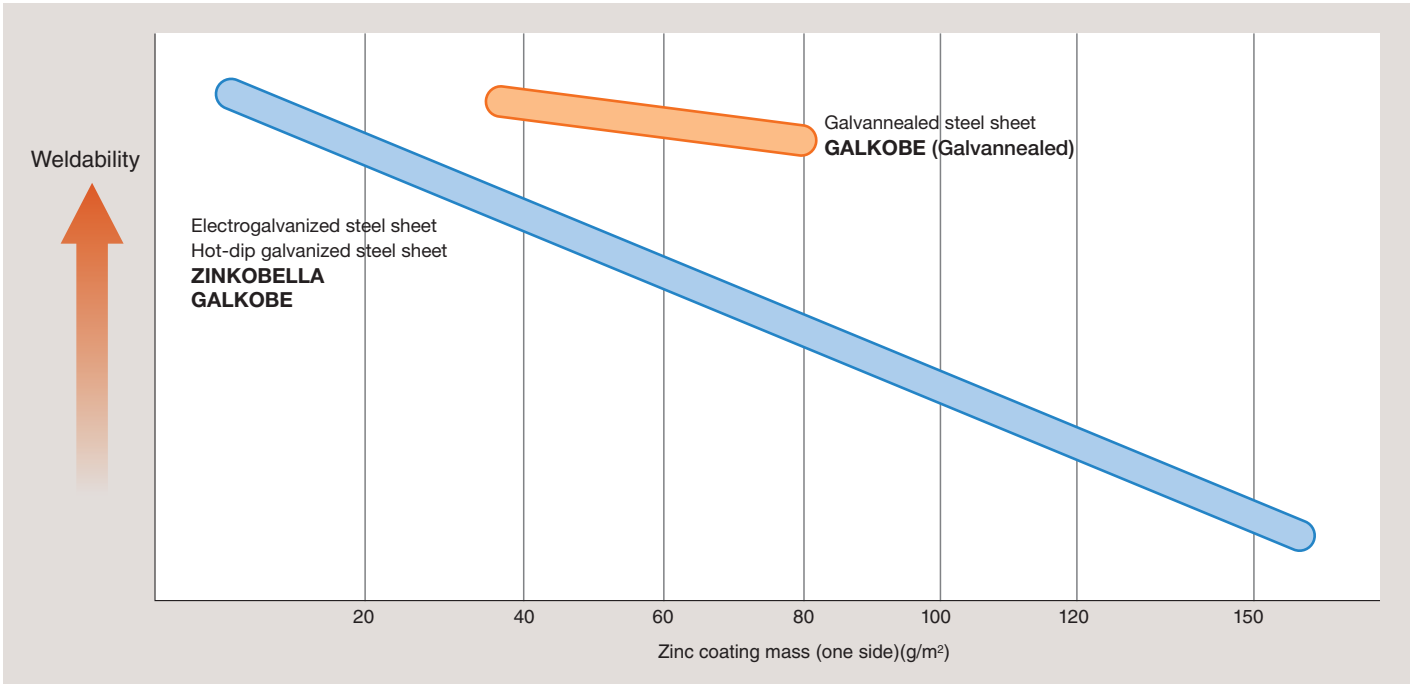
Spot welding

- Set the welding current 10-30% higher than usual.
- Extend the weld time 10% longer than usual.
- A Cr-Cu alloy electrode with a JIS-C type truncated cone tip is recommended.
- Clean the electrode often, and make sure you have adequate water-cooling.

Seam welding

- Set the welding current high.
- Control air bubbles and internal defects by increasing the welding pressure.
- Interrupted current is recommended. In addition, a high ratio of intervals with current to intervals without current should be maintained for best results in the welded sections.

Relationship between zinc coating mass and weldability



Specification and range of available products

Electrogalvanized steel sheet ZINKOBELLA

Product types

hot-rolled sheet

Product symbol	Applications	Base sheet specification	JIS classification	Yield point N/mm²	Tensile strength N/mm²	Tensile	
						1.6 to less than 2.0	2.0 to less than 2.5
SEHC	For commercial use	SPHC	SEHC	—	270 and over	29 and over	29 and over
SEHD	For drawing	SPHD	SEHD	—	270 and over	32 and over	33 and over
SEHE	For deep drawing	SPHE	SEHE	—	270 and over	33 and over	35 and over
SE400	For general structural use	SS400	SE400	245 and over	400 ～ 510	21 and over	21 and over
SE490		SS490	SE490	285 and over	490 ～ 610	19 and over	19 and over
KBEH370	For structural use	SAPH370	SEPH370	225 and over	370 and over	32 and over	33 and over
KBEH400		SAPH400	SEPH400	255 and over	400 and over	31 and over	32 and over
KBEH440		SAPH440	SEPH440	305 and over	440 and over	29 and over	30 and over

Note 1: Values for the bending test represent the number of sheets of the same c as measured by the spacing of the inside of the bend.

Cold-rolled sheet

Product symbol	Applications	Base sheet specification	JIS classification	Yield point N/mm²	Tensile strength N/mm²	
						0.40 to less than 0.60
SECC	For commercial use	SPCC	SECC	—	—	—
SECCT		SPCCT	SECCT	—	270 and over	34 and over
SECD	For drawing	SPCD	SECD	—	270 and over	36 and over
SECE	For deep drawing	SPCE	SECE	—	270 and over	38 and over
SECF	For non-aging deep drawing	SPCF	SECF	—	270 and over	40 and over
SECG	For non-aging extra deep drawing	SPCG	SECG	—	270 and over	42 and over
KBEC340R	For drawing	KBCF340R	SEFC340	175 and over	340 and over	—
KBEC390R	For forming	KBCF390R	SEFC390	235 and over	390 and over	—
KBEC440R		KBCF440R	—	260 and over	440 and over	—

Product symbol	Applications	Base sheet specification	Bending test			Hardness test	
			Bending angle	Internal radius	Test piece (JIS)	HRB	HV
SECC-8D	For hardness	SPCC-8D	180°	Flat on itself	No.3 rolling direction	50～71	95～130
SECC-4D		SPCC-4D		0.5		65～80	115～150
SECC-2D		SPCC-2D		1.0		74～89	135～185
SECC-1D		SPCC-1D		—		85and over	170and over

