HOT DIP GALVANIZED STEEL SHEET

JFE Steel Corporation

"JFE is sensitive to the earth and human beings"

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.

JFE Galvanized Products are fluttering to the Future

The applications of steel sheets in daily life are constantly expanding. Coated steel products such as JFE's galvanized steel sheets have enjoyed particularly strong growth in fields where corrosion resistance and cost reduction by process omission are important. Our coated steel sheets offer superior economy in construction and automotive applications, electric appliances, and electronic equipment.

JFE Steel Corporation, who holds ISO 9001, QS-9000 and ISO 14001 certifications, has made an effort for development and production of various kinds of hot dip galvanized products thanks to most modern facilities and long time accumulated technologies.

JFE's wide range of hot dip galvanized products include pure zinc coated, alloy coated, and unique high corrosion resistance chemically treated steel sheets which respond to the increasingly advanced and diverse needs of changing markets. As the results, JFE has got sincere reliance from the domestic and overseas customers.

Understanding the excellent characteristics of JFE products aiming future progress, sincere patronage from the customers are welcomed.

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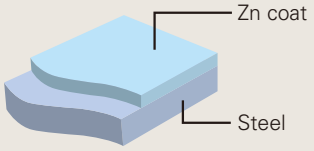
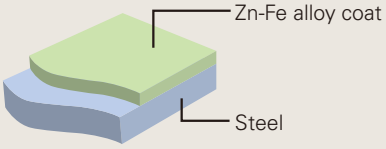
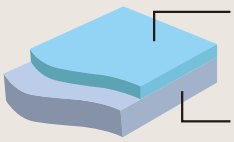
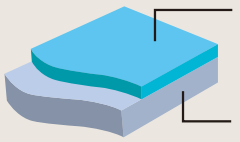
"JFE GALVAZINC", "JFE GALVAZINC ALLOY", "ECOGAL-Neo", and "Eco Frontier" are registered trademarks of JFE Steel Corporation in Japan.

Galvanized steel sheet products and Characteristics

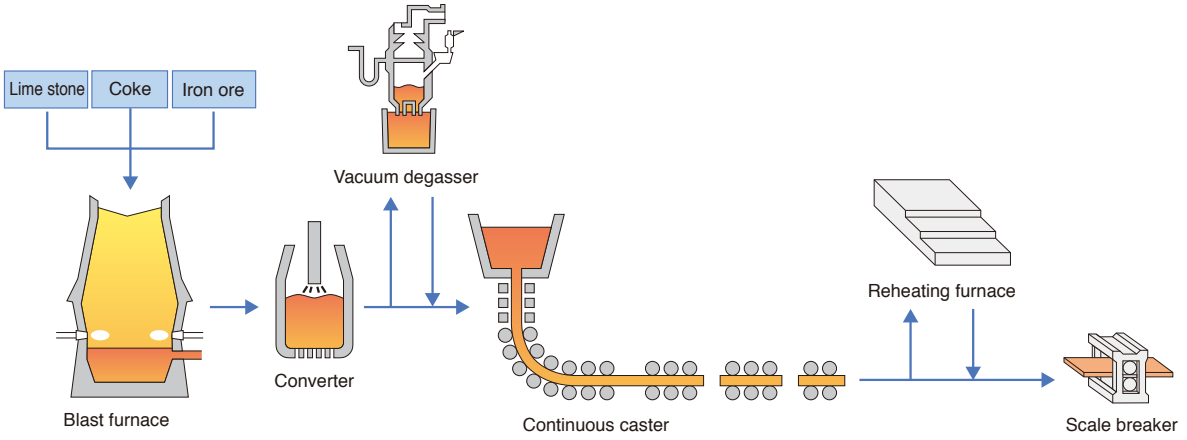
Classification	Coating	Product	Characteristics
Hot dip galvanizing	Pure Zinc	JFE GALVAZINC	● Zinc coated by hot dip galvanizing. ● Light coated products have good weldability and formability. Usable from general processing to deep drawing according to application. ● Heavy coated products have superior corrosion resistance. Wide application are possible by selecting spangle or a post treatment.
		JFE GALVAZINC ALLOY	● Zn-Fe alloy coated by hot dip galvanizing and annealing. ● Zn-Fe coating has superior paint adhesion and corrosion resistance. ● Weldability is superior to JFE GALVAZINC products.
	Alloy	ECOGAL-Neo	● ECOGAL-Neo is a Zn-5%Al-based alloy-coated steel sheet, which realized higher corrosion resistance than conventional Zn-5%Al alloy-coated steel sheets by adding small amounts of magnesium (Mg) and nickel (Ni) to the Zn-5%Al alloy-coating. A high corrosion resistance chromate-free conversion coating is also applied. ● In addition to excellent corrosion resistance, the coated layer has good adhesion and ductility, securing excellent formability. ● Beautiful external appearance enables use in applications without painting.
		GALVALUME STEEL SHEET	● Alloyed coating containing zinc and about 55 % aluminum. ● Products have heat resistance and heat reflection property of aluminum in addition to corrosion resistance of zinc and aluminum. ● Surface is attractive white silver.
Electro-galvanizing	Pure zinc	JFE EXCELZINC	● Smooth, attractive surface produced by electro-plating. ● Formability of coating is excellent, with same mechanical properties as base metal. Weldability is also good due to light coating. ● Paintability, anti-fingerprint property and lubricity can be added by post-treatment.
	Alloy	JFE EXCELZINC NICKEL	● Surface coated by zinc-nickel alloy. ● 3 to 5 times better corrosion resistance than that of pure zinc coating. ● Superior formability and weldability.

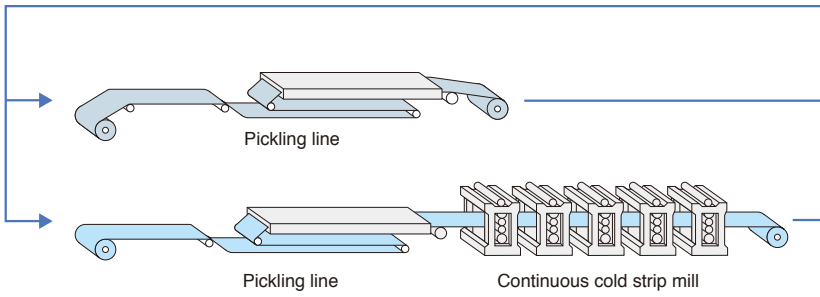
Hot dip galvanized steel sheet products and Characteristics

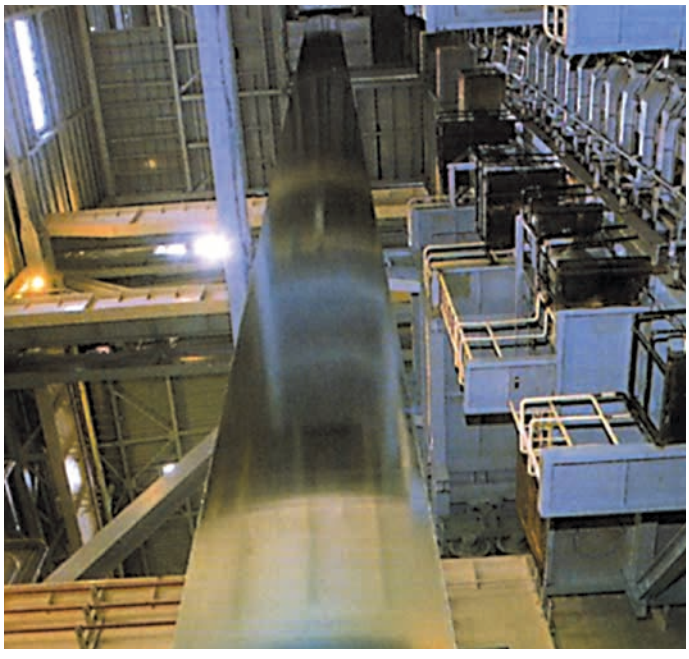
Classification		JFE GALVAZINC	JFE GALVAZINC ALLOY
Coating layer / Characteristics			
Formability		Full line from general processing to for deep drawing products.	Same as JFE GALVAZINC. Full line from for general processing to deep drawing products.
Weldability		Weldability changes depending on zinc coating weight. However, thin coating weight of less than 60/60 have same weldability as cold rolled sheets under proper welding conditions.	Weldability is superior to that of normal zinc coated steel sheets due to Zn-Fe alloy coating. Same weldability as cold rolled sheets under proper welding conditions.
Paintability		By selecting proper spangles, flat painted surface is obtained.	By including iron in the coated layer and proper porosity structure and uneven surface, superior paint adhesion can be obtained.
Corrosion resistance		With heavier coating weight than that of electrogalvanized coating, has superior corrosion resistance. Corrosion resistance of zinc itself and sacrificed corrosion function delays generation of red rust.	Corrosion protecting capacity of surface is same as JFE GALVAZINC, but superior paint adhesion provides higher corrosion resistance after painting.
Application	Architecture	Sash, shutter, door, wall, partition, under-ceiling, beam, column, deck plate, scaffold pipe, veranda, car port, duct, guardrail, etc.	Sash, shutter, door, fence, wall, partition, beam, column, under-ceiling, veranda, car port, store-room, etc.
	Electric appliance	Wash machine, refrigerator, cleaner, air conditioner, fan-heater, office appliance, elevator, vender, etc.	Wash machine, refrigerator, cleaner, air conditioner, lighting appliance, fan-heater, office appliance, elevator, etc.
	Auto-mobile	Door, fender, heat insulator, air cleaner, reinforce around wheel, etc.	Door, fender, trunk lid, hood, fuel tank, etc.
	Others	Steel furniture, electric distributor panel, drum, pipe for vinyl house, etc.	Steel furniture, office appliance (desk, chair, locker, cabinet, etc.), electric distributor panel, lamp oil tank, etc.

Product	ECOGAL-Neo	GALVALUME STEEL SHEET
Coating layer / Characteristics		
Characteristics	ECOGAL-Neo is a Zn-5%Al-based alloy-coated steel sheet, which realized higher corrosion resistance than conventional Zn-5%Al alloy-coated steel sheets. The formability and weldability of the coating layer are equal to those of conventional galvanized (GI) steel sheets. The beautiful external appearance of ECOGAL-Neo also use in applications without painting.	With very high aluminum content in the coated layer, unpainted corrosion resistance is extremely good. Has superior acid resistance, heat resistance, heat reflection property, formability and paintability.
Application	Building materials (general building hardware, material for pipes, base material for painted steel sheets), electrical equipment parts (motor cases), automotive electrical parts.	Industrial machinery, electric facility, civil and architecture, air conditioner, etc.

