ELECTROGALVANIZED STEEL SHEET

JFE Steel Corporation

"JFE is committing to environment and human life."

This is our motto.
Our galvanized steel sheet products have been developed to meet the strict requirements of demanding customers. Our goal is to help people and contribute to society by manufacturing these and other products which provide high quality and performance.

Steel sheets are used in a remarkably wide range of applications in everyday life. The growth of coated steel sheets has been especially astonishing in fields where improved product durability and cost reduction by process omission are strongly required.
Today, coated steel sheets are widely used as corrosion-resistant steel sheets with excellent economy, mainly in fields such as automobiles, electrical appliances, and OA equipment.
JFE Steel Corporation has devoted great effort to the development and production of various types of coated steel sheets, taking advantage of the company's state-of-the-art manufacturing equipment and technologies accumulated over many years.

JFE's electrogalvanized steel sheets have responded to market needs that are constantly changing and increasingly diverse and sophisticated with extensive chemical conversion-treated products suited to their attractive appearance. In particular, JFE has earned the firm confidence of customers in Japan and other countries by early commercialization of the "Eco Frontier™ Series" of chromate-free products, which responds to customers' needs for environment-friendly products.

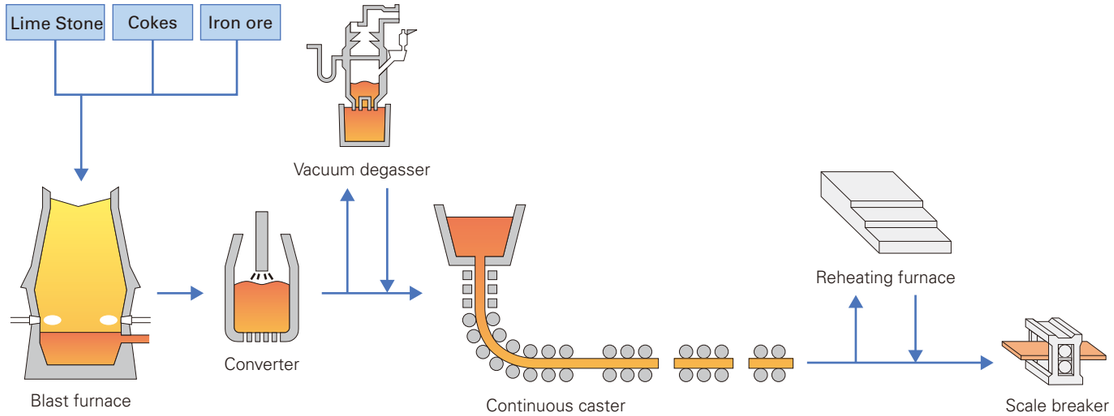
In the future, we appreciate customers' understanding of the outstanding properties of JFE products and we look forward to serving you with the best possible product for every application.

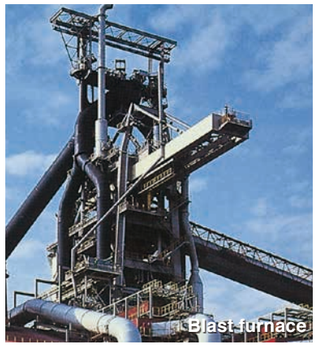
JFE Steel propelling in to the future.

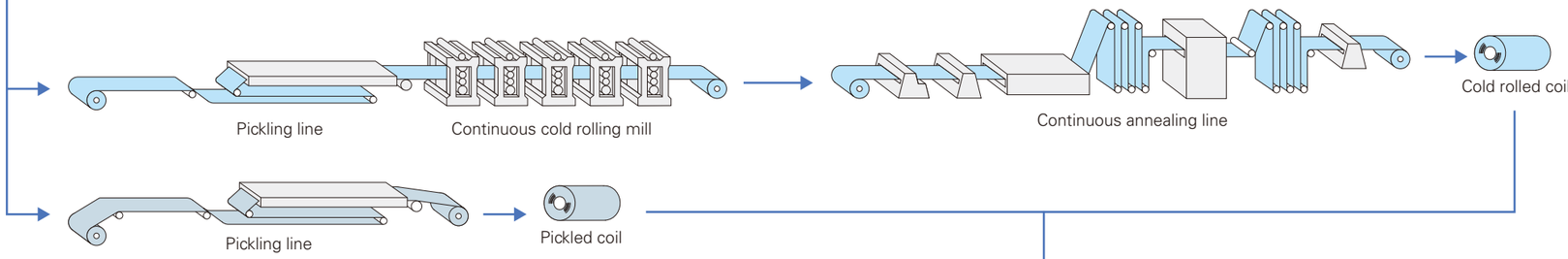
JFE's electrogalvanized steel sheets Contents

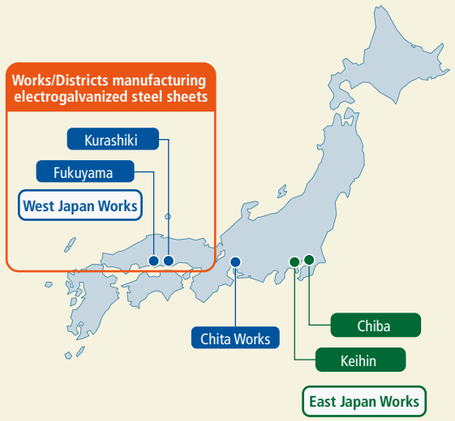
ELECTROGALVANIZED STEEL SHEET

Manufacturing Process

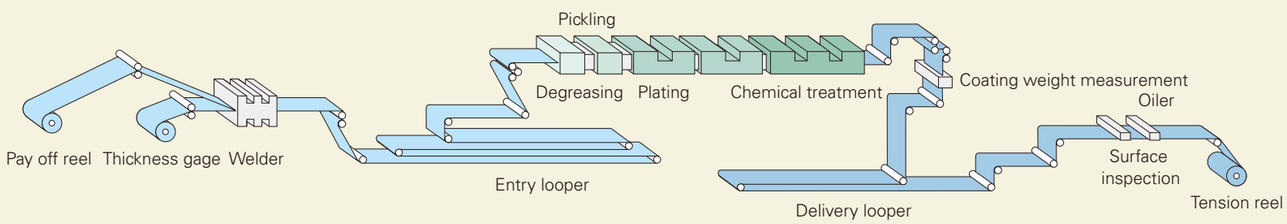








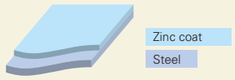
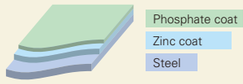
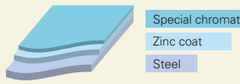
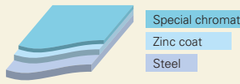
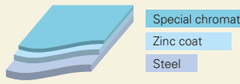
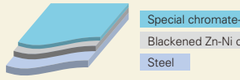
Electrogalvanizing line

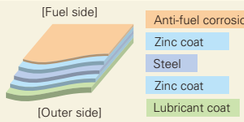
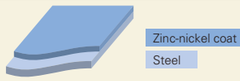
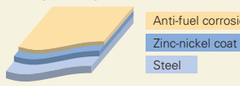


Base materials	Pre-treatment	Plating	Chemical treatment	Products
●Hot rolled coil ●Cold rolled coil	●Degreasing ●Pickling	●Electroplated in electrolytic bath. ●Coating weight is controlled by quantity of electricity.	●Various post-treatments can be used to improve anti-corrosion and paint properties.	●JFE EXCELZINC ●JFE EXCELZINC NICKEL