Note 1: Values for the bending test represent the number of sheets of the same nominal thickness as measured by the spacing of the inside of the bend.
Note 2: Please consult us for high-tensile strength steel of 490 N/mm2 or more.
Note 3: Hardness is measured in either HRB or HV; however, HRB is applicable unless otherwise specified.

test				Bending test				
Elongation%			Test piece (JIS)	Bending angle	Internal radius			Test piece (JIS)
Thickness mm					Thickness, 2.0mm max.	Thickness, 2.0mm to less than 3.2mm	3.2mm	
2.5 to less than 3.15	3.15 to less than 3.2	3.2						
29 and over	29 and over	31 and over	No.5 rolling direction	180°	Flat on itself	Flat on itself	0.5	No. 3 rolling direction
35 and over	35 and over	37 and over					Flat on itself	
37 and over	37 and over	39 and over					Flat on itself	
21 and over	21 and over	21 and over			1.5	1.5	1.5	No.1 perpendicular to rolling direction
19 and over	19 and over	19 and over			2.0	2.0	2.0	
35 and over	36 and over	36 and over			0.5	1.0	1.0	No.3 perpendicular to rolling direction
34 and over	35 and over	35 and over			1.0	1.0	1.0	
32 and over	33 and over	33 and over			1.0	1.5	1.5	

Tensile test						Bending test		
Elongation%					Test piece (JIS)	Bending angle	Internal radius	Test piece (JIS)
Thickness mm								
0.60 to less than 1.0	1.0 to less than 1.6	1.6 to less than 2.3	2.3 to less than 2.5	2.5 and over or less 3.2				
—	—	—	—	—	No.5 rolling direction	180°	Flat on itself	No.3 rolling direction
36 and over	37 and over	38 and over	38 and over	39 and over			Flat on itself	
38 and over	39 and over	40 and over	40 and over	41 and over			Flat on itself	
40 and over	41 and over	42 and over	42 and over	43 and over			Flat on itself	
42 and over	43 and over	44 and over	44 and over	45 and over			Flat on itself	
44 and over	45 and over	46 and over	46 and over	—			Flat on itself	
34 and over	35 and over	35 and over	—	—	No.5 perpendicular to rolling direction		Flat on itself	No.3 perpendicular to rolling direction
30 and over	31 and over	31 and over	—	—			Flat on itself	
26 and over	27 and over	27 and over	—	—			Flat on itself	

Specification and range of available products

Zinc coating mass

Type	Symbol	Standard zinc coating mass (one side) g/m²	Minimum zinc coating mass (one side) g/m²	
			Equal thickness coating	Different thickness coating
JIS classification	ES	—	—	Note 1
	EB	3	2.5	—
	E8	10	8.5	8
	E16	20	17	16
	E24	30	25.5	24
	E32Note 2	40	34	32
	E40Note 2	50	42.5	40
One side	K	3	2.5	—
	10	10	8.5	8
	20	20	17	16
	30	30	25.5	24
	40Note 2	40	34	32
	50Note 2	50	42.5	40

Note 1: Zinc mass is kept at 50 mg/m2 or less, except at the edges of the sheet.
Note 2: Pleas consult us for one-side galvanized sheets, and one side zinc coating mass over 30 g/m2, or of JIS E24 or more.

Chemical conversion coating

Symbol	Chemical conversion coating
GX-GP	Phosphate treatment (chromate-free)
GX-K2	Anti-fingerprint treatment (chromate-free)
GX-KS	
GX-J2	Lubricant treatment (chromate-free)
M	(Uncoated)

Reference: Uncoated materials are normally oiled.

Thickness tolerance

Thickness tolerance is applied to the values obtained by adding the equivalent zinc thickness for each zinc coating mass symbol to the nominal thickness.

Hot-rolled sheet

Unit:mm

Product symbol	Width / Nominal thickness	Under 1200	1200 to less than 1500	1500 and over
SEHC SEHD SEHE	1.60 to less than 2.00	±0.16	±0.17	±0.18
	2.00 to less than 2.50	±0.17	±0.19	±0.21
	2.50 to less than 3.15	±0.19	±0.21	±0.24
	3.15 and over or less 3.20	±0.21	±0.23	±0.26

Unit:mm

Product symbol	Width / Nominal thickness	1524以下
SE400 SE490	1.60 to less than 2.00	±0.19
	2.00 to less than 2.50	±0.20
	2.50 to less than 3.15	±0.22
	3.15 and over or less 3.20	±0.24

Unit:mm

Product symbol	Width / Nominal thickness	Under 1200	1200 to less than 1500	1500 and over
KBEH370 KBEH400 KBEH440	1.60 to less than 2.00	±0.16	±0.17	±0.18
	2.00 to less than 2.50	±0.17	±0.19	±0.21
	2.50 to less than 3.15	±0.19	±0.21	±0.24
	3.15 and over or less 3.20	±0.21	±0.23	±0.26

Cold-rolled sheet

Unit:mm

Product symbol	Width / Nominal thickness	Under 630	630 to less than 1000	1000 to less than 1250	1250 to less than 1600	1600 and over
SECC SECCT SECD SECE SECF SECG SECC-8D SECC-4D SECC-2D SECC-1D	0.40 to less than0.60	±0.05	±0.05	±0.05	±0.06	—
	0.60 to less than0.80	±0.06	±0.06	±0.06	±0.06	±0.07
	0.80 to less than1.00	±0.06	±0.06	±0.07	±0.08	±0.09
	1.00 to less than1.25	±0.07	±0.07	±0.08	±0.09	±0.11
	1.25 to less than1.60	±0.08	±0.09	±0.10	±0.11	±0.13
	1.60 to less than2.00	±0.10	±0.11	±0.12	±0.13	±0.15
	2.00 to less than2.50	±0.12	±0.13	±0.14	±0.15	±0.17
	2.50 to less than3.15	±0.14	±0.15	±0.16	±0.17	±0.20
	3.15 to less than3.20	±0.16	±0.17	±0.19	±0.20	—