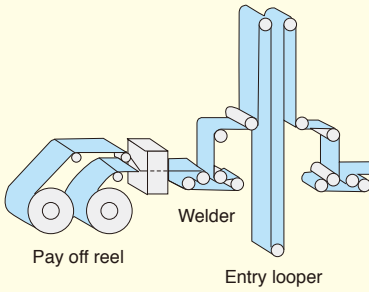
Manufacturing process







Cooling tower



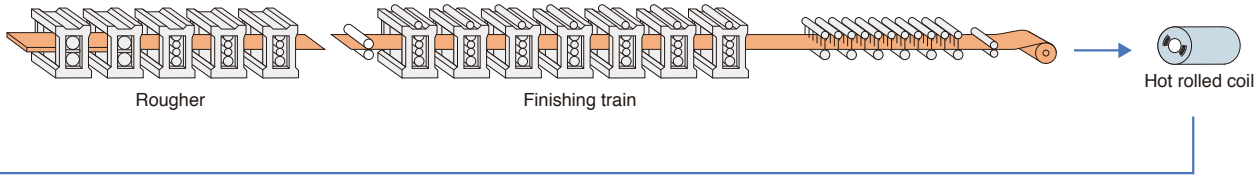
Base material

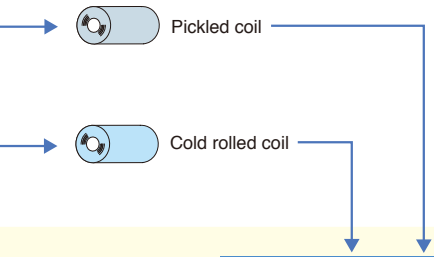
- Hot rolled pickled coil
- Cold rolled coil

Blast furnace

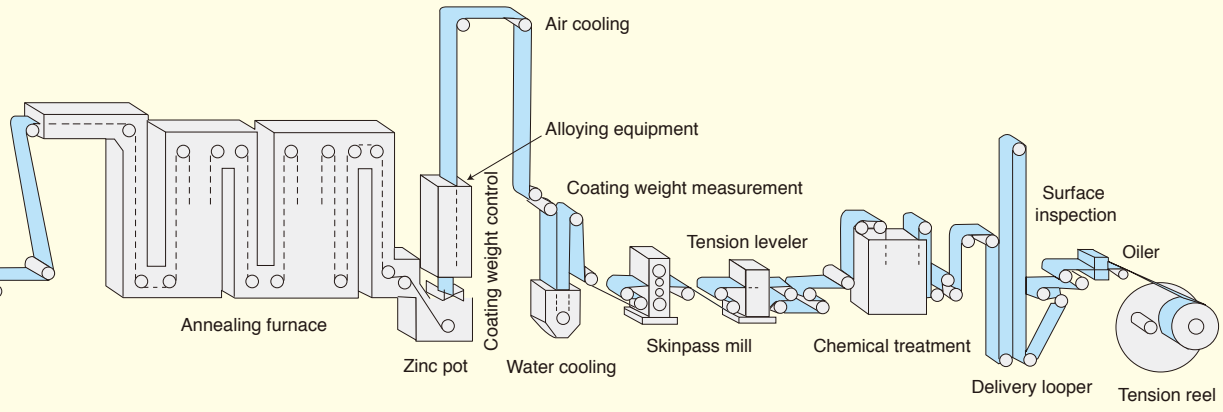
Converter

Hot strip mill





Hot dip galvanizing line



Annealing

- Annealed in line and quality adjustment

Coating

- Coated in Zn pot.
- Coating weight is controlled by air pressure.

Alloying

- Reheating after coating and uniformly alloying of Zn-Fe

Chemical treatment

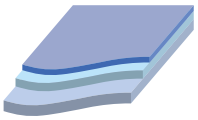
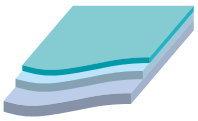
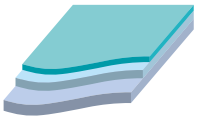
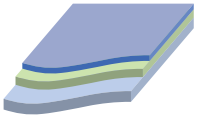
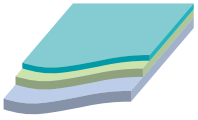
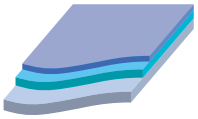
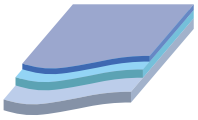
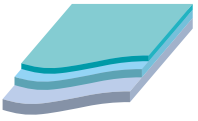
- Chemical treatment for anti-corrosion and paintability

Product

- JFE GALVAZINC
- JFE GALVAZINC ALLOY
- ECOGAL-Neo
- GALVALUME STEEL SHEET

Chemical treatment of hot dip galvanized products

● Chromate-free type chemical treatment

Classification		Chemical treatment and coating layer			Quality characteristics				
		Structure of coating layer	Desig-nation	Chemical treatment	Corrosion resistance	Surface conductivity	Lubricity	Paintability	Anti-fingerprint property
JFE GALVAZINC	General usage (Organic coat)	 Chromate-free coat / Zn coat / Steel	JC	Chromate-free coating	○	○	○	○	○
	General usage (Inorganic coat)	 Inorganic chromate-free coat / Zn coat / Steel	JB	Chromate-free coating	○–	○	○–	○	○–
	Inorganic coat	 Inorganic chromate-free coat / Zn coat / Steel	JM	Chromate-free coating	○	○	○	○	○
JFE GALVAZINC ALLOY	General usage (Organic coat)	 Chromate-free coat / Zn-Fe alloy coat / Steel	JC	Chromate-free coating	○	○	○	○	○
	General usage (Inorganic coat)	 Inorganic chromate-free coat / Zn-Fe alloy coat / Steel	JB	Chromate-free coating	○–	○	○–	○	○–
GALVALUME STEEL SHEET	General usage (Organic coat)	 Chromate-free coat / 55%Al-Zn alloy coat / Steel	FJ	Chromate-free coating	◎	—	○	○	—
ECOGAL-Neo	General usage (Organic coat)	 High corrosion resistance chromate-free film / Zn-5%Al-based alloy-coated layer with small amounts of added Mg and Ni / Steel	EN	Chromate-free coating	◎	○	○	○	○–
	General usage (Inorganic coat)	 High corrosion resistance chromate-free film / Zn-5%Al-based alloy-coated layer with small amounts of added Mg and Ni / Steel	EX	Chromate-free coating	◎	○	○	○	○

JFE GALVAZINC characteristics

JFE GALVAZINC products have superior corrosion resistance thanks to a thicker coating layer than thin coated sheets with high formability and weldability. Produced by the continuous galvanizing line, products has good coating adhesion and formability, combined with excellent corrosion resistance and lubricity imparted by various chemical treatments.

Public standard

● Japanese Industrial Standards (JIS)

Classification	Designation
G 3302 Hot dip zinc coated steel sheets and coils	SGHC, SGH400, SGCC, SGCH, SGCD, SGC400, etc.

JFE standard

● JFE GALVAZINC for hot rolled soft base metal used

Classification	Designation
Structural quality, class 1	JFE-H400-GZ
Structural quality, class 2	JFE-H490-GZ
Commercial quality	JFE-HB-GZ
Forming quality	JFE-HC-GZ
Drawing quality	JFE-HD-GZ
Deep drawing quality	JFE-HE-GZ

● JFE GALVAZINC for cold rolled soft base metal used

Classification	Designation
Structure quality, class 1	JFE-C400-GZ
Structure quality, class 2	JFE-C490-GZ
Commercial quality	JFE-CB-GZ
Forming quality	JFE-CC-GZ
Drawing quality	JFE-CD-GZ
Deep drawing quality	JFE-CE-GZ
Deep drawing quality with bake hardenability	JFE-CH-GZ
Extra deep drawing quality, class 1	JFE-CF-GZ
Extra deep drawing quality, class 2	JFE-CG-GZ

● JFE GALVAZINC for hot rolled base metal used (High strength steel)

Classification	Designation (・・・: Strength level)	Tensile strength level (N/mm²)					
		310	370	400	440	490	590
Commercial quality	JFE-HA・・・-GZ	○	○	○	○	○	○
High stretch flange formability quality	JFE-HA・・・SF-GZ				○		
Low yield ratio quality	JFE-HA・・・Y-GZ						○

● JFE GALVAZINC for cold rolled base metal used (High strength steel)

Classification	Designation (・・・: Strength level)	Tensile strength level (N/mm²)						
		340	370	390	440	490	540	590
Commercial quality	JFE-CA・・・-GZ	○	○	○	○	○		
Deep drawing quality with bake hardenability	JFE-CA・・・H-GZ	○						
High yield ratio quality	JFE-CA・・・R-GZ							○
Deep drawing quality	JFE-CA・・・P-GZ	○	○	○	○			
Extra deep drawing quality	JFE-CA・・・G-GZ	○	○	○	○			
Low yield ratio quality	JFE-CA・・・Y-GZ							○
High stretch flange formability quality	JFE-CA・・・SF-GZ				○			

JFE GALVAZINC standard

Mechanical properties (1)

● JFE GALVAZINC for hot rolled base metal used

Classification	Designation	Yield Point min. (N/mm²) Thickness mm		
		1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 3.2
Structural quality, class 1	JFE-H400-GZ	295		
Structural quality, class 2	JFE-H490-GZ	365		
Commercial quality	JFE-HB-GZ	—		
Forming quality	JFE-HC-GZ	205	195	
Drawing quality	JFE-HD-GZ	195	185	
Deep drawing quality	JFE-HE-GZ	175	165	
High strength steel for commercial quality	JFE-HA310-GZ	205	195	
High strength steel for commercial quality	JFE-HA370-GZ	235	225	
High strength steel for commercial quality	JFE-HA400-GZ	255	245	
High strength steel for commercial quality	JFE-HA440-GZ	275		
High strength steel for commercial quality	JFE-HA490-GZ	315		
High strength steel for commercial quality	JFE-HA590-GZ	440		
High strength steel with high stretch flange formability quality	JFE-HA440SF-GZ	305		
High strength steel for low yield ratio quality	JFE-HA590Y-GZ	325		

Remarks 1. JIS No.5 test piece for tensile test taken in rolling direction.
2. Figures in parentheses are reference values.

● JFE GALVAZINC for cold rolled soft base metal used

Classification	Designation	Yield Point min. (N/mm²) Thickness mm			Tensile strength min. (N/mm²)	Tensile Test		
		0.4 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ ≤ 2.8		0.4 ≤ < 0.6	0.6 ≤ < 0.8	0.8 ≤ < 1.0
Structural quality, class 1	JFE-C400-GZ	295			400 ～ 490			
Structural quality, class 2	JFE-C490-GZ	365			490			
Commercial quality	JFE-CB-GZ	—			—			
Forming quality	JFE-CC-GZ	185	175	165	270	35	36	37
Drawing quality	JFE-CD-GZ	135	125	115	270	40	41	42
Deep drawing quality	JFE-CE-GZ	130	120	110	270	42	43	44
Drawing quality with bake hardenability	JFE-CH-GZ	135	125	115	270	40	41	42
Extra deep drawing quality, class 1	JFE-CF-GZ	120	110	100	270	44	45	46
Extra deep drawing quality, class 2	JFE-CG-GZ	110	100	90	260	45	46	47

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

Tensile Test						Bend test	Hole Expanding Ratio λ min. (%)
	Tensile strength min. (N/mm^2)	Elongation min. (%) Thickness mm				Internal Radius	
		1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ < 3.2	3.2		
	400 ～ 490	18				—	—
	490	16				—	—
	—	—				(2t)	—
	270	35	36		37	—	—
	270	37	38		39	—	—
	270	40	41		42	—	—
	310	36	37			—	—
	370	33	34			—	—
	400	31	32	33		—	—
	440	25	26		27	—	—
	490	21	22	23	24	—	—
	590	18	19	20	—	—	—
	440	28	29	31	32	—	(70)
	590	21	22		23	—	—