ELECTROGALVANIZED STEEL SHEET

List of JFE Electrogalvanized Products

Type of coating	Classification	Chemical treatment designation	Structure of coating layer	Chemical treatment	Available range			Characteristics						Main applications	Reference page No.
					Coating weight (g/m^2)	Thickness (mm)	Width (mm)	Corrosion resistance	Conductivity	Lubricity	Paint adhesion	Scratch resistance	Other		
JFE EXCELZINC (Pure zinc coating)		M	 Zinc coat / Steel	No treatment	3 – 40	0.3 – 3.2	600 – 1850							Painting substrate, etc.	—
	JFE Eco Frontier™ Series	JP	 Phosphate coat / Zinc coat / Steel	Chromate free Phosphate treatment	3 – 40	0.3 – 3.2	600 – 1630	△	○	△	◎	○		Switch board, office equipment, construction materials	14
		JN	 Special chromate-free coat / Zinc coat / Steel	Chromate-free Anti-fingerprint treatment (standard type)	3 – 40	0.3 – 2.6	700 – 1500	○	◎	○	○+	○		AV, office equipment, automotive applications, PC cases, electrical appliances, etc.	15
		JX	 Special chromate-free coat / Zinc coat / Steel	Chromate-free Anti-fingerprint treatment (high performance type)	3 – 40	0.4 – 2.3	700 – 1500	◎	◎	◎	○+	◎		AV, office equipment, motor cases, tanks, etc.	16
		JE	 Special chromate-free coat / Zinc coat / Steel	Chromate-free Inorganic treatment	3 – 40	0.4 – 2.3	900 – 1350	△	◎	○	○+	○	High speed press formability	Motor cases, automotive applications, electrical appliances, etc.	17
JFE EXCELZINC NICKEL (Zinc-nickel alloy coating)		Z1	 Special chromate-free coat / Blackened Zn-Ni coat / Steel	Chromate-free Black steel sheet	10 – 20	0.5 – 1.6	800 – 1219	○	○	△	—	○	Heat radiation	AV, office equipment, etc.	18

Type of coating	Chemical treatment designation	Structure of coating layer	Chemical treatment	Available range			Characteristics					Main applications	Reference page No.
				Coating weight (g/m^2)	Thickness (mm)	Width (mm)	Anti-gasoline corrosion (*1)	Weldability (*2)	Formability (*3)	Paint adhesion (*3)	Other		
JFE EXCELZINC (Pure zinc coating)	GT	[Fuel side]  [Outer side] Anti-fuel corrosion coat / Zinc coat / Steel	One side coating (both sides coating) +one side special coating	10 – 40	0.7 – 1.2	600 – 1500	○	◎	◎	◎		Gasoline tank for motorcycle and general use (Motorboat, Mowing machine, Cropper, Dynamo)	19
	GP	[Fuel side]  [Outer side] Anti-fuel corrosion coat / Zinc coat / Steel / Zinc coat / Lubricant coat	Both sides coating +both sides special coating	10 – 40	0.6 – 1.6	750 – 1400	◎+	○	◎	◎	Anti-gasoline corrosion	Gasoline tank for automobile (Passenger car, Truck)	20
JFE EXCELZINC NICKEL (Zinc-nickel alloy coating)	M	 Zinc-nickel coat / Steel	No treatment	10 – 40	0.4 – 2.3	600 – 1850					Heat resistance	Substrate for painting	—
	GT	[Fuel side]  [Outer side] Anti-fuel corrosion coat / Zinc-nickel coat / Steel	One side coating (both sides coating) +one side special coating	10 – 40	0.7 – 1.2	600 – 1500	◎	◎+	◎	◎		Gasoline tank for motorcycle and general use (Motorboat, Mowing machine, Cropper, Dynamo)	19

Remarks: (*1) The cup test piece is immersed in 40°C contaminated gasoline for 10 days.
(Contaminated gasoline: Formic acid, acetic acid, peroxides, water, Cl-ion are added in gasoline.)
(*2) Spot welding is evaluated by continuity of successful welding.
(*3) Since no common-method data were available, it is listed as qualitative evaluation.

Note: Conventional chemical treatments JD, JS, JF, and JT have been replaced by the following treatments.
① JD→JE, ② JS, JF, JT→JX.

☆ JFE Steel provides information in connection with substances of environmental concern for the following datasheets:
① Safety Data Sheet (SDS)
② Specified Chemical Substances Data Sheet for Steel (SSDS)
③ RoHS Directive Restricted Material of hazardous Substances (RoHS, RoHS2.0)
④ JAMP format (AIS)
⑤ JAMP format (MSDSplus)
⑥ JAMA format
⑦ JIG format
For more information, please refer to the JFE Steel website: http://www.jfe-sds.jp/

◎: Excellent
○: Good
△: Fair

List of JFE electrogalvanized products

ELECTROGALVANIZED STEEL SHEET

JFE EXCELZINC and JFE EXCELZINC NICKEL

(1) JFE EXCELZINC

Public standards

● **Japanese Industrial Standards (JIS)**

Classification		Designation	Characteristics, application
JIS G 3313	Electrolytic zinc-coated steel sheets and strip	SEHC, SEHD, SEHE, SECC, SECD, SECE, etc.	Defined electrogalvanized steel sheets from structural quality to deep drawing quality, from general use to high strength steel.

● **The Japan Iron and Steel Federation Standard (JFS)**

Classification		Designation	Characteristics, application
JFS A 3021	Electrolytic zinc coated steel sheets and strip for automobile uses	JEH, JEC	Electrogalvanized steel sheets for automobiles (From general use to high strength steel.)

JFE standards

●JFE EXCELZINC
(base metal: hot-rolled steel)

Classification	Designation
Commercial quality	JFE-HC-EZ
Drawing quality	JFE-HD-EZ
Deep drawing quality	JFE-HE-EZ
High strength steel for Commercial quality 390	JFE-HA390-EZ
High strength steel for Commercial quality 440	JFE-HA440-EZ

●JFE EXCELZINC
(base metal: cold-rolled steel)

Classification	Designation
Commercial quality	JFE-CC-EZ
Drawing quality	JFE-CD-EZ
Deep drawing quality 1	JFE-CE-EZ
Deep drawing quality 2	JFE-CF-EZ
Extra deep drawing quality	JFE-CG-EZ
Ultra deep drawing quality	JFE-CGX-EZ
Bake hardenability quality	JFE-CEH-EZ
Deep drawing quality with bake hardenability	JFE-CGH-EZ
High strength steel for commercial quality 390	JFE-CA390-EZ
High strength steel for commercial quality 440	JFE-CA440-EZ
High strength steel for commercial quality 590	JFE-CA590-EZ

●JFE EXCELZINC
(base metal: cold-rolled high strength steel)
For other high strength steel substrates,
please inquire regarding the desired substrate.

(2) JFE EXCELZINC NICKEL

Public standards

● **The Japan Iron and Steel Federation Standard (JFS)**

Classification		Designation	Characteristics, application
JFS A 3041	Electrolytic zinc-nickel alloy coated steel sheets and strip for automobile uses	JNH, JNC	Zinc-Nickel alloy coated electrogalvanized steel sheets for automobiles

JFE standards

● **JFE EXCELZINC NICKEL**
(base metal: hot-rolled steel)

Classification	Designation
Commercial quality	JFE-HC-EZN
Drawing quality	JFE-HD-EZN
Deep drawing quality	JFE-HE-EZN
High strength steel for commercial quality390	JFE-HA390-EZN
High strength steel for commercial quality440	JFE-HA440-EZN

●**JFE EXCELZINC NICKEL**
(base metal: cold-rolled steel)

Classification	Designation
Commercial quality	JFE-CC-EZN
Drawing quality	JFE-CD-EZN
Deep drawing quality 1	JFE-CE-EZN
Deep drawing quality 2	JFE-CF-EZN
Extra deep drawing quality	JFE-CG-EZN
Ultra deep drawing quality	JFE-CGX-EZN
Bake hardenability quality	JFE-CEH-EZN
Deep drawing quality with bake hardenability	JFE-CGH-EZN
High strength steel for commercial quality390	JFE-CA390-EZN
High strength steel for commercial quality440	JFE-CA440-EZN
High strength steel for commercial quality590	JFE-CA590-EZN

● **JFE EXCELZINC NICKEL**
(base metal: cold-rolled high strength steel)
For other high strength steel substrates,
please inquire regarding the desired substrate.