Unit:mm

Product symbol	Width / Nominal thickness	Under 630	630 to less than 1000	1000 to less than 1250	1250 to less than 1600
KBEC340R KBEC390R KBEC440R	0.40to less than0.60	±0.05	±0.05	±0.05	—
	0.60to less than0.80	±0.06	±0.06	±0.06	±0.07
	0.80to less than1.00	±0.07	±0.07	±0.08	±0.09
	1.00to less than1.25	±0.08	±0.08	±0.09	±0.10
	1.25to less than1.60	±0.09	±0.10	±0.11	±0.12
	1.60to less than2.00	±0.10	±0.11	±0.12	±0.14
	2.00to less than2.80	±0.12	±0.13	±0.14	±0.16

Range of available products

Equivalent zinc thickness

Unit:mm

Zinc coating mass symbol	EB	E8	E16	E24	E32	E40	K	10	20	30	40	50
Equivalent zinc thickness (one side)	0	0.001	0.003	0.004	0.005	0.006	0	0.001	0.003	0.004	0.005	0.006

Width tolerance

Unit:mm

Width / Base sheet	Hot-rolled sheet	Cold-rolled sheet
Under 1250	+10 - 0	+ 7 + 0
1250 and over	+10 - 0	+10 - 0

Length tolerance

Unit:mm

Width / Base sheet	Hot-rolled sheet	Cold-rolled sheet
Under 2000	+10 - 0	+10 + 0
2000 to less than 4000	+15 - 0	+15 - 0
4000 and over	+20 -0	+20 - 0

Coil inside diameter, outside diameter, mass

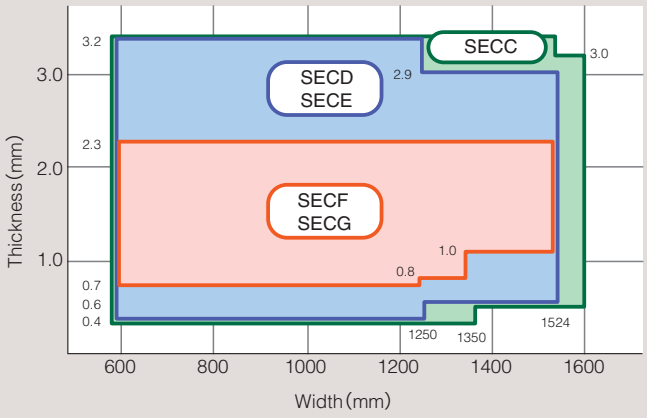
Unit:mm

Inside diameter mm(in)	Outside diameter mm	Mass ton
508(20)、610(24)	1770 max.	25 max.

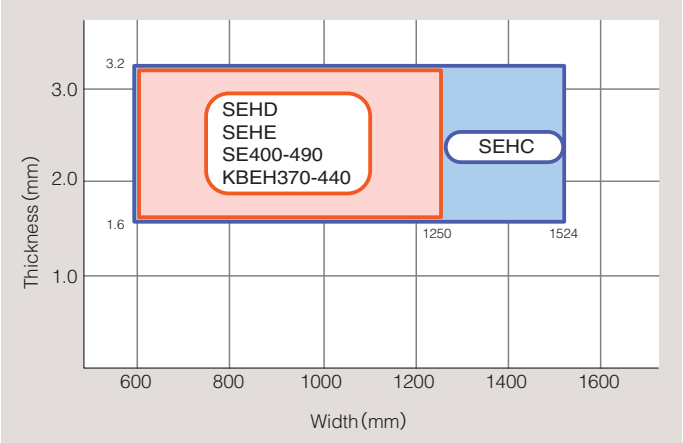
Cut sheet length

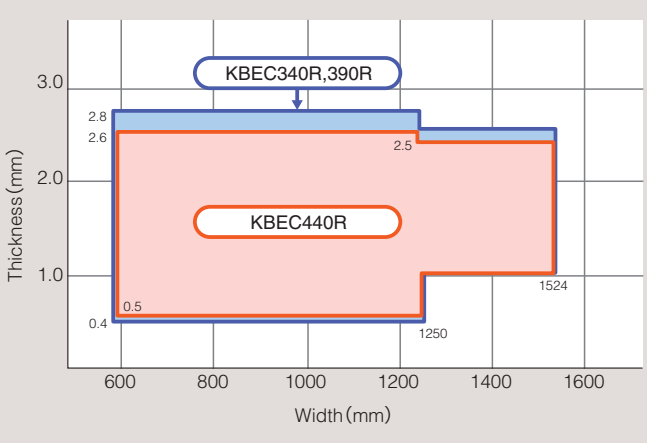
Thickness mm	Width mm	Length mm
0.4 and over or less 1.2	1294 or less	610～6096
	1294 or more	914～6096
1.2 or more	Entire width	914～6096

Cold-rolled sheet



Hot-rolled sheet





Hot-dip galvanized steel sheet GALKOBE Galvanized steel sheets

Product types

Hot-rolled sheet

Product symbol		Applications	Tensile test			
Kobe Steel standard	JIS classification		Yield point N/mm²	Tensile strength N/mm²	Elongation % Thickness, 1.6 mm and over	Test piece (JIS)
GAHC	SGHC	For commercial use	(205 and over)	(270 and over)	—	No.5 rolling direction
GAHS400	—	For structural use	245 and over	400 and over	18 and over	
GAHS440	—		270 and over	440 and over	18 and over	
GAHS490	—		360 and over	490 and over	16 and over	
GAHS540	—		350 and over	540 and over	16 and over	
—	SGH400		295 and over	400 and over	18 and over	
—	SGH440		335 and over	440 and over	18 and over	
—	SGH490		365 and over	490 and over	16 and over	
—	SGH540		400 and over	540 and over	16 and over	
KBGH390	—	For forming	250 and over	390 and over	30 and over	
KBGH440	—		300 and over	440 and over	29 and over	

Note 1: Figures in parentheses are for reference.
Note 2: Values for the bending test represent the number of sheets of the same nominal thickness as measured by the spacing of the inside of the bend.
Note 3: Please consult us for products of Z27 or more.