Elongation min. (%) Thickness mm					Mean r-value min. Thickness mm		BH Value min. (N/mm^2)	Bend Test Internal Radius Thickness mm	
1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 2.8	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6		≤ 1.6	1.6 <
18					—	—	—	—	—
16					—	—	—	—	—
—					—	—	—	(1t)	(2t)
38	39	40	41	42	—	—	—	—	—
43	44	45	46	47	(1.2)	(1.1)	—	—	—
45	46	47	48	49	(1.4)	(1.3)	—	—	—
43	44	45			(1.3)	(1.2)	30	—	—
47	48	49	50	51	1.5	1.4	—	—	—
48	49	50	51	52	1.6	1.5	—	—	—

Mechanical properties (2)

● JFE GALVAZINC for cold rolled base metal used (High strength steel)

Classification	Designation	Tensile Test					
		Yield Point min. (N/mm^2) Thickness mm			Tensile strength min. (N/mm^2)		
		0.4 ≤ < 0.8	0.8 ≤ <1.0	1.0 ≤ ≤ 2.8		0.4 ≤ < 0.6	0.6 ≤ < 0.8
Commercial quality	JFE-CA340-GZ	215	205	195	340	32	33
Commercial quality	JFE-CA370-GZ	235	225	215	370	30	31
Commercial quality	JFE-CA390-GZ	255	245	235	390	28	29
Commercial quality	JFE-CA440-GZ	295	285	275	440	25	26
Commercial quality	JFE-CA490-GZ	335	325	315	490	20	21
Deep drawing quality with bake hardenability	JFE-CA340H-GZ	195	185	175	340	33	34
High yield ratio quality	JFE-CA590R-GZ	440	430	420	590	—	13
Deep drawing quality	JFE-CA340P-GZ	175	165	155	340	34	35
Deep drawing quality	JFE-CA370P-GZ	195	185	175	370	—	33
Deep drawing quality	JFE-CA390P-GZ	215	205	195	390	—	31
Deep drawing quality	JFE-CA440P-GZ	255	245	235	440	—	27
Extra deep drawing quality	JFE-CA340G-GZ	165	155	145	340	—	35
Extra deep drawing quality	JFE-CA370G-GZ	185	175	165	370	—	33
Extra deep drawing quality	JFE-CA390G-GZ	205	195	185	390	—	31
Extra deep drawing quality	JFE-CA440G-GZ	245	235	225	440	—	27
Low yield ratio quality	JFE-CA590Y-GZ	325	315	305	590	16	17
High stretch flange formability quality	JFE-CA440SF-GZ	330	320	310	440	22	23

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

	Elongation min. (%)						Mean r-value min.		BH Value	Hole Expanding Ratio λ
	Thickness mm						Thickness mm			
	0.8 ≤ < 1.0	1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 2.8	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6	min. (N/mm^2)	min. (%)
	34	35	36	37			—	—	—	—
	32	33	34	35			—	—	—	—
	30	31	32	33			—	—	—	—
	27	28	29	30			—	—	—	—
	22	23	24	25			—	—	—	—
	35	36	37	38			(1.3)	(1.2)	30	—
	14	15	16	17			—	—	—	—
	36	37	38	39			(1.4)	(1.3)	—	—
	34	35	36	37			(1.3)	(1.2)	—	—
	32	33	34	35			(1.3)	(1.2)	—	—
	28	29	30	31			(1.3)	(1.2)	—	—
	36	37	38	39			1.6	1.5	—	—
	34	35	36	37			1.6	1.5	—	—
	32	33	34	35			1.6	1.5	—	—
	28	29	30	31			1.5	1.4	—	—
	18	20	20	21			—	—	—	—
	24	25	26	27			—	—	—	70

Zinc Coating weight

JIS Products

Total coating weight on both sides	Z08	Z10	Z12	Z18	Z20	Z22	Z25	Z27	Z35	Z45	(Z60)
Min. coating weight in triple-spot test on both sides (g/m^2)	80	100	120	180	200	220	250	275	350	450	(600)
Equivalent coating thickness (mm)	0.017	0.021	0.026	0.034	0.04	0.043	0.049	0.054	0.064	0.08	(0.102)

1) JIS H 0401 is applied to coating weight measurement.
2) Z60 is subject to negotiation.

JFE GALVAZINC

Total coating weight on both sides	45/45	60/60	75/75	90/90	120/120	140/140	150/150
Min. coating weight in triple-spot test on both sides (g/m^2)	60	80	100	120	180	200	220

Coating weight is measured by the triple-spot test specified in JIS H 0401.

Chemical treatment

Type	Classification	Designation
Chromate-free type	General usage (organic coat)	JC
	General usage (Inorganic coat)	JB
	Inorganic coat	JM

Remarks: In case of no chemical treatment, there is no description of treatment, or described by "M".

Oiling

Classification	Designation
Oiling	O
No oiling	X

Spangle

Classification	Designation	Remarks
Zero spangle	ZS	Extra minimization

Dimensional tolerance

JIS G 3302 is applied to strip dimensional tolerance. The thickness tolerance is shown below.
Thickness tolerance shall be apply to nominal thickness plus the equivalent thickness of coating.

● Hot rolled base metal used

Unit : mm

Width / Nominal thickness	610 ≤ < 1200	1200 ≤ < 1500	1500 ≤ ≤ 1733
1.60 ≤, < 2.00	±0.17	±0.18	±0.19
2.00 ≤, < 2.50	±0.18	±0.20	±0.22
2.50 ≤, < 3.15	±0.20	±0.22	±0.25
3.15 ≤, ≤ 3.20	±0.22	±0.24	±0.27

● Cold rolled base metal used

Unit : mm

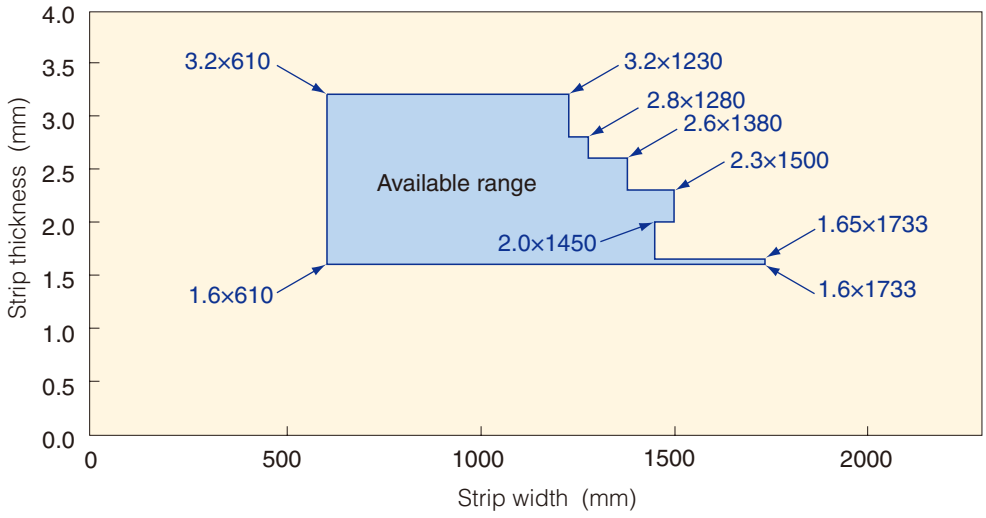
Width / Nominal thickness	610 ≤ < 630	630 ≤ < 1000	1000 ≤ < 1250	1250 ≤ < 1600	1600 ≤ ≤ 1830
0.40 ≤, < 0.60	±0.06	±0.06	±0.06	±0.07	±0.08
0.60 ≤, < 0.80	±0.07	±0.07	±0.07	±0.07	±0.08
0.80 ≤, < 1.00	±0.07	±0.07	±0.08	±0.09	±0.10
1.00 ≤, < 1.25	±0.08	±0.08	±0.09	±0.10	±0.12
1.25 ≤, < 1.60	±0.09	±0.10	±0.11	±0.12	±0.14
1.60 ≤, < 2.00	±0.11	±0.12	±0.13	±0.14	±0.16
2.00 ≤, < 2.50	±0.13	±0.14	±0.15	±0.16	±0.18
2.50 ≤, ≤ 2.80	±0.15	±0.16	±0.17	±0.18	±0.21

JFE GALVAZINC available product size range 1

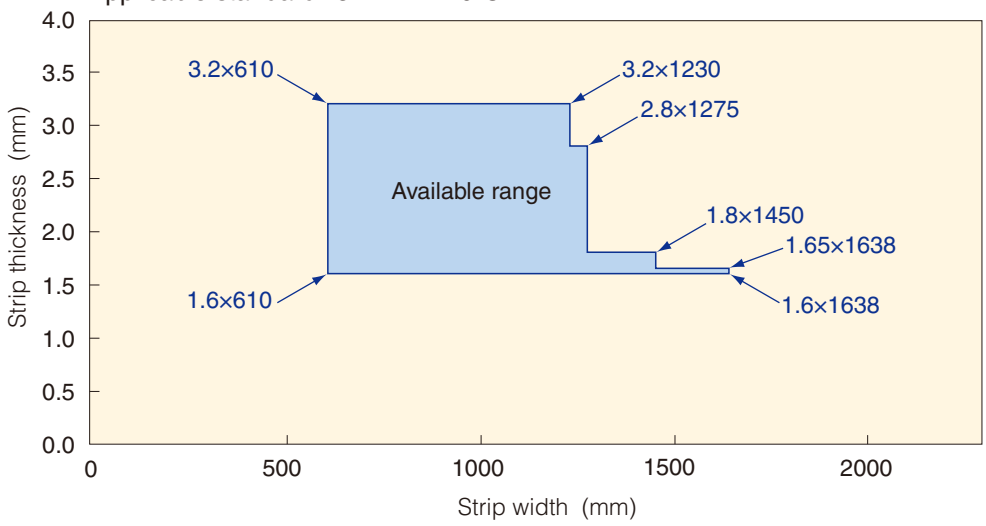
Examples of available product size range are shown below.
Size outside the available is subject to negotiation.

● Available product size range for chemical treatment
Available product size range is different in applied chemical treatment.
Please consult us.