JFE EXCELZINC and JFE EXCELZINC NICKEL

ELECTROGALVANIZED STEEL SHEET

Mechanical Properties

● JFE EXCELZINC (base metal: cold-rolled mild steel)

Classification	Designation	Tensile Test													Mean r-value min.		BH Value min. (N/mm^2)
		Yield Point min. (N/mm^2) Thickness mm			Tensile Strength min. (N/mm^2)	Elongation min. (%) Thickness mm									Thickness mm		
		0.3 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ ≤ 3.2		0.3 ≤ < 0.4	0.4 ≤ < 0.6	0.6 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 3.2	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6	
Commercial quality	JFE-CC-EZ	(145)	(135)	(125)	(270)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	—	—	—
Drawing quality	JFE-CD-EZ	135	125	115	270	—	40	41	42	43	44	45	46	47	(1.2)	(1.1)	—
Deep drawing quality 1	JFE-CE-EZ	130	120	110	270	—	42	43	44	45	46	47	48	49	(1.4)	(1.3)	—
Deep drawing quality 2	JFE-CF-EZ	120	110	100	270	—	44	45	46	47	48	49	50	51	(1.6)	(1.5)	—
Extra deep drawing quality	JFE-CG-EZ	110	100	90	260	—	46	47	48	49	50	51	52		1.8	1.7	—
Ultra deep drawing quality	JFE-CGX-EZ	100		90	260	—	46	47	48	49	50	51	—	—	2.1	2.0	—
Bake hardenability quality	JFE-CEH-EZ	135	125	115	270	—	40	41	42	43	44	45			(1.4)	(1.3)	30
Deep drawing quality with bake hardenability	JFE-CGH-EZ	135	125	115	260	—	—	44	45	46	47	—	—	—	(1.6)	(1.4)	30

Notes 1. JIS No.5 test piece for tensile test taken in rolling direction.
Notes 2. For thickness less than 0.6mm, above tests are omitted if not specifically requested.
Notes 3. Figures in the parentheses are reference values.

● JFE EXCELZINC (base metal: cold-rolled high strength steel)

Please contact JFE Steel for further information.

● JFE EXCELZINC NICKEL (base metal: cold-rolled mild steel)

Classification	Designation	Tensile Test												Mean r-value min.		BH Value min. (N/mm^2)
		Yield Point min. (N/mm^2) Thickness mm			Tensile Strength min. (N/mm^2)	Elongation min. (%) Thickness mm								Thickness mm		
		0.3 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ ≤ 2.3		0.3 ≤ < 0.4	0.4 ≤ < 0.6	0.6 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ ≤ 2.3	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6	
Commercial quality	JFE-CC-EZN	(145)	(135)	(125)	(270)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	—	—	—
Drawing quality	JFE-CD-EZN	135	125	115	270	—	38	39	40	41	42	43	44	(1.0)	(0.9)	—
Deep drawing quality 1	JFE-CE-EZN	130	120	110	270	—	40	41	42	43	44	45	46	(1.2)	(1.1)	—
Deep drawing quality 2	JFE-CF-EZN	120	110	100	270	—	42	43	44	45	46	47	48	(1.4)	(1.3)	—
Extra deep drawing quality	JFE-CG-EZN	110	100	90	260	—	44	45	46	47	48	49	50	1.6	1.5	—
Ultra deep drawing quality	JFE-CGX-EZN	100		90	260	—	44	45	46	47	48	—	—	1.9	1.8	—
Bake hardenability quality	JFE-CEH-EZN	135	125	115	270	—	38	39	40	41	42	43		(1.2)	(1.1)	30
Deep drawing quality with bake hardenability	JFE-CGH-EZN	135	125	115	260	—	—	42	43	44	—	—	—	(1.4)	(1.2)	30

Notes 1. JIS No.5 test piece for tensile test taken in rolling direction.
Notes 2. For thickness less than 0.6mm, above tests are omitted if not specifically requested.
Notes 3. Figures in the parentheses are reference values.

● JFE EXCELZINC NICKEL (base metal: cold-rolled high strength steel)

Please contact JFE Steel for further information.

Mechanical Properties

ELECTROGALVANIZED STEEL SHEET

Products Standards

(1) JFE EXCELZINC

Zinc Coating weight

● **JFE EXCELZINC**

Designation \ Coating weight	Standard coating weight (One side)		Min. coating weight (One side g/m²)	
	g/m²	μm	Equal coating	Differencial coating
A	3	0.4	—	—
10	10	1.4	8.5	8
15	15	2.1	12.7	12
20	20	2.8	17	16
30	30	4.2	25.5	24
40	40	5.6	34	32

One-side coating, differencial coating or coating weight more than 40g/m² are available, please contact JFE Steel for further information.

● **JIS-equivalent product**

JIS G 3313(2010)

One-side Zn coating weight designation	Min. Zn coating weight (One side) g/m² [a]		(Reference) Standard Zn coating weight (One side) g/m²
	Equal coating	Differencial coating	
ES [b]	—	— [c]	—
EB	2.5	—	3
E8	8.5	8	10
E16	17	16	20
E24	25.5	24	30
E32	34	32	40
E40	42.5	40	50

Remarks: The standard coating weights given here are reference values showing the coating weight (one-side) based on actual production results.

Notes: a) Coating weight designations and minimum coating weights for coatings over E40 are decided through consultation between JFE and the customer.
b) The coating weight designation ES means the steel surface of one-side coated products.
c) Coating weight is 50 mg/m² or less except at the edges (edges in widthwise direction).

Oiling

Oiling is specified in the table.

Oiling	Designation
No oiled	X
Oiled	O

Chemical treatment

The chemical treatment of JFE EXCELZINC is referred to pages 4 to 5.

Dimension tolerance

JIS G 3313 (2010), Appendix JA, Table JA.2 is applied to the dimensional tolerances of hot rolled steel. JIS G 3313 (2010), Appendix JA, Table JA.6 is applied to cold rolled steel; however, JIS G 3141 (2011), Table 16 is applied when the indicated thickness is less than 0.40 mm. Examples of thickness tolerances are shown below.

● **Hot-rolled base metal**

Unit : mm

Nominal thickness \ Width	< 1,200	1,200 ≤ < 1,500	1,500 ≤ < 1,800	1,800 ≤ < 2,300
1.60 ≤, < 2.00	±0.16	±0.17	±0.18	±0.21[a]
2.00 ≤, < 2.50	±0.17	±0.19	±0.21	±0.25[a]
2.50 ≤, < 3.15	±0.19	±0.21	±0.24	±0.26
3.15 ≤, ≤ 3.20	±0.21	±0.23	±0.26	±0.27

Remarks: a) is applied to the strip width less than 2,000mm.

● **Cold-rolled base metal**

Unit : mm

Nominal thickness \ Width	< 630	630 ≤ < 1,000	1,000 ≤ < 1,250	1,250 ≤ < 1,600	1,600 ≤
< 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 ≤, ≤ 3.20	±0.16	±0.17	±0.19	±0.20	—

(2) JFE EXCELZINC NICKEL

Zinc coating weight

● **JFE EXCELZINC NICKEL**

Designation	Standard coating weight (One side)		Min. coating weight (One side) g/m²	
	g/m²	Thickness μm	Equal coating	Differencial coating
10	10	1.4	8.5	8
15	15	2.1	12.7	12
20	20	2.8	17	16
30	30	4.2	25.5	24
40	40	5.6	34	32

One-side coating and differential coating are available, please contact JFE Steel for further information.