Cold-rolled sheet

Product symbol		Applications	Tensile test					
Kobe Steel standard	JIS classification		Yield point N/mm²	Tensile strength N/mm²	Elongation % Nominal thickness mm			
					0.40 to less than0.60	0.60 to less than1.0	1.0 to less than1.6	1.6 to less than 2.5
GACC	SGCC	For commercial use	(205 and over)	(270 and over)	—	—	—	—
GACD	SGCD1	For drawing (class 1)	—	270 and over	34 and over	36 and over	37 and over	38 and over
GACE	SGCD2	For drawing (class 2)	—	270 and over	36 and over	38 and over	39 and over	40 and over
GACX	SGCD3	For drawing (class3)	—	270 and over	38 and over	40 and over	41 and over	42 and over
—	SGCD4	For non-aging drawing (class 4)	—	270 and over	40 and over	42 and over	43 and over	44 and over
GACS400	—	For structural use	245 and over	400 and over	18 and over	18 and over	18 and over	18 and over
GACS440	—		335 and over	440 and over	18 and over	18 and over	18 and over	18 and over
GACS490	—		365 and over	490 and over	16 and over	16 and over	16 and over	16 and over
—	SGC400		295 and over	400 and over	18 and over	18 and over	18 and over	18 and over
—	SGC440		335 and over	440 and over	18 and over	18 and over	18 and over	18 and over
—	SGC490		365 and over	490 and over	16 and over	16 and over	16 and over	16 and over
—	SGC570		560 and over	570 and over	—	—	—	—
KBGC340	—	For forming	195 and over	340 and over	33 and over	35 and over	36 and over	37 and over
KBGC390	—		255 and over	390 and over	28 and over	30 and over	31 and over	32 and over
KBGC440	—		295 and over	440 and over	24 and over	26 and over	27 and over	28 and over

Note 1: Figures in parentheses are for reference.
Note 2: Values for the bending test represent the number of sheets of the same nominal thickness as measured by the spacing of the inside of the bend.
Note 3: Please consult us for products of Z27 or more.

	Bending test					
Bending angle	Thickness, 1.6mm to less than 3.0mm			3.0mm and over		
	Z27 or less	Z35、Z37	Z45、Z60	Z27 or less	Z35、Z37	Z45、Z60
180°	1	2	2	2	2	2
	—	—	—	—	—	—
	—	—	—	—	—	—
	—	—	—	—	—	—
	—	—	—	—	—	—
	2	2	2	3	3	3
	3	3	3	3	3	3
	3	3	3	3	3	3
	3	3	3	3	3	3
	—	—	—	—	—	—
	—	—	—	—	—	—

		Bending test								
	Test piece (JIS)	Bending angle	Thickness, 1.6 mm and over			Thickness, 1.6 mm to less than3.0mm			3.0mm and over		
2.5 and over			Z27 or less	Z35、Z37	Z45、Z60	Z27 or less	Z35、Z37	Z45、Z60	Z27 or less	Z35、Z37	Z45、Z60
—	No.5 rolling direction	180°	1	1	2	1	2	2	2	2	2
—			1	—	—	1	—	—	—	—	—
—			0	—	—	0	—	—	—	—	—
—			0	—	—	0	—	—	—	—	—
—			0	—	—	0	—	—	—	—	—
18 and over			—	—	—	—	—	—	—	—	—
18 and over			—	—	—	—	—	—	—	—	—
16 and over			—	—	—	—	—	—	—	—	—
18 and over			2	2	2	2	2	2	3	3	3
18 and over			3	3	3	3	3	3	3	3	3
16 and over			3	3	3	3	3	3	3	3	3
—			—	—	—	—	—	—	—	—	—
38 and over	No.5 perpendicular to rolling direction		—	—	—	—	—	—	—	—	—
33 and over			—	—	—	—	—	—	—	—	—
29 and over			—	—	—	—	—	—	—	—	—

Specification and range of available products

Zinc coating mass

Type	Symbol	Minimum zinc coating mass g/㎡		
		Both sides (triple-spot test)	Both sides (single-spot test)	One side (triple-spot test)
Both sides	(Z06)	(60)	(51)	—
	Z08	80	68	—
	Z10	100	85	—
	Z12	120	102	—
	Z14	140	119	—
	Z18	180	153	—
	Z20	200	170	—
	Z22	220	187	—
	Z25	250	213	—
	Z27	275	234	—
	Z35	350	298	—
	Z37	370	315	—
	Z45	450	383	—
	Z60	600	510	—
One side	45	—	—	30
	60	—	—	40
	90	—	—	60
	120	—	—	90

Note 1: Symbols and figures for zinc coating mass in parentheses are based on agreements reached between Kobe Steel and the purchaser on a case-by-case basis.

Chemical conversion coating

Symbol	Chemical conversion coating
GX-GC	Chromate-free treatment
M	(Uncoated)

Reference: Uncoated materials are normally oiled.

Surface finish

Symbol	Finish
Z	Zero and minimized spangle finish

Equivalent zinc thickness

Unit:mm

Zinc coating mass symbol	Z06	Z08	Z10	Z12	Z14	Z18
Equivalent zinc thickness (both sides)	0.013	0.017	0.021	0.026	0.029	0.034

Z20	Z22	Z25	Z27	Z35	Z37	Z45	Z60
0.040	0.043	0.049	0.054	0.064	0.067	0.080	0.102

Unit:mm

Zinc coating mass symbol	45	60	90	120
Equivalent zinc thickness (both sides)	0.006	0.008	0.013	0.017

Thickness tolerance

Thickness tolerance is applied to the values obtained by adding the equivalent zinc thickness (both sides) for each zinc coating mass symbol to the nominal thickness.