Applicable standard : JFE-HC-GZ

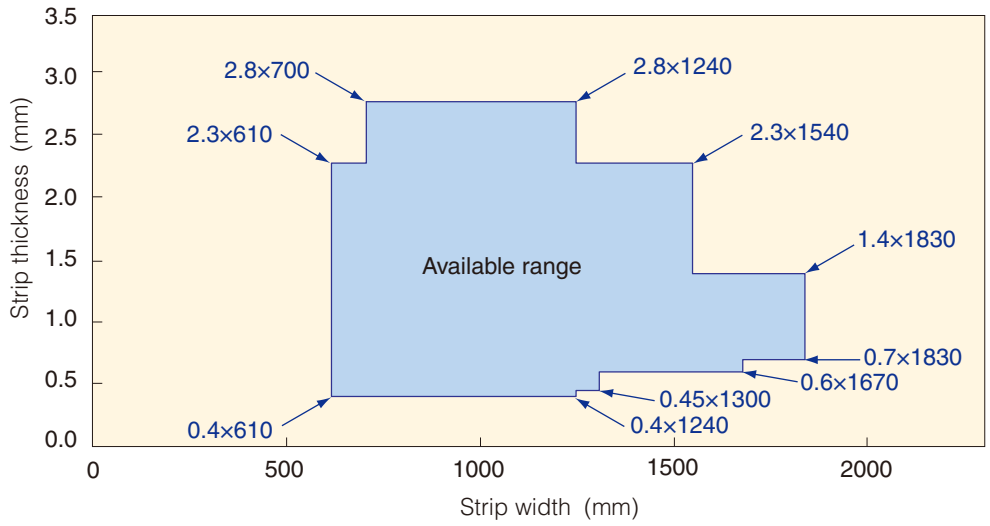


Applicable standard : JFE-HA440-GZ

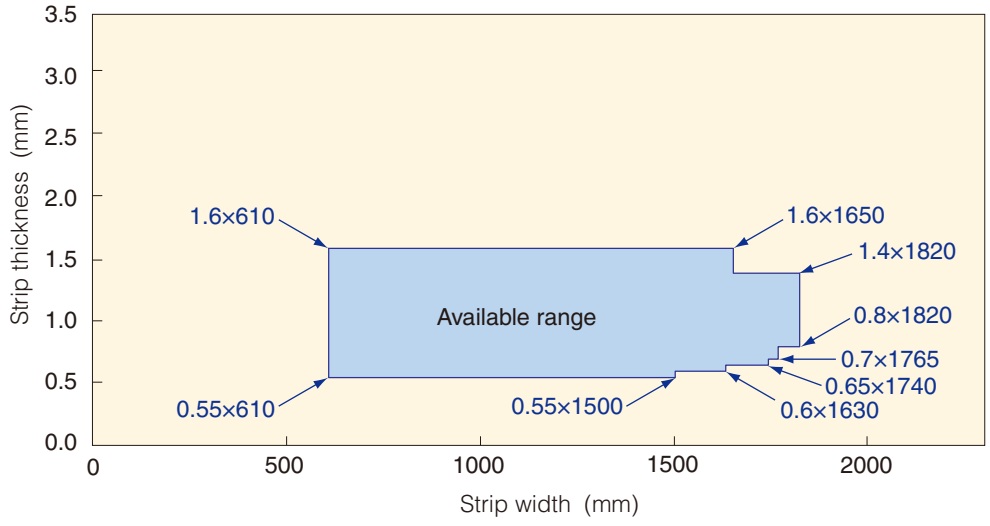


Size outside the available range is subject to negotiation.

Applicable standard : JFE-CC-GZ



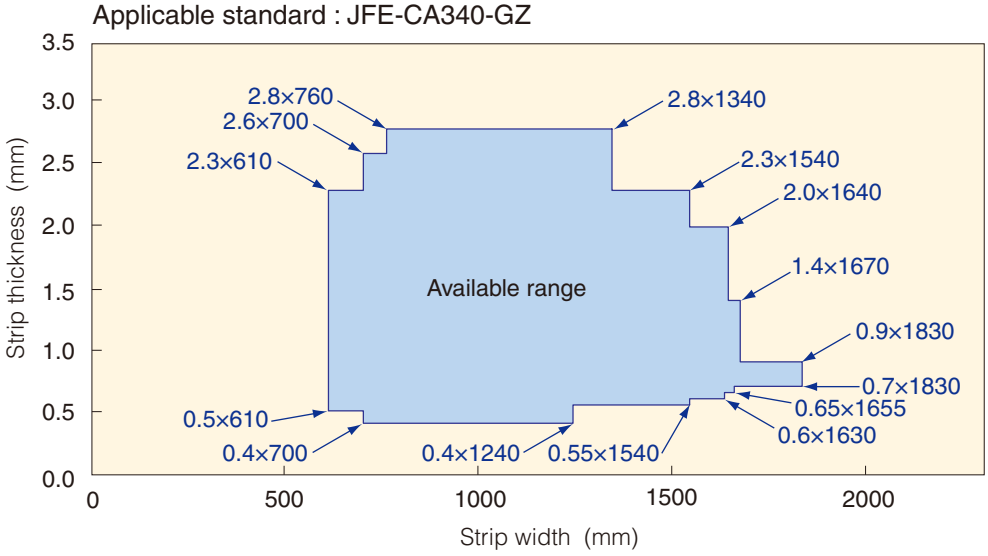
Applicable standard : JFE-CF-GZ



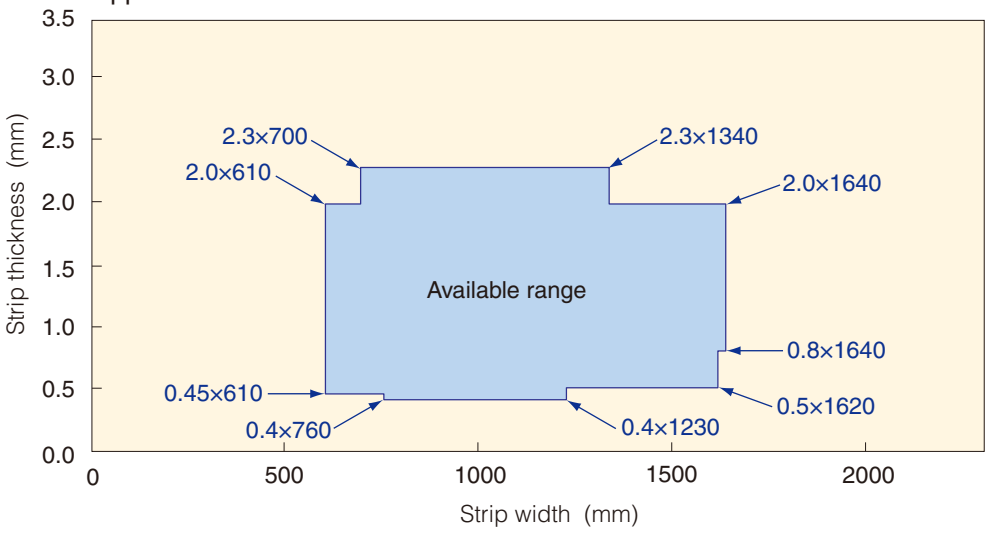
JFE GALVAZINC available product size range 2

Examples of available product size range are shown below.
Size outside the available range is subject to negotiation.

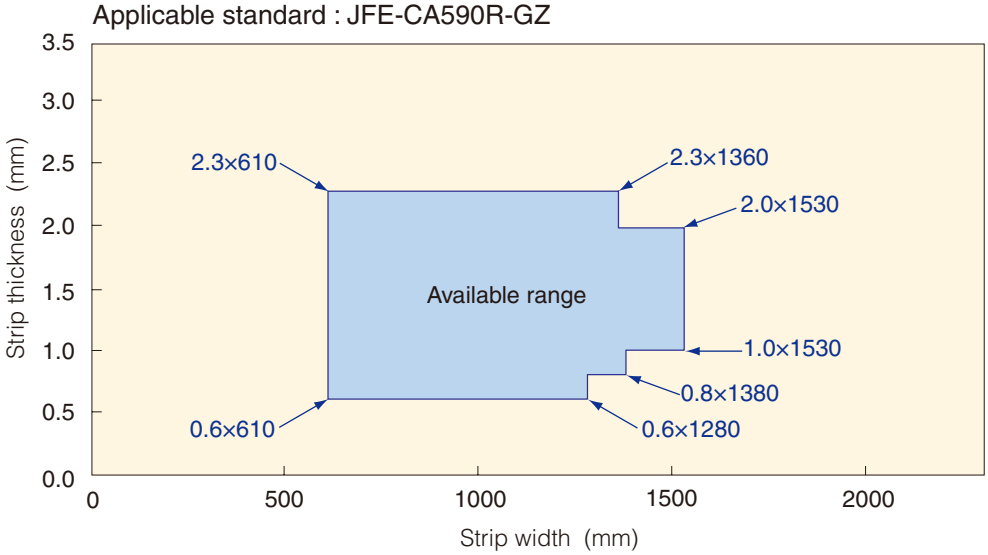
Applicable standard : JFE-CA340-GZ



Applicable standard : JFE-CA440-GZ



Applicable standard : JFE-CA590R-GZ



JFE GALVAZINC ALLOY

JFE GALVAZINC ALLOY characteristics

JFE GALVAZINC ALLOY is a galvannealed product of JFE GALVAZINC which provides higher levels of paintability and weldability. Used as a substrate material for painting in applications requiring high corrosion resistance, and in applications requiring high weldability.

Public standard

● Japanese Industrial Standards (JIS)

Classification	Designation
G 3302 Hot dip zinc coated steel sheets and coils	SGHC, SGH400, SGCC, SGCH, SGCD, SGC400, etc.

● The Japan Iron and Steel Federation Standard (JFS)

Classification	Designation
A 3041 Hot dip zinc alloy coated steel sheets	JAH, JAC

JFE standard

● JFE GALVAZINC ALLOY for hot rolled soft base metal used

Classification	Designation
Structural quality, class 1	JFE-H400-GA
Structural quality, class 2	JFE-H490-GA
Commercial quality	JFE-HB-GA
Forming quality	JFE-HC-GA
Drawing quality	JFE-HD-GA
Deep drawing quality	JFE-HE-GA

● JFE GALVAZINC ALLOY for cold rolled soft base metal used

Classification	Designation
Structural quality, class 1	JFE-C400-GA
Structural quality, class 2	JFE-C490-GA
Commercial quality	JFE-CB-GA
Forming quality	JFE-CC-GA
Drawing quality	JFE-CD-GA
Deep drawing quality	JFE-CE-GA
Deep drawing quality with bake hardenability	JFE-CH-GA
Extra deep drawing quality, class 1	JFE-CF-GA
Extra deep drawing quality, class 2	JFE-CG-GA

● JFE GALVAZINC ALLOY for hot rolled base metal used (High strength steel)

Classification	Designation (・・・: Strength level)	Tensile strength level (N/mm^2)					
		310	370	400	440	490	590
Commercial quality	JFE-HA・・・-GA	○	○	○	○	○	○
High stretch flange formability quality	JFE-HA・・・SF-GA				○		
Low yield ratio quality	JFE-HA・・・Y-GA						○

● JFE GALVAZINC ALLOY for cold rolled base metal used (High strength steel)

Classification	Designation (・・・: Strength level)	Tensile strength level (N/mm^2)					
		340	370	390	440	490	590
Commercial quality	JFE-CA・・・-GA	○	○	○	○	○	
Deep drawing quality with bake hardenability	JFE-CA・・・H-GA	○					
High yield ratio quality	JFE-CA・・・R-GA						○
Deep drawing quality	JFE-CA・・・P-GA	○	○	○	○		
Extra deep drawing quality	JFE-CA・・・G-GA	○	○	○	○		
Low yield ratio quality	JFE-CA・・・Y-GA						○
High stretch flange formability quality	JFE-CA・・・SF-GA				○		

JFE GALVAZINC ALLOY standard

Mechanical properties (1)

● JFE GALVAZINC ALLOY for hot rolled base metal used

Classification	Designation	Yield Point min. (N/mm²) Thickness mm		
		1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 3.2
Structural quality, class 1	JFE-H400-GA	295		
Structural quality, class 2	JFE-H490-GA	365		
Commercial quality	JFE-HB-GA	—		
Forming quality	JFE-HC-GA	205	195	
Drawing quality	JFE-HD-GA	195	185	
Deep drawing quality	JFE-HE-GA	175	165	
High strength steel for commercial quality	JFE-HA310-GA	205	195	
High strength steel for commercial quality	JFE-HA370-GA	235	225	
High strength steel for commercial quality	JFE-HA400-GA	255	245	
High strength steel for commercial quality	JFE-HA440-GA	275		
High strength steel for commercial quality	JFE-HA490-GA	315		
High strength steel for commercial quality	JFE-HA590-GA	440		
High strength steel with high stretch flange formability quality	JFE-HA440SF-GA	305		
High strength steel for low yield ratio quality	JFE-HA590Y-GA	325		

Remarks 1. JIS No.5 test piece for tensile test taken in rolling direction.
2. Figures in parentheses are reference values.