Description of steel grade (examples)

● **JFE Eco Frontier™ Series**

SE		C	C		__	*	JN	-	X	- E16/E16
JFE	-	C	C	-	EZ	*	JN	-	X	- 20/20
JFE	-	C	C	-	EZN	*	Z1	-	X	- 10/10
(A)		(B)	(C)		(D)		(E)		(F)	(G)

(A) Standards: SE = JIS Electrolytic zinc coated steel sheet standard, JFE = JFE standard
(B) Base metal used: C = Cold rolled steel sheet, H = Hot rolled steel sheet
(C) Classification: C = Commercial quality, D = Drawing quality, E = Deep drawing quality
(D) Coating: EZ = JFE EXCELZINC = JFE Pure zinc electrogalvanized steel sheet
EZN = JFE EXCELZINC NICKEL = JFE Alloy Electrogalvanized steel sheet
(E) Chromate-free chemical treatment: JN = Standard, Z1 = Blackening chemical treatment
(F) Oiling: X = No Oiling
(G) Standard coating weight (Top side/Bottom side)

● **Steel sheets for fuel tanks**

JFE	-	C	G	-	EZ	*	M/GT	-	O	- 0/20
JFE	-	C	C	-	EZ	*	GP	-	__	40/40
JFE	-	C	G	-	EZN	*	M/GT	-	O	- 0/20
(A)		(B)	(C)		(D)		(E)		(F)	(G)

(A) Standard: JFE = JFE standard
(B) Base metal used: C = Cold rolled steel sheet
(C) Classification: C = Commercial quality, D = Drawing quality, E = Deep drawing quality 1,
F = Deep drawing quality 2, G = Extra deep drawing quality
GX = Ultra deep drawing quality
(D) Coating: EZ = JFE EXCELZINC = JFE Pure zinc electrogalvanized steel sheet
EZN = JFE EXCELZINC NICKEL = JFE Alloy Electrogalvanized steel sheet
(E) Chromate-free chemical treatment: M = No treatment, GT = Anti-fuel corrosion coat,
GP = Special anti-fuel corrosion coat
(F) Oiling: O = Oiling
(G) Standard coating weight (Top side/Bottom side): 0/20 (one-side coating) 0 = 0 g/m², 20 = 20 g/m²
40/40 (both-side coating) 40 = 40 g/m²

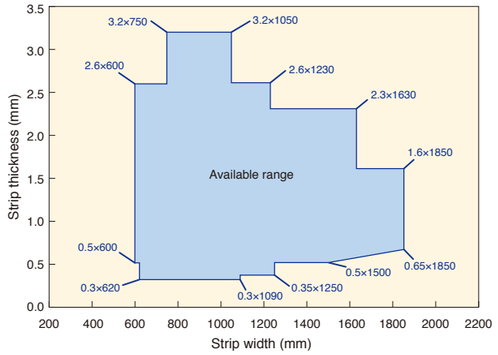
Products standards

ELECTROGALVANIZED STEEL SHEET

Available Product Size Range

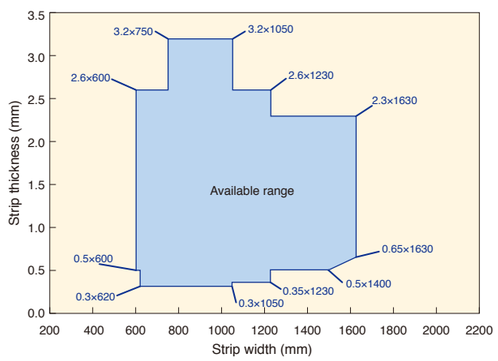
(1) JFE EXCELZINC (no treatment, oiling)

Applicable standard: SECC, JFE-CC-EZ



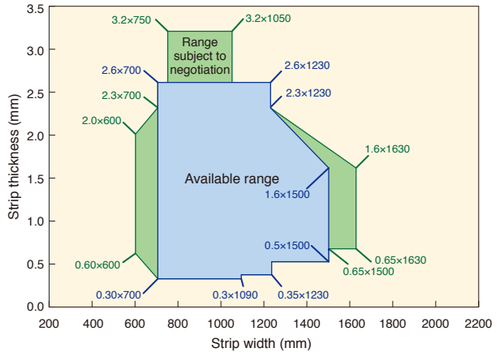
(2) JFE EXCELZINC (JP)

Applicable standard: SECC, JFE-CC-EZ



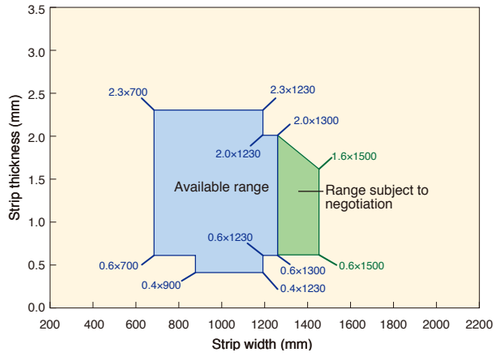
(3) JFE EXCELZINC (JN)

Applicable standard: SECC, JFE-CC-EZ



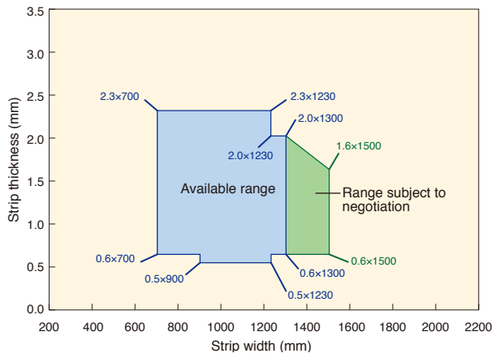
(4) JFE EXCELZINC (JN)

Applicable standard: CA390



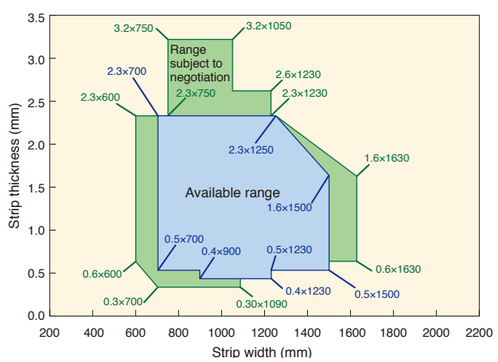
(5) JFE EXCELZINC (JN)

Applicable standard: CA440



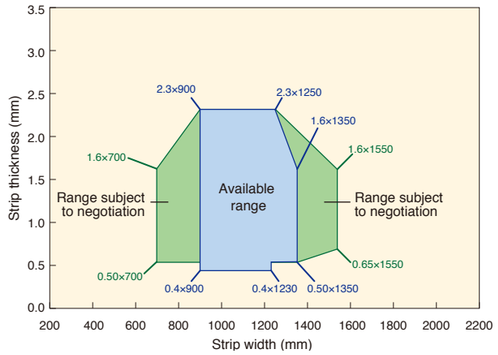
(6) JFE EXCELZINC (JX)

Applicable standard: SECC, JFE-CC-EZ



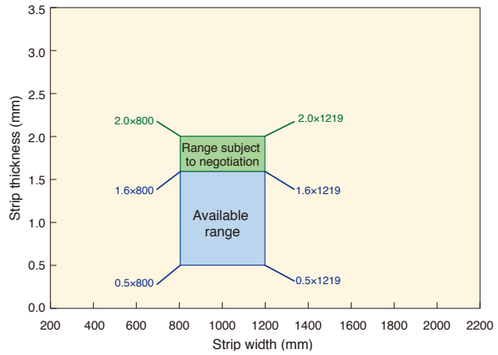
(7) JFE EXCELZINC (JE)

Applicable standard: SECC, JFE-CC-EZ



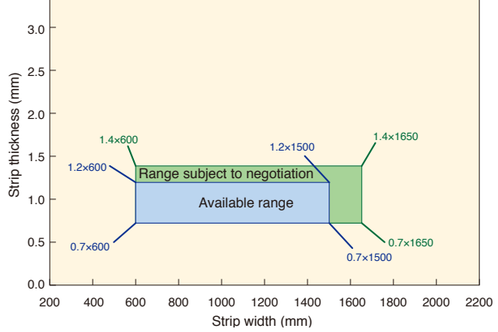
(8) JFE EXCELZINC NICKEL (Z1)