Hot-rolled sheet (for commercial use)

Unit:mm

Nominal thickness \ Width	Under 1200	1200 to less than 1500	1500 and over
1.6to less than 2.0	±0.17	±0.18	±0.19
2.0to less than2.5	±0.18	±0.20	±0.22
2.5to less than3.15	±0.20	±0.22	±0.25
3.15to less than4.0	±0.22	±0.24	±0.27
4.0 and over or less 4.5	±0.25	±0.27	—

Hot-rolled sheet (For structural use and forming)

Unit:mm

Nominal thickness \ Width	Under 1600	1600
1.6to less than 2.0	±0.20	±0.24
2.0to less than2.5	±0.21	±0.26
2.5to less than3.15	±0.23	±0.30
3.15to less than4.0	±0.25	±0.35
4.0 and over or less 4.5	±0.46	—

Cold-rolled sheet (for commercial use)

Unit:mm

Nominal thickness \ Width	Under 630	630 to less than 1000	1000 to less than 1250	1250 and over
0.40to less than 0.60	±0.06	±0.06	±0.06	±0.07
0.60to less than 0.80	±0.07	±0.07	±0.07	±0.07
0.80to less than 1.00	±0.07	±0.07	±0.08	±0.09
1.00to less than 1.25	±0.08	±0.08	±0.09	±0.10
1.25to less than 1.60	±0.09	±0.10	±0.11	±0.12
1.60to less than 2.00	±0.11	±0.12	±0.13	±0.14
2.00to less than 2.50	±0.13	±0.14	±0.15	±0.16
2.50to less than 3.15	±0.15	±0.16	±0.17	±0.18
3.15 and over or less 3.20	±0.17	±0.18	±0.20	±0.21

Width tolerance

Unit:mm

Base sheet / Tolerance classification / Width classification	Hot-rolled sheets		Cold-rolled sheets
	A	B	
1500 or less	+25 0	+10 0	+7 0
1500 or more			+10 0

Length tolerance

Unit:mm

Hot-rolled sheet	Cold-rolled sheet
+15 - 0	+15 - 0

Range of available products

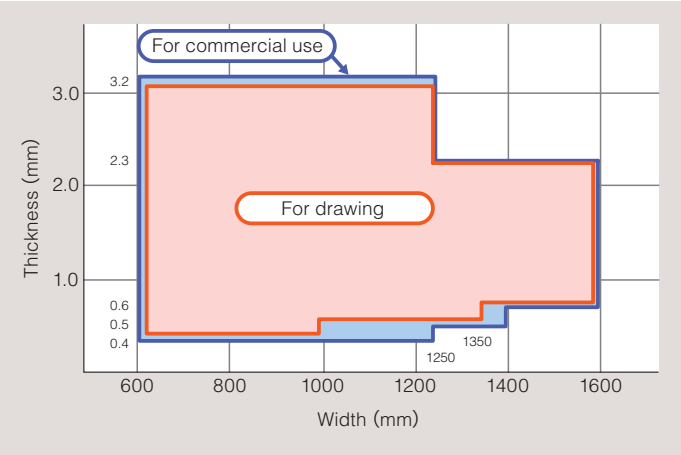
Coil inside diameter, outside diameter, mass

Inside diametermm(in.)	Outside diameter mm	Mass ton
508(20)、610(24)	1850 max.	25 max.

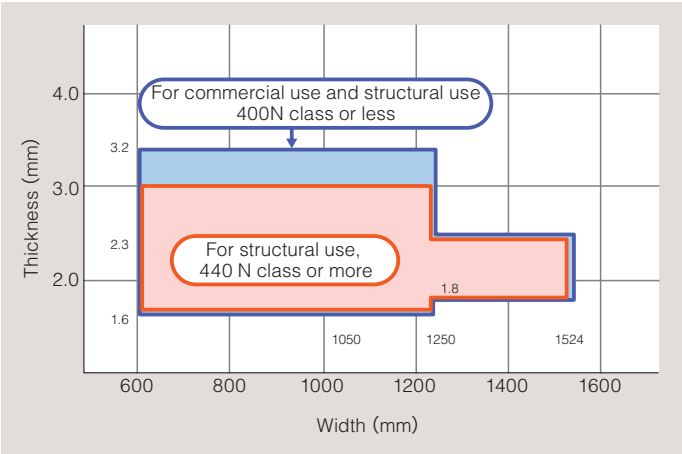
Cut sheet length

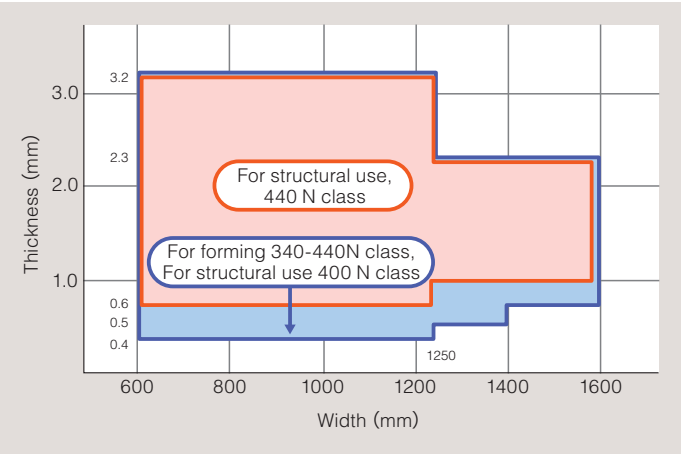
Thickness mm	Width mm	Length mm
Under 0.4	1294 or less	610～4880
0.4 and over or less 1.2	1294 or less	610～6096
	1294 or more	914～6096
1.2 or more	Entire width	914～6096

Cold-rolled sheet



Hot-rolled sheet





Reference: For thickness of hot-dip base sheet over 3.2, please consult us.

Hot-dip galvanized steel sheet GALKOBE (Galvannealed)

Product types

Hot-rolled sheet

Product symbol		Applications	JIS classification	Tensile test			
Kobe Steel standard	JIS classification			Yield point N/mm²	Tensile strength N/mm²	Elongation % Thickness, 1.6 mm and over	Test piece (JIS)
GAHC-A	SGHC-A	For commercial use	SGHC	(205 and over)	(270 and over)	–	No.5 rolling direction
GAHS400-A	–	For structural use	–	245 and over	400 and over	18 and over	
GAHS440-A	–		–	270 and over	440 and over	18 and over	
GAHS490-A	–		–	360 and over	490 and over	16 and over	
GAHS540-A	–		–	350 and over	540 and over	16 and over	
–	SGH400-A		SGH400	295 and over	400 and over	18 and over	
–	SGH440-A		SGH440	335 and over	440 and over	18 and over	
–	SGH490-A		SGH490	365 and over	490 and over	16 and over	
–	SGH540-A		SGH540	400 and over	540 and over	16 and over	
KBAH390	–	For forming	–	250 and over	390 and over	30 and over	
KBAH440	–		–	300 and over	440 and over	29 and over	

Note 1: Figures in parentheses are for reference.