● JFE GALVAZINC ALLOY for cold rolled base metal used

Classification	Designation	Yield Point min. (N/mm²) Thickness mm			Tensile strength min. (N/mm²)	Tensile Test		
		0.4 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ ≤ 2.8		0.4 ≤ < 0.6	0.6 ≤ < 0.8	0.8 ≤ < 1.0
Structural quality, class 1	JFE-C400-GA	295			400 ～ 490			
Structural quality, class 2	JFE-C490-GA	365			490			
Commercial quality	JFE-CB-GA	—			—			
Forming quality	JFE-CC-GA	185	175	165	270	35	36	37
Drawing quality	JFE-CD-GA	135	125	115	270	40	41	42
Deep drawing quality	JFE-CE-GA	130	120	110	270	42	43	44
Drawing quality with bake hardenability	JFE-CH-GA	135	125	115	270	40	41	42
Extra deep drawing quality, class 1	JFE-CF-GA	120	110	100	270	44	45	46
Extra deep drawing quality, class 2	JFE-CG-GA	110	100	90	260	45	46	47

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

Tensile Test						Bend test	Hole Expanding Ratio λ min. (%)
	Tensile strength min. (N/mm^2)	Elongation min. (%)				Internal Radius	
		Thickness mm					
		1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ < 3.2	3.2		
	400 ～ 490	18				—	—
	490	16				—	—
	—	—				(2t)	—
	270	35	36		37	—	—
	270	37	38		39	—	—
	270	40	41		42	—	—
	310	36	37			—	—
	370	33	34			—	—
	400	31	32	33		—	—
	440	25	26		27	—	—
	490	21	22	23	24	—	—
	590	18	19	20	—	—	—
	440	28	29	31	32	—	(70)
	590	21	22		23	—	—

						Mean r-value min.		BH Value	Bend Test	
	Elongation min. (%)								Internal Radius	
	Thickness mm					Thickness mm			Thickness mm	
	1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 2.8	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6	min. (N/mm^2)	≤ 1.6	1.6 <
	18					—	—	—	—	—
	16					—	—	—	—	—
	—					—	—	—	(1t)	(2t)
	38	39	40	41	42	—	—	—	—	—
	43	44	45	46	47	(1.2)	(1.1)	—	—	—
	45	46	47	48	49	(1.4)	(1.3)	—	—	—
	43	44	45			(1.3)	(1.2)	30	—	—
	47	48	49	50	51	1.5	1.4	—	—	—
	48	49	50	51	52	1.6	1.5	—	—	—

Mechanical properties (2)

● JFE GALVAZINC ALLOY for cold rolled base metal used (High strength steel)

Classification	Designation	Tensile Test					
		Yield Point min. (N/mm^2) Thickness mm			Tensile strength min. (N/mm^2)		
		0.4 ≤ < 0.8	0.8 ≤ < 1.0	1.0 ≤ ≤ 2.8		0.4 ≤ < 0.6	0.6 ≤ < 0.8
Commercial quality	JFE-CA340-GA	215	205	195	340	32	33
Commercial quality	JFE-CA370-GA	235	225	215	370	30	31
Commercial quality	JFE-CA390-GA	255	245	235	390	28	29
Commercial quality	JFE-CA440-GA	295	285	275	440	25	26
Commercial quality	JFE-CA490-GA	335	325	315	490	20	21
Deep drawing quality with bake hardenability	JFE-CA340H-GA	195	185	175	340	33	34
High yield ratio quality	JFE-CA590R-GA	440	430	420	590	—	13
Deep drawing quality	JFE-CA340P-GA	175	165	155	340	34	35
Deep drawing quality	JFE-CA370P-GA	195	185	175	370	—	33
Deep drawing quality	JFE-CA390P-GA	215	205	195	390	—	31
Deep drawing quality	JFE-CA440P-GA	255	245	235	440	—	27
Extra deep drawing quality	JFE-CA340G-GA	165	155	145	340	—	35
Extra deep drawing quality	JFE-CA370G-GA	185	175	165	370	—	33
Extra deep drawing quality	JFE-CA390G-GA	205	195	185	390	—	31
Extra deep drawing quality	JFE-CA440G-GA	245	235	225	440	—	27
Low yield ratio quality	JFE-CA590Y-GA	325	315	305	590	16	17
High stretch flange formability quality	JFE-CA440SF-GA	330	320	310	440	22	23

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

Elongation min. (%)						Mean r-value min.		BH Value	Hole Expanding Ratio λ
Thickness mm						Thickness mm			
0.8 ≤ < 1.0	1.0 ≤ < 1.2	1.2 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ < 2.5	2.5 ≤ ≤ 2.8	0.5 ≤ ≤ 1.0	1.0 < ≤ 1.6	min. (N/mm^2)	min. (%)
34	35	36	37			—	—	—	—
32	33	34	35			—	—	—	—
30	31	32	33			—	—	—	—
27	28	29	30			—	—	—	—
22	23	24	25			—	—	—	—
35	36	37	38			(1.3)	(1.2)	30	—
14	15	16	17			—	—	—	—
36	37	38	39			(1.4)	(1.3)	—	—
34	35	36	37			(1.3)	(1.2)	—	—
32	33	34	35			(1.3)	(1.2)	—	—
28	29	30	31			(1.3)	(1.2)	—	—
36	37	38	39			1.6	1.5	—	—
34	35	36	37			1.6	1.5	—	—
32	33	34	35			1.6	1.5	—	—
28	29	30	31			1.5	1.4	—	—
18	20	20	21			—	—	—	—
24	25	26	27			—	—	—	70

Coating weight

JIS Products

Total coating weight on both sides	(F04)	F06	F08	F10	F12
Min. coating weight in triple-spot test on both sides (g/m^2)	(40)	60	80	100	120
Equivalent coating thickness (mm)	(0.008)	0.013	0.017	0.021	0.026

1) JIS H 0401 is applied to coating weight measurement.
2) F04 is subject to negotiation.

JFE GALVAZINC ALLOY

Total coating weight on both sides	30/30	45/45	60/60	75/75	90/90	120/120
Min. coating weight in triple-spot test on both sides (g/m^2)	40	60	80	100	120	180

1) Coating weight is measured by the triple-spot test specified in JIS H 0401.
2) Coating weight includes iron in the coated layer.
3) Coating weight not specified in the tables is subject to negotiation.

Chemical treatment

Type	Classification	Designation
Chromate-free type	General usage (organic coat)	JC
	General usage (Inorganic coat)	JB

Remarks : In case of no chemical treatment, there is no description of treatment or described by "M".

Oiling

Classification	Designation
Oiling	O
No oiling	X

Dimensional tolerance

JIS G 3302 is applied to strip dimensional tolerance. The thickness tolerance is shown below.
Thickness tolerance shall be applied to nominal thickness plus the equivalent thickness of coating.

● Hot rolled base metal used

Unit : mm

Width / Nominal thickness	610 ≤ < 1200	1200 ≤ < 1500	1500 ≤ ≤ 1733
1.60 ≤, < 2.00	±0.17	±0.18	±0.19
2.00 ≤, < 2.50	±0.18	±0.20	±0.22
2.50 ≤, < 3.15	±0.20	±0.22	±0.25
3.15 ≤, ≤ 3.20	±0.22	±0.24	±0.27

The measuring point is any points more than 25mm from the edge of the strip.

● Cold rolled base metal used

Unit : mm

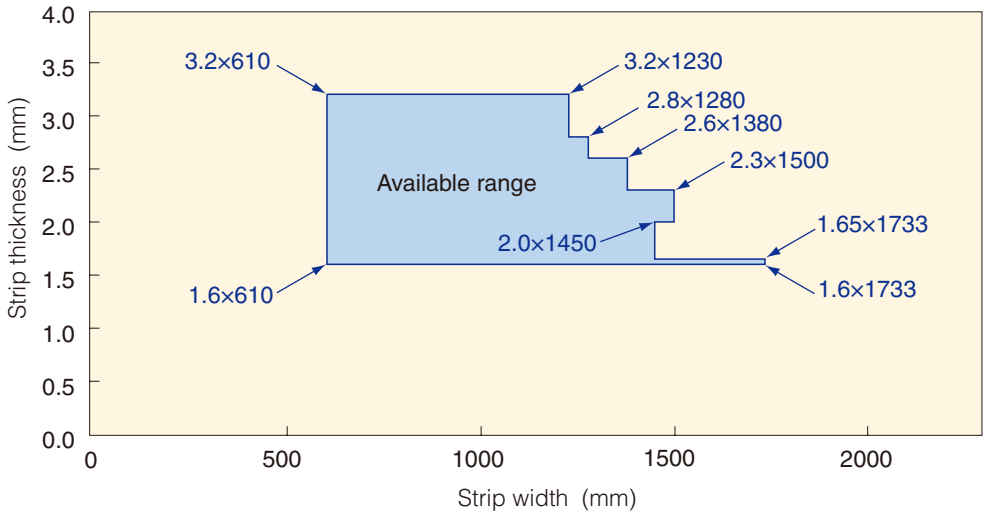
Width / Nominal thickness	610 ≤ < 630	630 ≤ < 1000	1000 ≤ < 1250	1250 ≤ < 1600	1600 ≤ ≤ 1830
0.40 ≤, < 0.60	±0.06	±0.06	±0.06	±0.07	±0.08
0.60 ≤, < 0.80	±0.07	±0.07	±0.07	±0.07	±0.08
0.80 ≤, < 1.00	±0.07	±0.07	±0.08	±0.09	±0.10
1.00 ≤, < 1.25	±0.08	±0.08	±0.09	±0.10	±0.12
1.25 ≤, < 1.60	±0.09	±0.10	±0.11	±0.12	±0.14
1.60 ≤, < 2.00	±0.11	±0.12	±0.13	±0.14	±0.16
2.00 ≤, < 2.50	±0.13	±0.14	±0.15	±0.16	±0.18
2.50 ≤, ≤ 2.80	±0.15	±0.16	±0.17	±0.18	±0.21

JFE GALVAZINC ALLOY available product size range 1

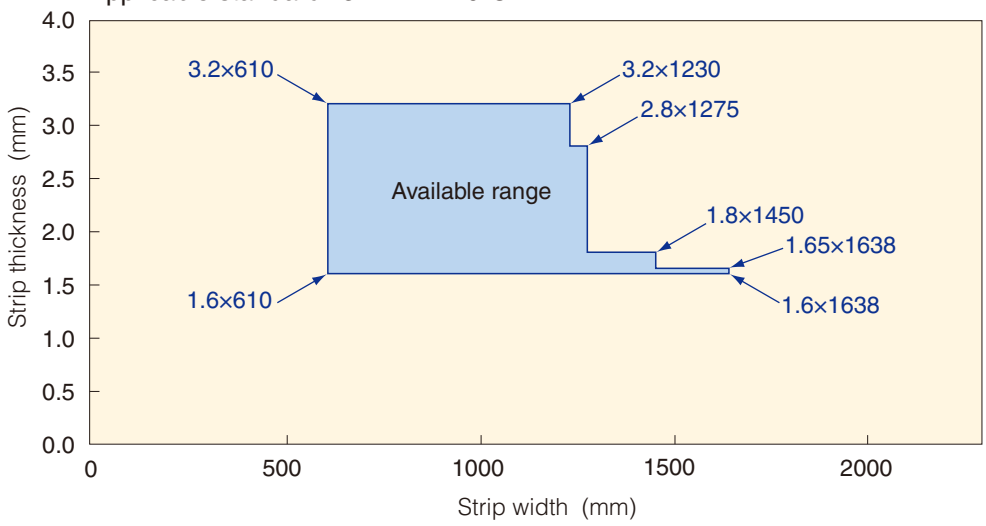
Examples of available product size range are shown below.
Size outside the available range is subject to negotiation.