Applicable standard: JFE-CC-EZN



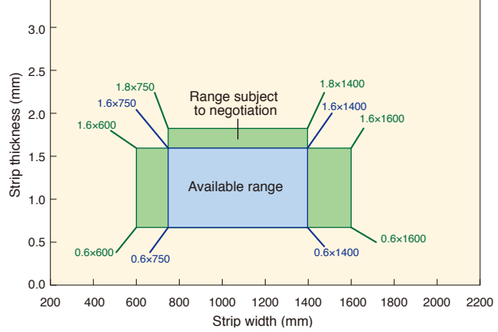
(9) JFE EXCELZINC (GT)

Applicable standard: JFE-CE-EZ



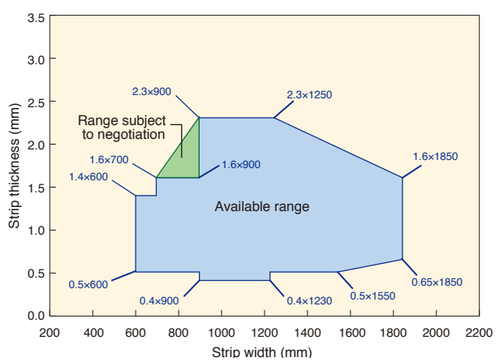
(10) JFE EXCELZINC (GP)

Applicable standard: JFE-CE-EZ



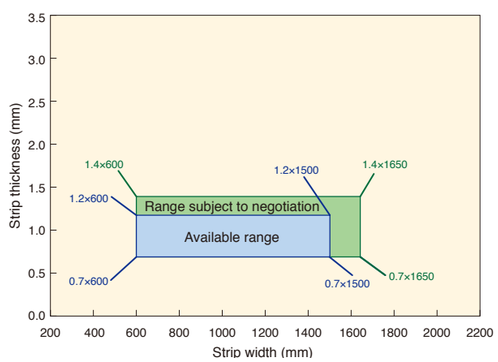
(11) JFE EXCELZINC NICKEL (no treatment, oiling)

Applicable standard: JFE-CC-EZN



(12) JFE EXCELZINC NICKEL (GT)

Applicable standard: JFE-CE-EZN



Available product size range

— Eco Frontier™ Series —

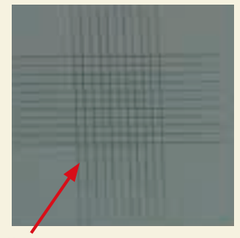
Chromate-free Coated Steel Sheet with Excellent Paint Adhesion = JP =

Suitable for application which requires high paint adhesion

Features

1) Paint adhesion → Excellent paint adhesion. Optimum substrate for painting.
2) Corrosion resistance after painting → Excellent corrosion resistance after painting.
3) Chromate-free → Chemical treatment coating contains absolutely no chromium. Satisfies all applicable environmental standards.

● Paint adhesion (secondary adhesion property)

JP	Phosphate treatment
	
No peeling	No peeling

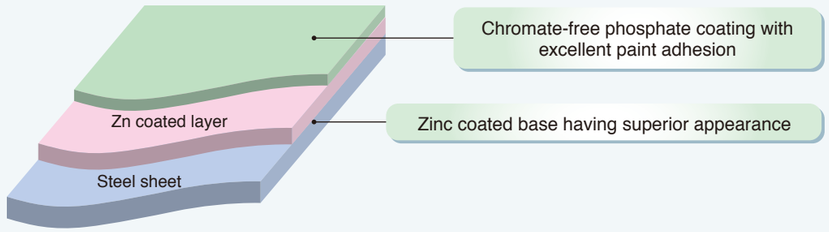
Paint: Delicon #700 by Dai Nippon Toryo Co., Ltd.
Coating thickness: 25 µm
Baking at 130°C × 30 min.
After dipping into boiling water for 2 hrs→cross cut peeling

● Corrosion resistance after 120 hrs SST

JP	Phosphate treatment
	
No peeling	No peeling

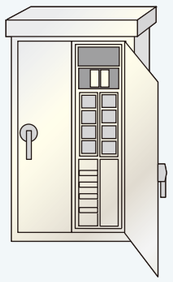
Paint: Delicon #240NPS + Delicon #700
by Dai Nippon Toryo Co., Ltd.
Coating thickness: 30 µm
Baking at 130°C × 30 min.
After cross cut →120 hrs SST

Structure of coating

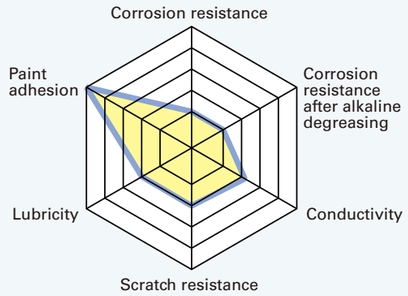


Applications

General usage with painting such as;
1) Steel sheet for general application
Cash dispenser, office equipment, etc.
2) Electrical appliances
Switch board, DVD casing, audio, etc.



Performance of JP



— Eco Frontier™ Series —

Standard Type Chromate-free Coated Steel Sheet with Excellent Anti-Fingerprint Property, Excellent Corrosion Resistance and High Conductivity = JN =

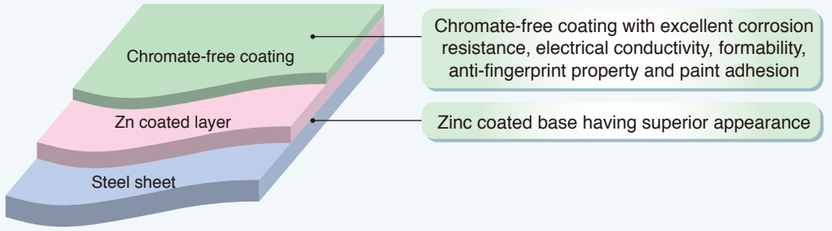
Winner of Okochi Memorial Technology Prize (2007) and National Commendation for Invention, Invention Prize of the Minster of Education, Culture, Sports, Science and Technology (2008)

Used in a wide variety of applications, and also has excellent procurability.

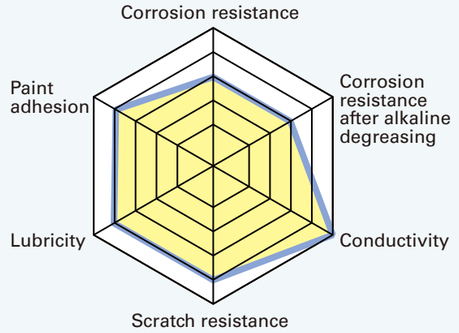
Features

1) Appearance → Good appearance by use of electrogalvanized substrate.
2) Corrosion resistance → Excellent corrosion resistance. Unpainted use is possible.
3) Conductivity → Superior electrical conductivity (excellent weldability).Optimum material for OA and AV applications in which electromagnetic shielding (EMS: electromagnetic susceptibility) is a priority.
4) Anti-fingerprint property → No remarkable fingerprints during handling.
5) Formability → Excellent press-formability.
6) Paint adhesion → Can be used as substrate for painting.
7) Alkaline degreasing property → Possible to use alkaline degreasing as a flat sheet and after forming.

Structure of coating



Performance of JN Balanced performance



Applications

1) OA and AV equipment and housings in which electrical conductivity and electromagnetic shielding are priorities.
2) Applications requiring unpainted use as a flat sheet and after forming (electrical machinery and electronic part applications).

— Eco Frontier™ Series —

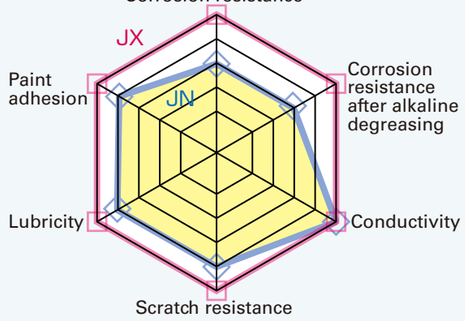
High Performance Chromate-free Steel Sheet with Advanced Conductivity, Corrosion Resistance and Formability = JX =

High performance steel sheets that realize advanced corrosion resistance and electrical conductivity and also enable severe press forming.