Cold-rolled sheet

Product symbol		Applications	JIS classification	Tensile test						
Kobe Steel standard	JIS classification			Yield point N/mm²	Tensile strength N/mm²	Elongation % Nominal thickness mm				Test piece (JIS)
						0.40 to less than 0.60	0.60 to less than1.0	1.0 to less than1.6	1.6 to less than2.5	2.5 and over	
GACC	SGCC-A	For commercial use	SGCC	(205 and over)	(270 and over)	–	–	–	–	–	No.5 rolling direction
GACD	SGCD1-A	For drawing (class1)	SGCD1	–	270 and over	34 and over	36 and over	37 and over	38 and over	–	
GACE	SGCD2-A	For drawing (class2)	SGCD2	–	270 and over	36 and over	38 and over	39 and over	40 and over	–	
GACX	SGCD3-A	For drawing (class3)	SGCD3	–	270 and over	38 and over	40 and over	41 and over	42 and over	–	
–	SGCD4-A	For non-aging drawing (class4)	SGCD4	–	270 and over	40 and over	42 and over	43 and over	44 and over	–	
GACS400-A	–	For structural use	–	245 and overr	400 and over	18 and over	18 and over	18 and over	18 and over	18 and over	
GACS440-A	–		–	335 and over	440 and over	18 and over	18 and over	18 and over	18 and over	18 and over	
GACS490-A	–		–	365 and over	490 and over	16 and over	16 and over	16 and over	16 and over	16 and over	
–	SGC400-A		SGC400	295 and over	400 and over	18 and over	18 and over	18 and over	18 and over	18 and over	
–	SGC440-A		SGC440	335 and over	440 and over	18 and over	18 and over	18 and over	18 and over	18 and over	
–	SGC490-A		SGC490	365 and over	490 and over	16 and over	16 and over	16 and over	16 and over	16 and over	
–	SGC570-A		SGC570	560 and over	570 and over	–	–	–	–	–	
KBAC340	–		–	195 and over	340 and over	33 and over	35 and over	36 and over	37 and over	38 and over	No.5 perpendicular to rolling direction
KBAC390	–	For forming	–	255 and over	390 and over	28 and over	30 and over	31 and over	32 and over	33 and over	
KBAC440	–		–	295 and over	440 and over	24 and over	26 and over	27 and over	28 and over	29 and over	

Note 1: Figures in parentheses are for reference.

Zinc coating mass

Type	Symbol	Minimum Zinc coating mass g/㎡		
		Both sides (triple-spot test)	Both sides (single-spot test)	One side (triple-spot test)
Both sides	(F04)	(40)	(34)	–
	F06	60	51	–
	F08	80	68	–
	F10	100	85	–
	F12	120	102	–
One side	30	–	–	20
	45	–	–	30
	60	–	–	40
	90	–	–	60

Chemical conversion coating

Symbol	Chemical conversion coating
GX-GC	Chromate-free treatment
M	(Uncoated)

Reference: Uncoated materials are normally oiled.

Note 1: Symbols and figures for zinc coating mass in parentheses are based on agreements reached between Kobe Steel and the purchaser on a case-by-case basis.

Thickness tolerance

Thickness tolerance is applied to the values obtained by adding the equivalent zinc thickness (both sides) for each zinc coating mass symbol to the nominal thickness.

Hot-rolled sheet (for general use)

Unit:mm

Width / Nominal thickness	Under 1200	1200 to less than 1500	1500 and over
1.6 to less than 2.0	±0.17	±0.18	±0.19
2.0 to less than 2.5	±0.18	±0.20	±0.22
2.5 to less than 3.15	±0.20	±0.22	±0.25
3.15 to less than 4.0	±0.22	±0.24	±0.27
4.0 and over or less4.5	±0.25	±0.27	—

Hot-rolled sheet (For structural use and forming)

Unit:mm

Width / Nominal thickness	Under 1600	1600
1.6 to less than 2.0	±0.20	±0.24
2.0 to less than 2.5	±0.21	±0.26
2.5 to less than 3.15	±0.23	±0.30
3.15 to less than 4.0	±0.25	±0.35
4.0 and over or less4.5	±0.46	—

Cold-rolled sheet

Unit:mm

Width / Nominal thickness	Under 630	630 to less than 1000	1000to less than 1250	1250 and over
0.40 to less than 0.60	±0.06	±0.06	±0.06	±0.07
0.60 to less than 0.80	±0.07	±0.07	±0.07	±0.07
0.80 to less than 1.00	±0.07	±0.07	±0.08	±0.09
1.00 to less than 1.25	±0.08	±0.08	±0.09	±0.10
1.25 to less than 1.60	±0.09	±0.10	±0.11	±0.12
1.60 to less than 2.00	±0.11	±0.12	±0.13	±0.14
2.00 to less than 2.50	±0.13	±0.14	±0.15	±0.16
2.50 to less than 3.15	±0.15	±0.16	±0.17	±0.18
3.15 and over or less 3.20	±0.17	±0.18	±0.20	±0.21

Equivalent zinc thickness

Unit:mm

Zinc coating mass symbol	F04	F06	F08	F10	F12	F18
Equivalent zinc thickness (both sides)	0.008	0.013	0.017	0.021	0.026	0.034

Zinc coating mass symbol	30	45	60	90
Equivalent zinc thickness (one side)	0.004	0.006	0.008	0.013

Width tolerance

Base sheet / Tolerance classification / Width classification	Hot-rolled sheets A	Hot-rolled sheets B	Cold-rolled sheets
1500 or less	+25 0	+10 0	+7 0
1500 or more			+10 0