● Available product size range for chemical treatment
Available product size range is different in applied chemical treatment.
Please consult us.

Applicable standard : JFE-HC-GA

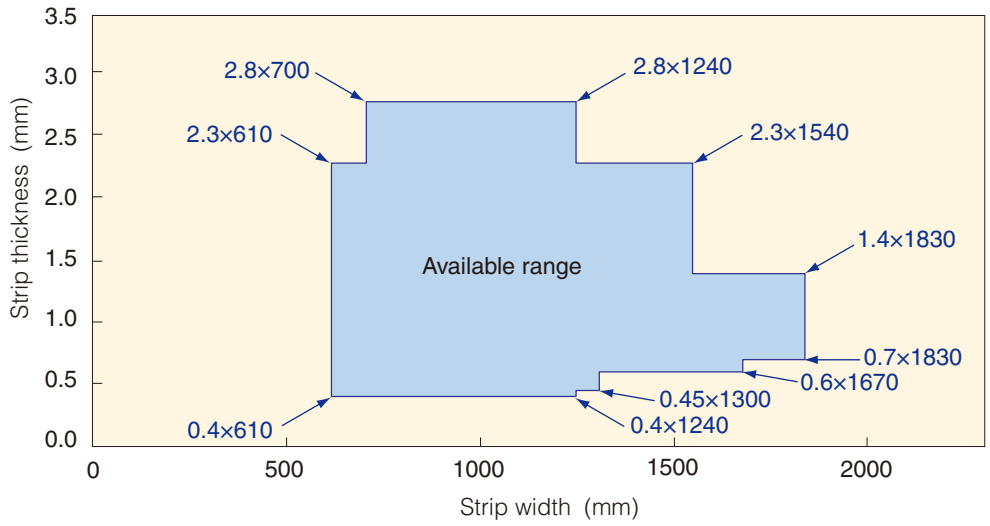


Applicable standard : JFE-HA440-GA

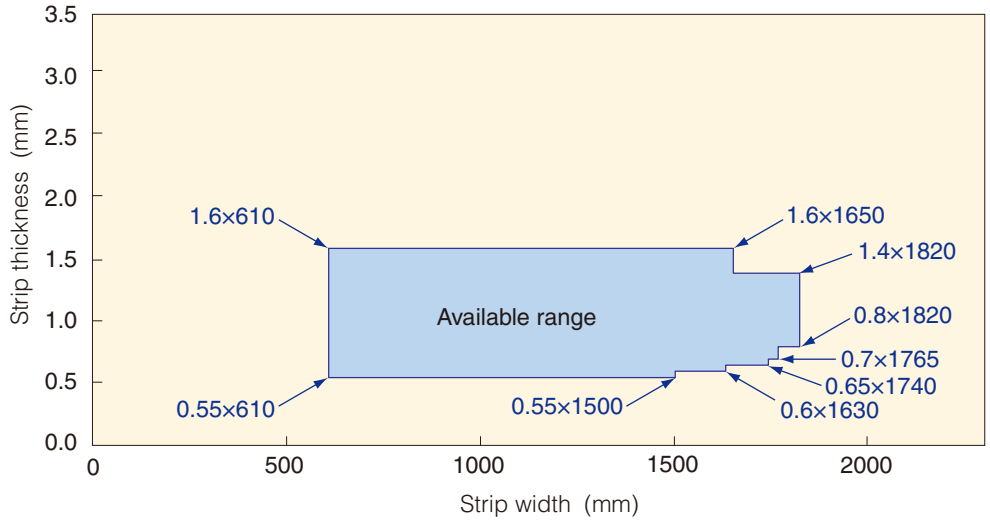


Size outside the available range is subject to negotiation.

Applicable standard : JFE-CC-GA



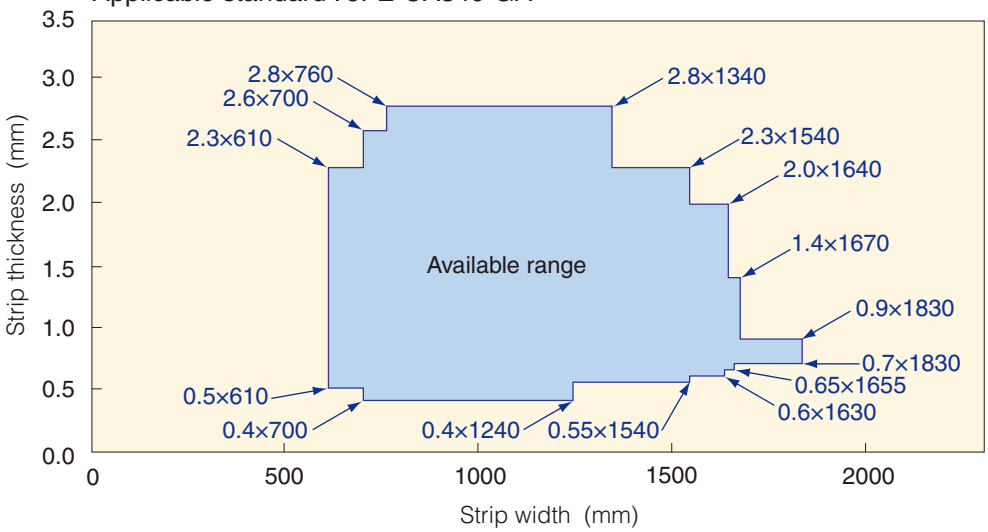
Applicable standard : JFE-CF-GA



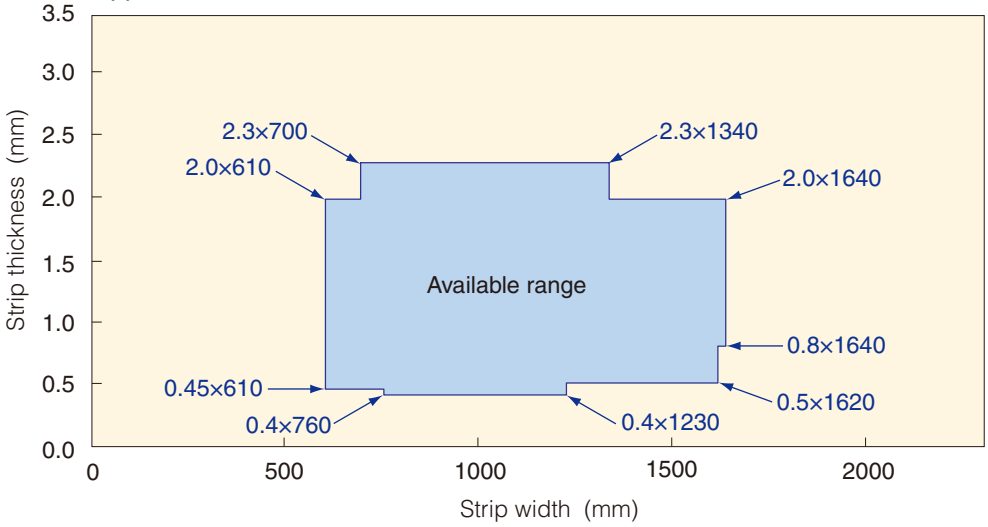
JFE GALVAZINC ALLOY available product size range 2

Examples of available product size range are shown below.
Size outside the available range is subject to negotiation.

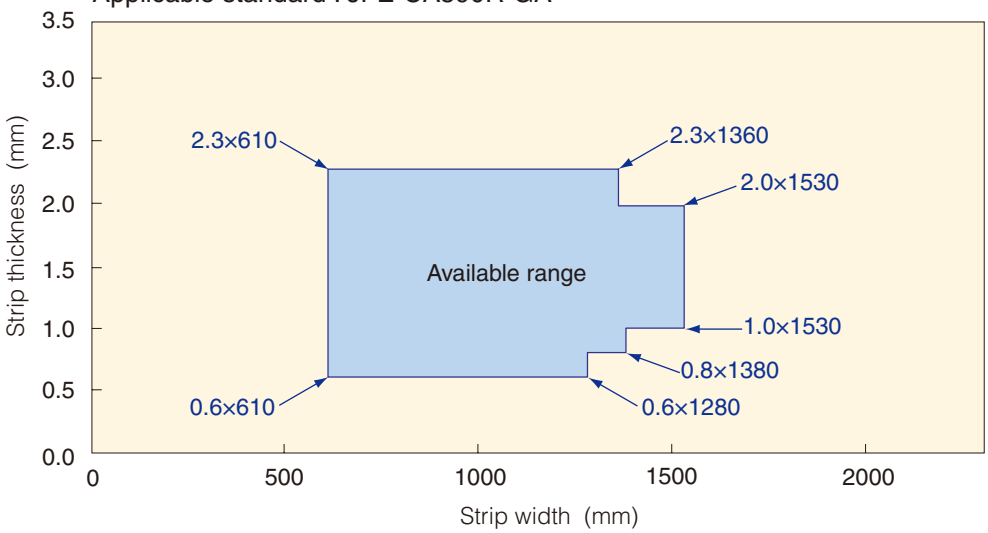
Applicable standard : JFE-CA340-GA



Applicable standard : JFE-CA440-GA



Applicable standard : JFE-CA590R-GA



GALVALUME STEEL SHEET

GALVALUME STEEL SHEET characteristics and standard

GALVALUME STEEL SHEET is a steel sheet product with about 55%aluminum-zinc coating, and has 3-6 times higher corrosion resistance than conventional galvanized products, as well as superior durability under severe service conditions. Because it also possesses excellent heat resistance and heat reflection properties, GALVALUME STEEL SHEET is widely used as an insulating material for various types of facilities and equipment.

Public standard

Japanese Industrial Standards (JIS)

Classification	Designation
G 3321 Hot dip 55% aluminum-zinc alloy coated sheets and coils	SGLHC, SGLCC,SGLH400, SGLCD,SGLC400, etc.