Features

1) New corrosion-resistant coating (eNano™) → New corrosion-resistant coating (eNano™) developed by JFE Steel prevents transmission of corrosion factors by a special nano-molecular layer on the surface of the Zn coating layer, thereby realizing high corrosion resistance with a thin film.
2) Corrosion resistance → Extremely high corrosion resistance. Can be used in severe corrosion environments.
3) Conductivity → Excellent electrical conductivity. Suitable for OA and PC equipment in which high conductivity is required.
4) Scratch resistance → Excellent scratch resistance. Because JX sheets have excellent resistance to scratches during processing, improved yield can be expected.
5) Formability → Excellent press formability, allowing customers to omit oil coating and degreasing processes.
6) Corrosion resistance after forming → Excellent corrosion resistance after forming, allowing customers to omit painting.

Performance of JX (comparison with JN)

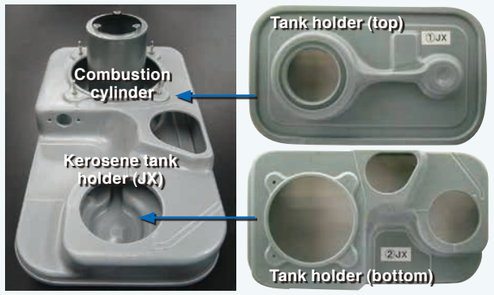


● Corrosion resistance of JX after forming (example)

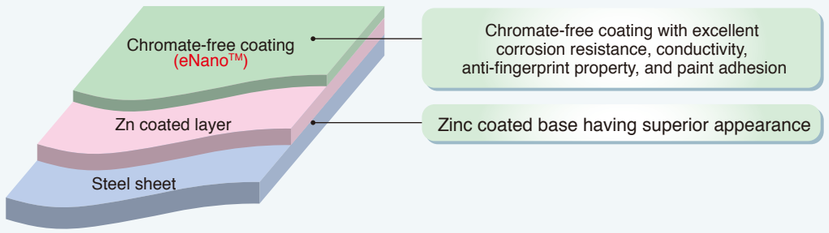
Appearance after 96 h salt spray test (JIS Z 2371) after cup forming

JX	JN
	

● JX part formed without oil coating (example)



Structure of coating



Applications

1) OA and AV equipment in which conductivity and electromagnetic shielding are priorities.
2) Electrical equipment and electrical machinery in which corrosion resistance is a priority.
3) Hard-to-form parts that require severe forming such as deep drawing, press-forming without oil coating, etc.

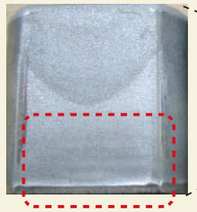
— Eco Frontier™ Series —

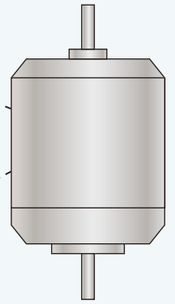
Chromate-free Steel Sheet with Excellent Continuous High-Speed Press Formability = JE =

Suitable for applications such as high-speed drawing and ironing.

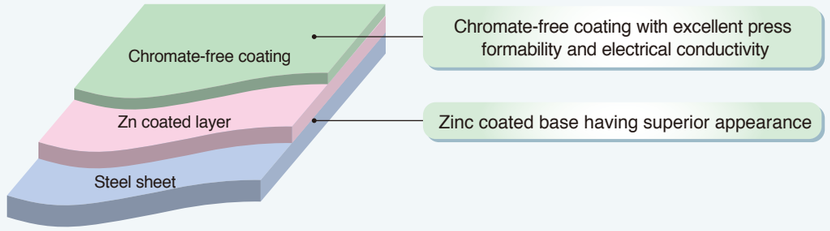
Features

1) Press formability → Excellent press formability. Continuous high-speed deep drawing is possible.
2) Appearance after press forming → Excellent appearance after forming. Prevents occurrence of “black stain” after forming, and makes it possible to omit cleaning of parts and dies after press forming.
3) Conductivity → Excellent electrical conductivity. High weldability (spot welding, etc.) and electromagnetic shielding property can be expected.
4) Corrosion resistance → Stable primary corrosion resistance. Management of storage before/after processing is easy.

	Conventional steel (JD)	Eco Frontier™ JE
Appearance of formed products after press forming	 Black stains: Many	 Black stains: Rare



Structure of coating



Applications

1) Small motor cases: Motors for automotive applications, electrical appliances, and AV/OA.
2) Electrical components: Electrical components and automotive, electrical appliance, and AV/OA parts.

Example of application: Micro motor

— Eco Frontier™ Series —

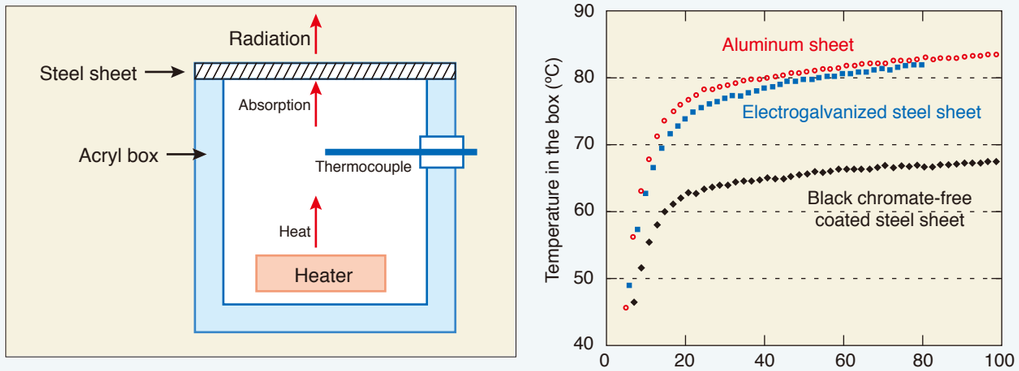
Black Chromate-free Coated Steel Sheet with High Emissivity and Electrical Conductivity = Z1 =

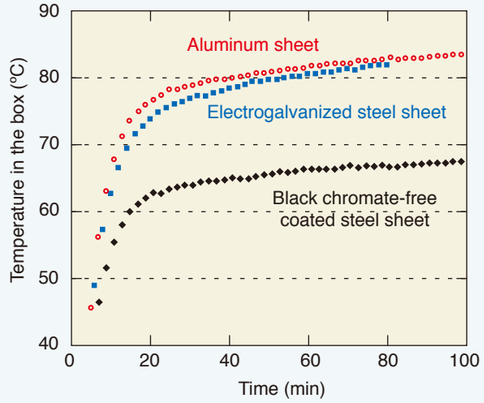
Suitable for applications such as cover box which requires internal heat irradiation and insulation of electromagnetic wave

Features

1) Appearance	→	Attractive black color. Suitable for optical components, etc.
2) Heat absorption and radiation property	→	High heat absorption and radiation property. Reduction of exhaust fan can be expected.
3) Corrosion resistance	→	Excellent corrosion resistance. Possible to omit painting by customer.
4) Electrical conductivity	→	Excellent electrical conductivity in comparison with painted steel sheets. Electromagnetic shielding and noise prevention are possible.
5) Anti-fingerprint property	→	Excellent anti-fingerprint property.
6) Chromate-free	→	Contains absolutely no chromium. Conforms to all applicable environmental regulations.