Length tolerance

Unit:mm

Hot-rolled sheet	Cold-rolled sheet
+15 - 0	+15 - 0

Range of available products

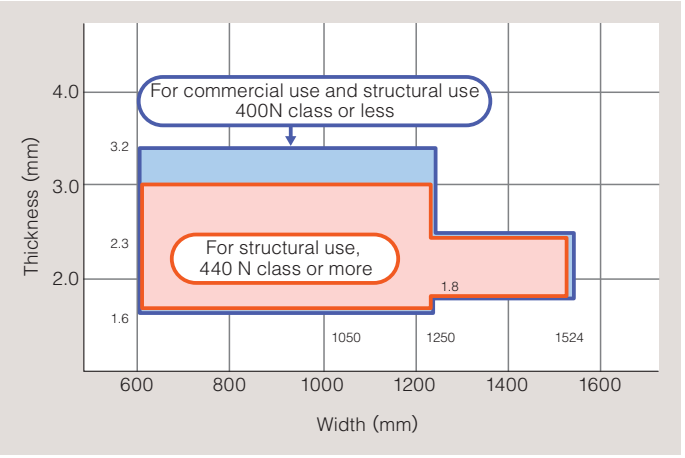
Coil inside diameter, outside diameter, mass

Inside diameter mm(in.)	Outside diameter mm	Mass ton
508(20)、610(24)	1850 max.	25 max.

Cut sheet length

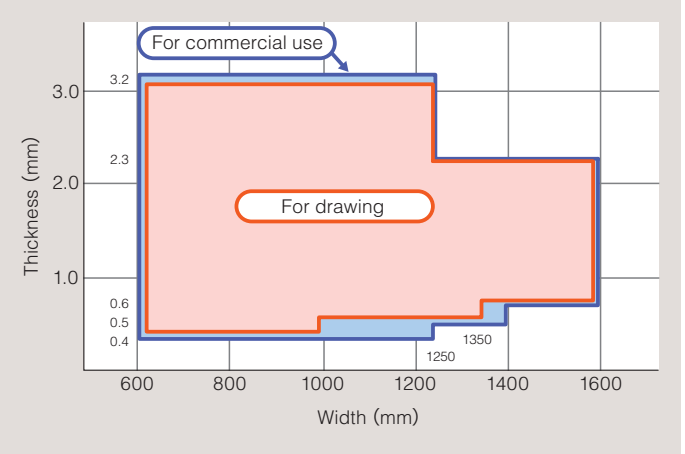
Thickness mm	Width mm	Length mm
0.4 Under	1294 or less	610～4880
0.4 and over or less 1.2	1294 or less	610～6096
	1294 or more	914～6096
1.2 or more	Entire width	914～6096

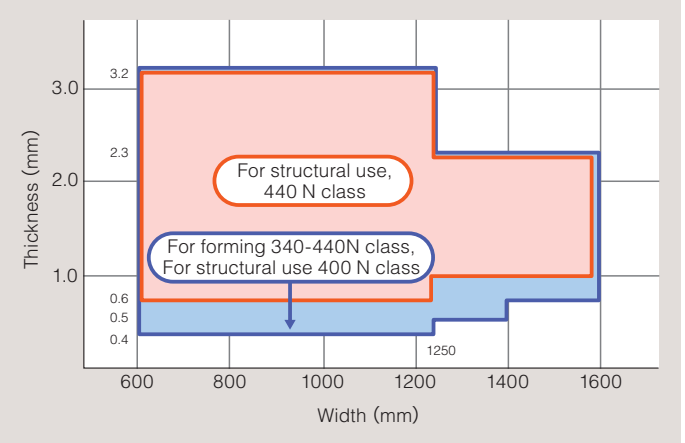
Hot-rolled sheet



Reference: For thickness of hot-dip base sheet over 3.2, please consult us.