JFE standard

GALVALUME STEEL SHEET for hot rolled base metal used

Classification	Designation
Structural quality, class 1	JFE-H400-GL
Commercial quality	JFE-HB-GL

GALVALUME STEEL SHEET for cold rolled base metal used

Classification	Designation
Structural quality, class 1	JFE-C400-GL
Structural quality, class 2	JFE-C570-GL
Commercial quality	JFE-CB-GL
Forming quality	JFE-CC-GL
Drawing quality	JFE-CD-GL
Deep drawing quality	JFE-CE-GL

Mechanical properties

Base metal	Classification	Designation	Tensile Test							Bend Test	
			Yield Point min. (N/mm^2)	Tensile strength min. (N/mm^2)	Elongation min. (%) Thickness mm					Internal Radius Thickness mm	
					0.4 ≤ < 0.6	0.6 ≤ < 1.0	1.0 ≤ < 1.6	1.6 ≤ < 2.0	2.0 ≤ ≤ 2.3	≤ 1.6	1.6 <
Hot rolled	Structural quality, class 1	JFE-H400-GL	245	400	—	—	—	18	18	—	—
	Commercial quality	JFE-HB-GL	—	—	—	—	—	—	—	(1t)	(1t)
Cold rolled	Structural quality, class 1	JFE-C400-GL	245	400	18	18	18	18	—	—	—
	Structural quality, class 2	JFE-C570-GL	500	570	—	—	—	—	—	—	—
	Commercial quality	JFE-CB-GL	—	—	—	—	—	—	—	(1t)	(1t)
	Forming quality	JFE-CC-GL	—	270	27	31	32	33	—	—	—
	Drawing quality	JFE-CD-GL	—	270	29	33	34	35	—	—	—
	Deep drawing quality	JFE-CE-GL	—	270	30	34	35	36	—	—	—

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

Coating weight

JIS products

Total coating weight on both sides	AZ90	AZ120	AZ150	AZ170
Min. coating weight in triple-spot test on both sides (g/m^2)	90	120	150	170
Equivalent coating thickness (mm)	0.033	0.043	0.054	0.062

1) JIS H 0401 is applied to coating weight measurement.

GALVALUME STEEL SHEET

Total coating weight on both sides	60/60	90/90
Min. coating weight in triple-spot test on both sides (g/m^2)	80	120

1) Coating weight is measured by the triple-spot test specified in JIS H 0401.
2) Other coating weight not specified above is subject to negotiation

Chemical treatment

Type	Classification	Designation
Chromate-free type	General usage (organic coat)	FJ

Remarks : In case of no chemical treatment, there is no description of treatment or described by "M".

Spangle

Surface spangle is normally regular spangle.

Dimensional tolerance

Dimension tolerance apply JIS G 3321.

Thickness tolerance of JIS G 3321 is shown below.

● Thickness tolerance for hot rolled soft base metal used

Unit mm

Nominal thickness \ Width	< 1000	1000 ≤ < 1250
1.60 ≤, < 2.00	±0.17	±0.18
2.00 ≤, ≤ 2.30	±0.18	±0.20

● Thickness tolerance for hot rolled structural base metal used

Unit mm

Nominal thickness \ Width	≤ 1250
1.60 ≤, < 2.00	±0.20
2.00 ≤, ≤ 2.30	±0.21

● Thickness tolerance for cold rolled base metal used

Unit mm

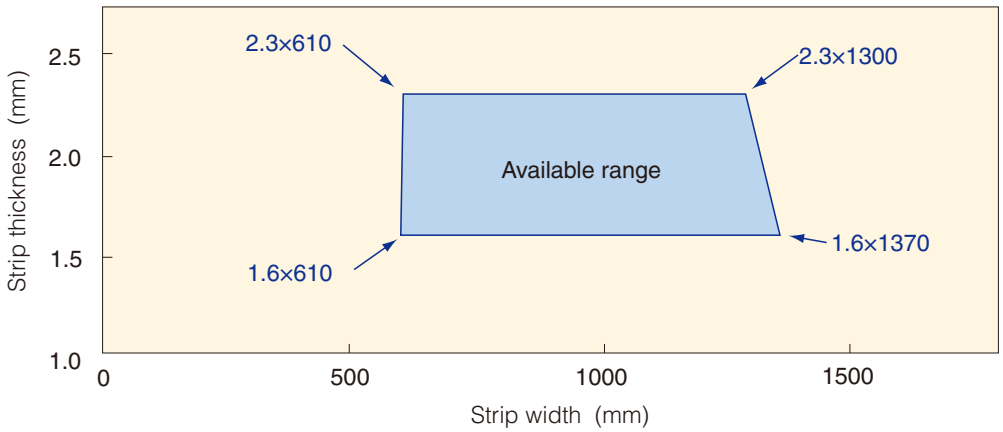
Nominal thickness \ Width	< 630	630 ≤ < 1000	1000 ≤ < 1250
0.25 ≤, < 0.40	±0.05	±0.05	±0.05
0.40 ≤, < 0.60	±0.06	±0.06	±0.06
0.60 ≤, < 0.80	±0.07	±0.07	±0.07
0.80 ≤, < 1.0	±0.07	±0.07	±0.08
1.0 ≤, < 1.25	±0.08	±0.08	±0.09
1.25 ≤, < 1.60	±0.09	±0.09	±0.11
1.60 ≤, < 2.00	±0.11	±0.12	±0.13
2.00 ≤, ≤ 2.30	±0.13	±0.14	±0.15

Remarks : The measuring point is any points more than 25mm from the edge of the strip.

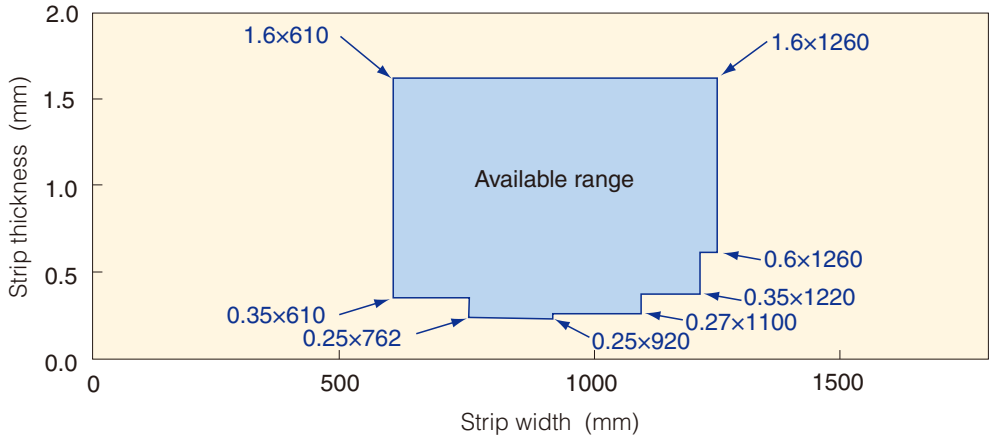
GALVALUME STEEL SHEET available product size range

Examples of available product size range are shown below.
Size outside the available range is subject to negotiation.

Applicable standard : JFE-HB-GL



Applicable standard : JFE-CB-GL



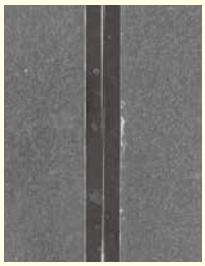
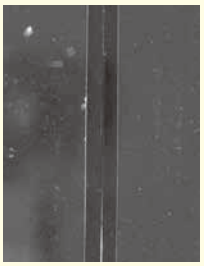
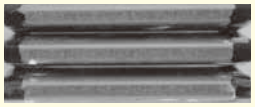
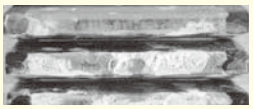
Eco Frontier Series

General usage type Organic chromate-free JC

Characteristics

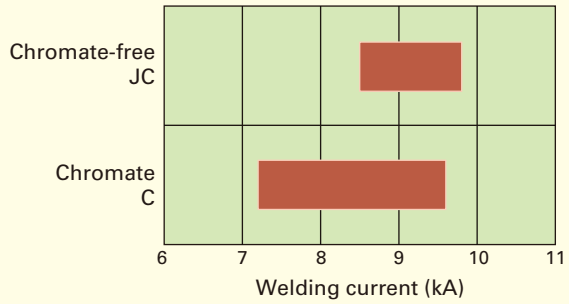
1) Excellent corrosion resistance → White rust area less than 5% after SST 72 hrs
2) Good spot weldability → Same electrode life as conventional chromate coating
3) Chromate-free coating → Environmentally-friendly chromate-free coated steel

● Corrosion resistance

Salt spray test		
	Chromate-free = JC =	Chromate = C =
After 72 hrs. SST tested by a flat panel		
After 48 hrs. SST at bent portion (3mmR bending)		

● Weldability

Suitable current range (example of GA base)



* Optimum current may be different from chromate-coated materials. Current adjustment is required for JC coat.

Remarks on chromate-free chemical treatment product use

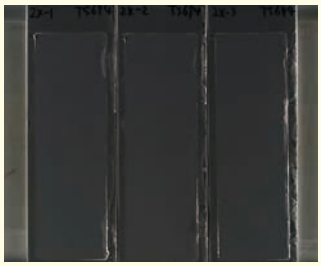
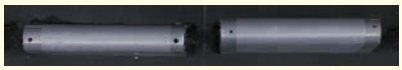
1) Coated layer might be removed or discolored during degreasing or cleaning in some case. Please confirm it before use.
2) Whitening or peeling of coated layer might occur due to continuous forming, severe bending and deep drawing, or sticking of adhesive tape. Please confirm it before use.
3) High temperature heating like brazing causes the damage to coating. Please confirm properties like corrosion resistance before use.

General usage type Inorganic chromate-free JB

Characteristics

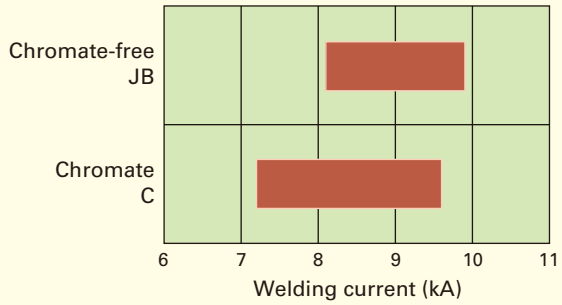
1) Good spot weldability → Same electrode life as conventional chromate coating
2) Chromate-free coating → Environmentally-friendly chromate-free coated steel

Corrosion resistance

Salt spray test (example of GA base)	
	Chromate-free = JB =
After 48 hrs. SST tested by a flat panel	
After 48 hrs. SST at bent portion (3mmR bending)	

Weldability

Suitable current range (example of GA base)



* Optimum current may be different from chromate-coated materials. Current adjustment is required for JB coat.

Remarks on chromate-free chemical treatment product use

1) Coated layer might be removed or discolored during degreasing or cleaning in some case. Please confirm it before use.
2) Whitening or peeling of coated layer might occur due to continuous forming, severe bending and deep drawing, or sticking of adhesive tape. Please confirm it before use.
3) High temperature heating like brazing causes the damage to coating. Please confirm properties like corrosion resistance before use.