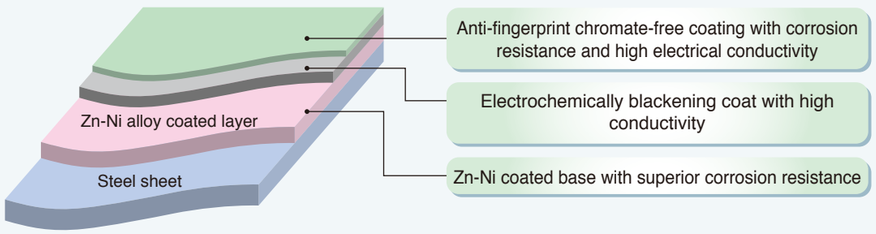
● Evaluation method of heat absorption and radiation properties





Properties of heat absorption and radiation

Structure of coating



Applications

1) Heat radiation and absorption use	Computer, DVD, HDD, Car audio, etc.
2) Optical use without reflection	Copier, TV, etc.
3) Usage without painting	

— Steel Sheets for Fuel Tanks —

Electrogalvanized Steel Sheets for Gasoline Tanks = JFE EXCELZINC NICKEL GT, JFE EXCELZINC GT =

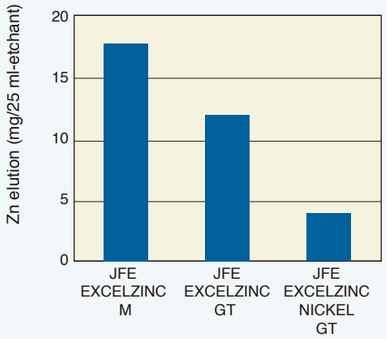
Steel sheets for gasoline tanks, in which a fuel corrosion resistant coating layer is applied to the fuel side (inside) of the tanks. Available in Zn-Ni alloy coated and pure Zn coated steel sheets.

Features

Excellent tank inside-surface corrosion resistance.

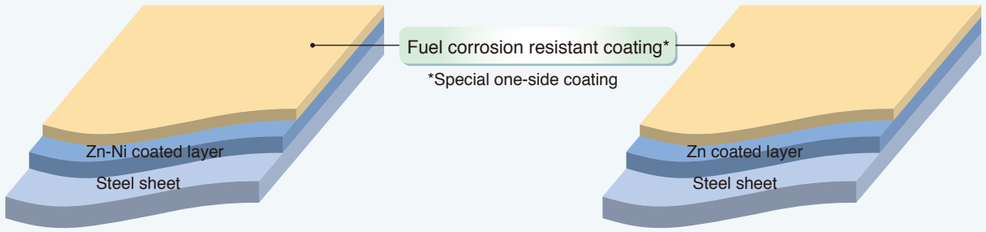
● Appearance of corrosion after accelerated corrosion resistance test

● Zn elution after accelerated corrosion resistance test



Structure of coating

A film that prioritizes gasoline corrosion resistance is applied to the side used as the inside of the fuel tank.



Applications

Gasoline tank for motor cycle and general use (motorboat, mowing machine, cropper, dynamo)

— Steel Sheets for Fuel Tanks —

Lead and Cr (VI)-free Steel Sheets with Excellent Corrosion Resistance for Fuel Tanks = JFE EXCELZINC GP =

Suitable for fuel tank materials in which environment-friendliness and corrosion resistance are priorities.

■ Features

Lead and hexavalent chromium (Cr(VI))-free steel sheet with excellent corrosion resistance for fuel tank use, manufactured by applying the optimum coating layers to the top and bottom sides of the steel sheet, corresponding to the inside and outside of fuel tanks.

■ Tank inside-surface corrosion resistance

● Appearance of corrosion after accelerated corrosion test

EXCELZINC GP	Pb-8%Sn plated (conventional product)
	
Max. reduction of sheet thickness: 0	Max. reduction of sheet thickness: 0.08 mm

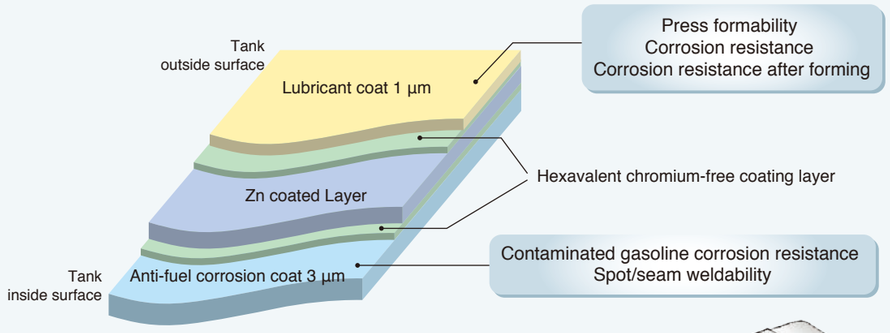
● Appearance of corrosion after 1 year exposure test in Okinawa

EXCELZINC GP	Pb-8%Sn plated (conventional product)
	

(After black post-coat painting)

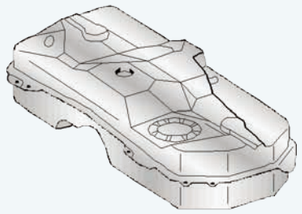
■ Structure of coating

A film that prioritizes corrosion resistance is applied to the side used as the outside of the tank, and a film prioritizing contaminated gasoline corrosion resistance is applied to the side used as the inside of the tank.



■ Applications

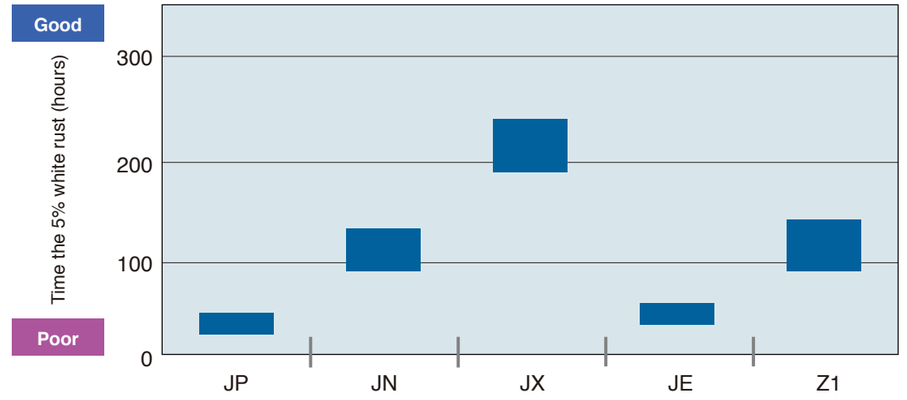
All types of fuel tanks: 4-wheeled vehicles (automobiles, trucks), motorcycles, general-purpose fuel tanks.



Comparison of Performance of Eco Frontier™ Series (1)

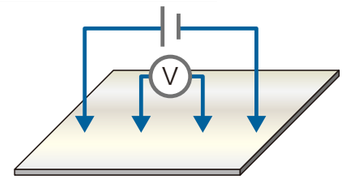
Corrosion Resistance

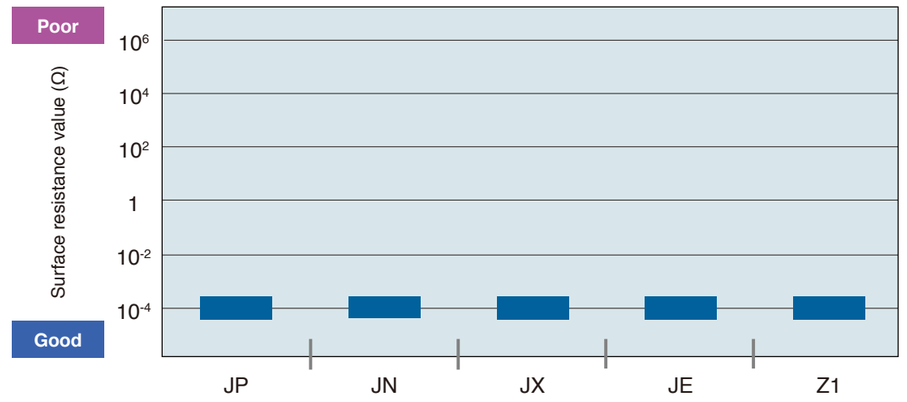
- Corrosion resistance test: Salt spray test (SST) in accordance with JIS Z 2371
- Evaluation criterion: Time to white rust (area ratio: 5%)



Conductivity (surface electrical resistance)

- Measuring device: Loresta GP; manufactured by Mitsubishi Chemical Analytech Co., Ltd.
- Measurement method: Four-point probe method
  (ASP probe manufactured by Mitsubishi Chemical Analytech Co., Ltd.)
  (In accordance with JIS K 7194)