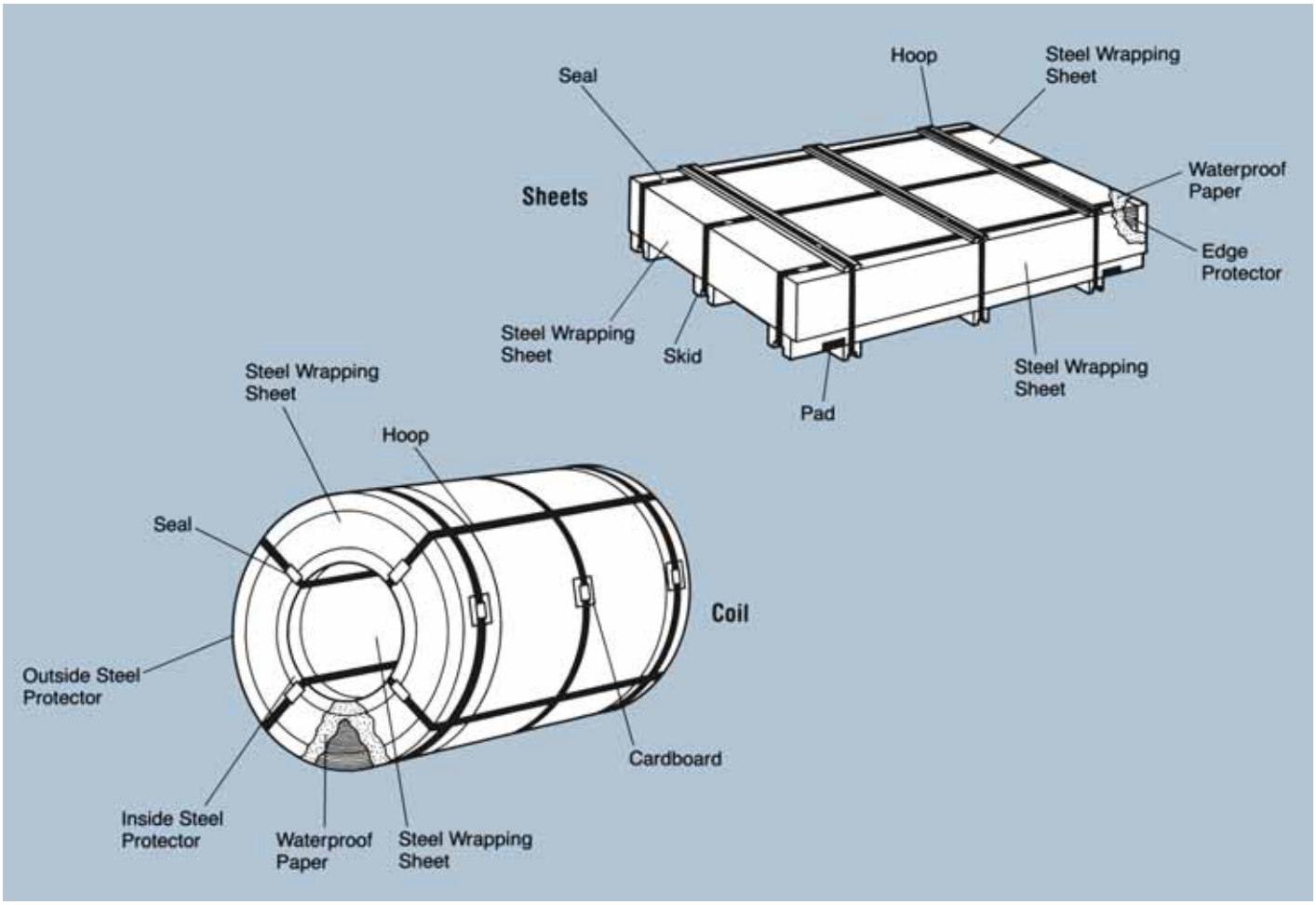
Cold-rolled sheet





Packaging and Identification

Packaging



Identification

Every package has an identification sticker printed with specifications, package number, dimensions, mass, number of sheets (when applicable), material grade, customer name, and other pertinent information.

KOBELCO ELECTRO-GALVANIZED STEEL SHEET IN COIL

SPEC
SECC

SIZE
0.800MM X 1219MM X COIL

PACK.NO

NET-MASS GROSS-MASS

C.NO

COATING-MASS
E16/E16

S.T
GX-K2

S.FINISH

KOBE STEEL, LTD. MADE IN JAPAN

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Notes for use

To get the best performance from your Kobe Steel's galvanized steel sheet, please observe the following precautions for use.

Storage

Under normal transport, storage, and processing conditions, there is little danger of rust. However, if the sheets are stored for long periods of time in a place exposed to rainwater or dew, or in high humidity, white rust can develop. To avoid this, choose a dry, clean place for storage.
If the packing paper is torn, cover the torn area immediately.

Handling

The zinc coatings are softer and more easily damaged than the steel sheet base. Although surface scratches will not immediately give rise to red rust, they mar the product's attractiveness. In addition, white rust can develop if the chemical treatment coating is damaged. The sheets should therefore be handled with reasonable care.
If the sheets are stained with press oil, machine oil, sweat, or fingerprints, they cannot deliver full performance. They should therefore be thoroughly cleaned before use.

Processing

Galvanized steel sheet is covered with a soft zinc surface. When rolling or pressing it, care must be taken to damage the sheet surface. Make sure that equipment and molds are clean and free of all foreign materials before processing.
The nominal thickness of galvanized steel sheet is the same as the thickness of the base sheet. When the zinc coating is thick, allowance must be made for the extra thickness when setting a mold clearance.

Welding

Appropriate welding conditions should be selected according to the zinc coating mass and chemical treatment applied.
Electrodes for resistance welding use cupper alloy, which easily alloys with zinc. It may result in stain and/or deformation of the electrode chip; therefore, it is necessary to dress or replace the chip during operation.

Degreasing and painting

Painting with insufficient degreasing may result in a painting defect; therefore, sufficient degreasing is critical. Do not use strong alkali degreasing agent, since it may significantly damage the surface.
Galvanized steel sheets with chemical treatment provide excellent paint adhesion; however, choose a paint that is compatible with the chemical treatment applied. Otherwise, it may result in poor paint adhesion.

KOBE STEEL, LTD.

IRON & STEEL BUSINESS

TOKYO HEAD OFFICE
9-12, Kita-Shinagawa 5-chome Shinagawa-ku, Tokyo 141-8688
Tel 81-3-5739-6153/Fax 81-3-5739-6923

Overseas Offices and Contacts

NEW YORK
Kobe Steel USA Inc.
535 Madison Avenue, New York, NY 10022, U.S.A.
Tel 1-212-751-9400/Fax 1-212-355-5564

DETROIT
Kobe Steel USA Inc.
19575 Victor Parkway, Suite 250, Livonia, MI 48152, U.S.A.
Tel 1-734-462-7757/Fax 1-734-462-7758

SINGAPORE
Kobe Steel Asia Pte. Ltd.
72 Anson Road, #11-01A, Anson House, Singapore 079911, Republic of Singapore
Tel 65-6221-6177/Fax 65-6225-6631

HONG KONG
Kobe Steel Asia Pte. Ltd.
Room 1604, Mass Mutual Tower, 38 Gloucester Road, Wanchai, Hong Kong
Tel 852-2865-0040/Fax 852-2520-6347

BANGKOK
Kobe Steel Asia Pte. Ltd.
10th Fl., Sathorn Thani Tower II, 92/23 North Sathorn Road.,Khwaeng Silom, Khet Bangrak, Bangkok
10500, Kingdom of Thailand
Tel 66-2636-8971/Fax 66-2636-8675

BEIJING
Kobe Steel, Ltd.
Beijing Office
Unit 1208, Bldg.A, The Lucky Tower, No.3 North Dongsanhuan Road, Chaoyang District, Beijing, China 100027
Tel 86-10-6461-8491/Fax 86-10-6461-8490

SHANGHAI
Kobelco (China) Holding Co., Ltd.
China headquarters
Room 3701, Hong Kong New World Tower, 300 Huai Hai Zhong Road, Luwan District, Shanghai 200021, China
Tel : +86-21-6415-4977 Fax : +86-21-6415-9409

201205500PR-F