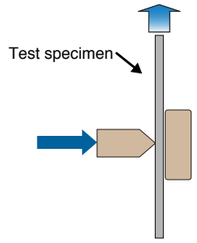


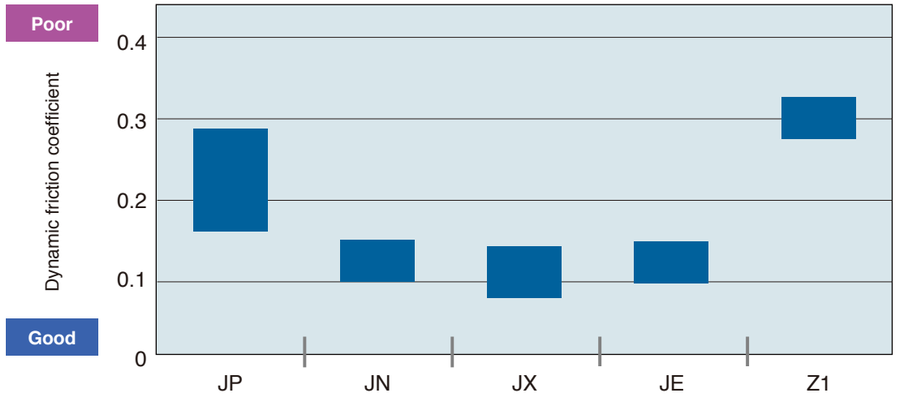


Comparison of Performance of Eco Frontier™ Series (2)

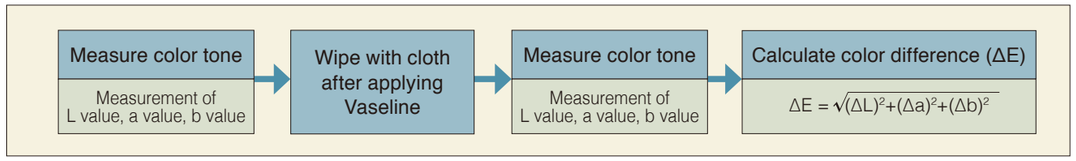
Lubricity (Dynamic friction coefficient)

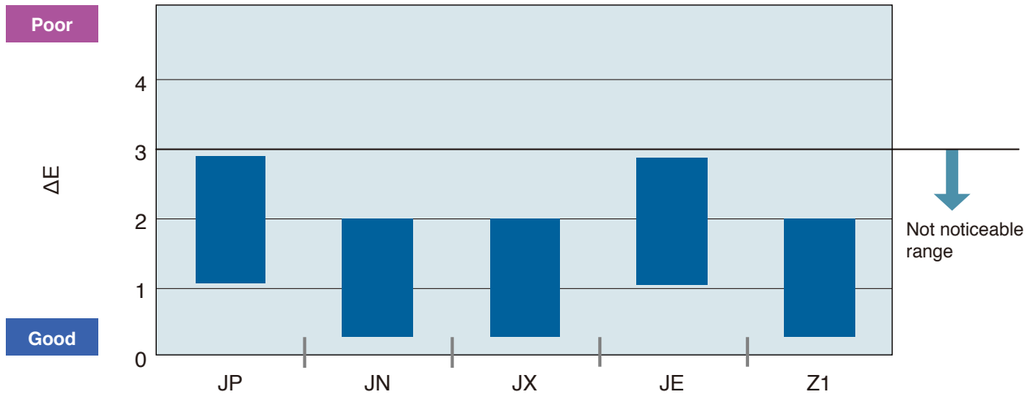
- Pressing load: 100 kgf
- Drawing speed: 500 mm/min
- Bead: 1 mm × 12 mm
- Press oil: None (non-oil-coated)





Anti-fingerprint Property

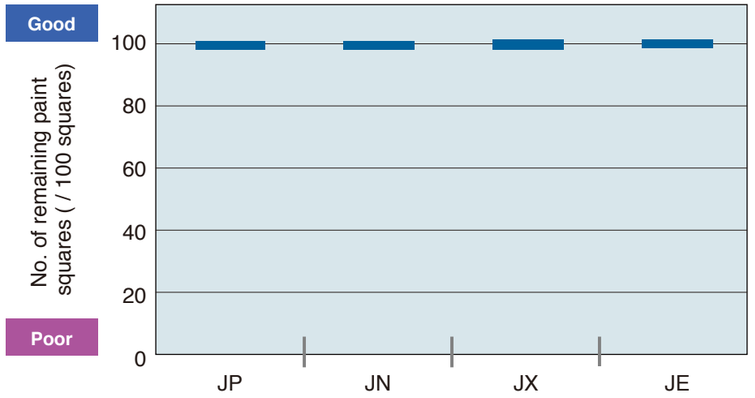




Comparison of Performance of Eco Frontier™ Series (3)

Paint Adhesion

- Painting: (Paint) Dericon #700; manufactured by Dai Nippon Toryo Co., Ltd.
  (Conditions) Coating thickness 30 μm. Baking at 130°C × 30 min.
- Evaluation of adhesion: Immersion in boiling water (2 hrs)
  ⇒ Cross-cut ⇒ Taping and Peeling
  ⇒ Evaluation of number of remaining squares of paint coating.



Notes:

- The property values and other information contained in this catalog are presented solely for reference and not intended to be guaranteed values.
- The performance and properties of this company's products may differ from those shown in this catalog, depending on the purpose and conditions of use, etc.
- JFE Steel Corporation cannot accept responsibility for any damages arising from erroneous use of the technical information contained in this document.

Instruction for Ordering

When ordering, please include the following information:

1	Classification of standard / Dimension / Quantity / Delivery date
2	Surface treatment / Coating weight
3	Application or parts name
4	Type of processing (In case of press forming, please show the part shape in detail.)
5	Unit mass and packaging ● Coils : Maximum and minimum coil mass / Maximum coil outer diameter / Coil inner diameter / Acceptability of welded portion in coil ● Sheets : Maximum lot mass
6	Others requirements (Surface finish, edge form, strip shape, oiling, etc.)

Packaging and Labeling

● Packaging

Electrogalvanized products are packed according to applicable standards and preserved in a properly controlled environment until shipment.

● Labeling

Labels showing the product standard, dimensions, mass and product serial No. are attached to the electrogalvanized product.

Handling Precautions

In using electrogalvanized steel sheets, the following precautions should be taken in order to ensure optimum use:

Storage

- When receiving products, check for moisture in the package. Dry immediately if wet.
- Use adequate care to prevent moisture in spaces between sheets, coiled strips, and work pieces.
- Storage areas should be as dry as possible. Storage in damp conditions and/or with broken packaging can result in discoloration or rusting.
- Repair broken packaging if long-term storage is required. Abrasion marks (black dents) may occur due to pressure if transportation or storage conditions are improper.

Handling

- Steel sheet products have sharp edges. Handle carefully using gloves to avoid injury.
- Scratches and oil stain due to improper handling can result in paint defects.
- Lubricated products have a low friction coefficient and slide easily. Coils may collapse (telescope, etc.) due to repeated uncoiling and recoiling. Cut sheets in piles may slide due to impact. Use care in handling and work around storage areas.

Processing

- Some types of lubricating oil corrode zinc. Prior testing shall be recommended.

Welding

- For high temperature brazing, nickel-brass brazing material is recommended.

Degreasing

- Insufficient degreasing can cause paint defects.
- Degreasing by spraying or dipping in a neutral or low alkaline agent is recommended. Strong alkaline agents can damage the strip surface.
- Adequate rinsing after degreasing is recommended. If degreasing is inadequate, water repulsion can be observed on the strip after dipping in clean water. Use a degreasing method which maintains smooth and uniform water film.

Painting

- Dirt or other foreign matter on the surface will cause paint defects. Degrease/clean adequately before painting.
- JFE coated steel products are chemically treated to improve paint adhesion. However, certain paints may have poor adhesion with certain zinc coatings. Prior testing is recommended. Undercoating with a wash primer will help ensure good results.

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