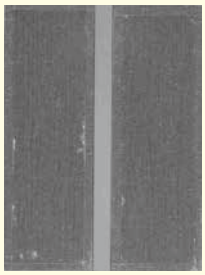
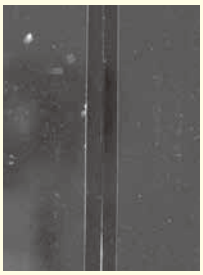
Inorganic chromate-free JM

Characteristics

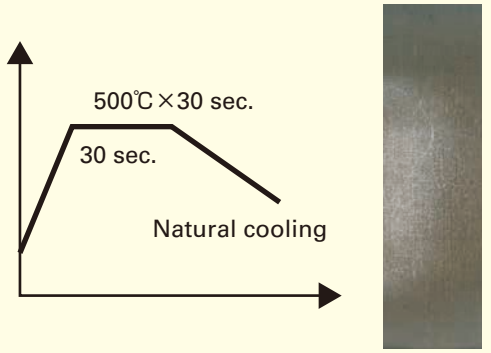
1) Excellent corrosion resistance → White rust area less than 5% after SST 72 hrs
2) Stable coating appearance after heating → Minimum coating deterioration after heating
3) Good spot weldability → Same electrode life as conventional chromate coating

Corrosion resistance

Salt spray test

	Chromate-free = JM =	Chromate = C =
After 72 hrs. SST tested by a flat panel		

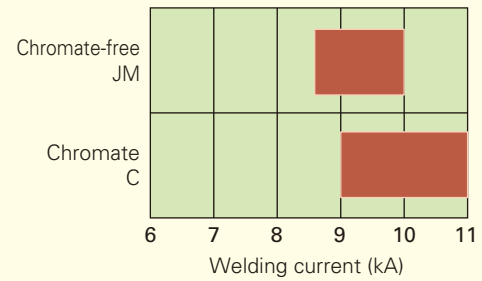
Appearance after high temperature heating



*Coating itself is damaged by high temperature heating.

Weldability

Suitable current range



* Optimum current is different from conventional chromate coat. Current adjustment is required for JM coat.

Remarks on chromate-free chemical treatment product use

1) Coated layer might be removed or discolored during degreasing or cleaning in some case. Please confirm it before use.
2) Whitening or peeling of coated layer might occur due to continuous forming, severe bending and deep drawing, or sticking of adhesive tape. Please confirm it before use.
3) The change in appearance by high temperature heating like brazing is restrained. However, please confirm properties like corrosion resistance before use.

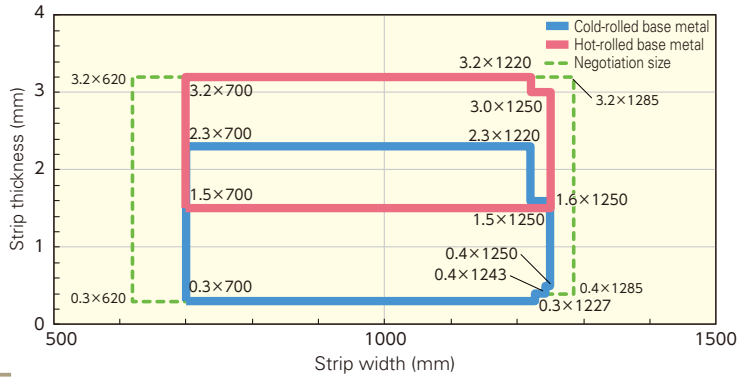
Hot-dip Coated Steel Sheet with High Corrosion Resistance
ECOGAL-Neo

Characteristics

ECOGAL-Neo is a JIS G 3317 compliant coated steel sheet in which further excellent corrosion resistance is achieved by adding small amounts of magnesium (Mg) and nickel (Ni) to Zn-5%Al-based alloy coating. Features other than corrosion resistance show the same performance as conventional Zn-5%Al alloy-coated steel sheets and galvanized (GI) steel sheets.

1) High corrosion-resistance → Because corrosion resistance is higher than that of the current GI, longer service life and use of a thinner coating weight are possible.
2) Beautiful exterior → Thanks to its uniform exterior, ECOGAL-Neo can be used as a substitute for post-coating/post painting, contributing to process omission.
3) Excellent weldability → Excellent weld quality on the same level as GI can be obtained by any welding method, including spot welding, arc welding, boss welding, etc.
4) Outstanding formability → Because the coating layer is soft and does not crack under bending and other forming processes, forming is possible by the same processes used with GI. In addition, formed parts also display excellent corrosion resistance.
5) Excellent alkali resistance → Excellent in alkali resistance compared to galvalume steel sheet. Suitable for use under severe environments such as livestock buildings, compost buildings, etc.
6) Selectable chromate-free conversion film → The conversion film is an eco-friendly chromate-free film. Both inorganic (EX) and organic systems (EN) are available. The organic system increases corrosion resistance and improves the appearance of welds, and is even easier to use.

Available product size range



Size outside the available range is subject to negotiation.
Please consult with JFE.

Applications

1) Building materials: General building hardware (residential, nonresidential), frames for PV, road and residential equipment, material for pipes, base material for painted steel sheets
2) Electrical equipment parts: Side panels of ventilating fans, internal parts of vending machines, side panels of electrical switchboards, motor case.
3) Automotive electrical parts

Remarks on product use

1) In some cases, decomposition, discoloration, etc. of the surface may occur due to degreasing, washing, use of a lubricating oil for forming, welding, brazing, etc. Please confirm the suitability of such processes before use.
2) Whitening or peeling of the film may occur under severe bending forming or deep drawing. Please confirm before use.

Quality Performance of ECOGAL-Neo

Corrosion Resistance

ECOGAL-Neo with chromate-free treatment displays higher corrosion resistance than chromate-free GI materials.

● Corrosion Resistance of Flat Panels in SST

After 240 hrs of SST

ECOGAL-Neo EN	GI JC*
Y18	Z18

After 1000 hrs of SST

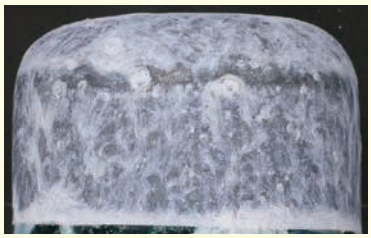
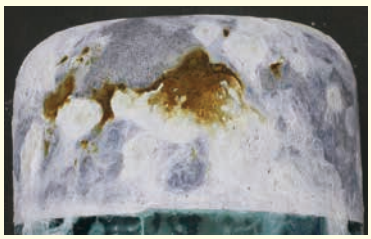
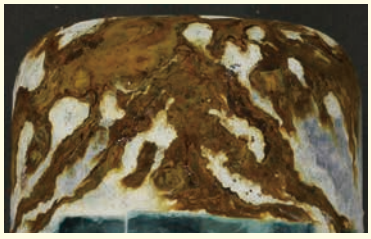
ECOGAL-Neo EN	GI JC*
Y18	Z18

After 2500 hrs of SST

ECOGAL-Neo EN
Y18

* JC: JFE Steel GI product (organic general-purpose chromate-free)

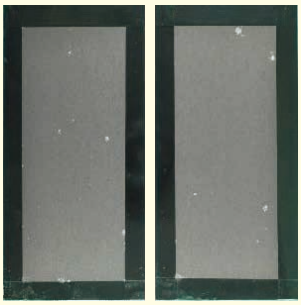
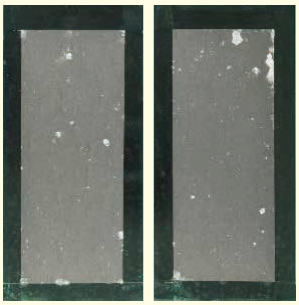
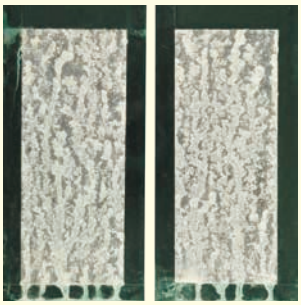
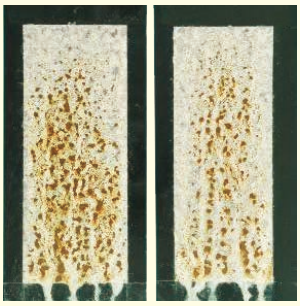
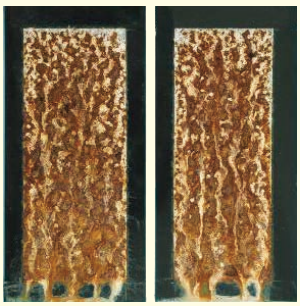
● Corrosion Resistance after Drawing in SST (Cup Forming)

	ECOGAL-Neo EX	GI JC*
	Y14	Z18
After 240 hrs of SST		
After 480 hrs of SST		

[Cup forming conditions]
Die shoulder R: 5 mm Blank holding pressure: 750 kgf
Punch shoulder R: 5 mm Clearance: 2.6 mm

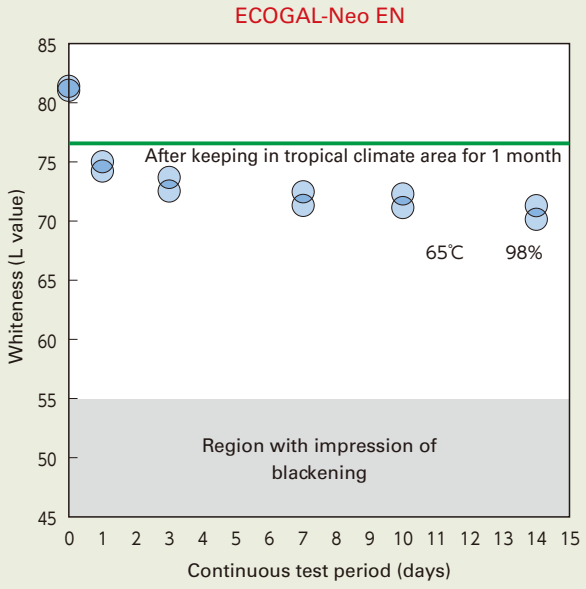
* JC: JFE Steel GI product (organic general-purpose chromate-free)

Corrosion Resistance of Flat Panels in CCT

	30 cycles	50 cycles	100 cycles
ECOGAL-Neo EX Y06			
GI C Z18			

◆CCT cycle
Salt spray (5% NaCl, 35˚C, 2hrs) → Dry (25% RH, 60˚C, 4hrs) → High temperature wet (98% RH, 50˚C, 2hrs)

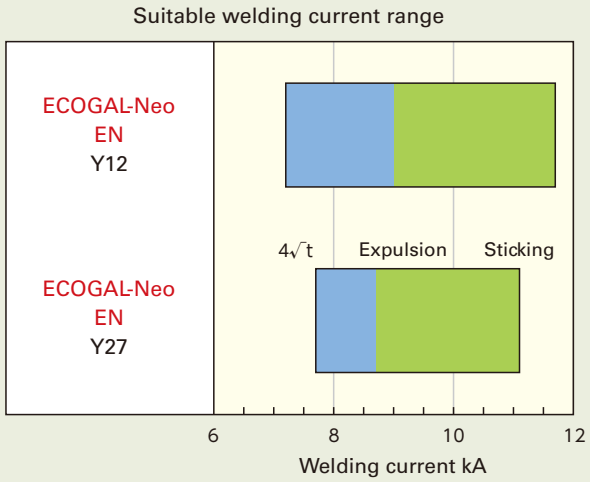
Blackening Resistance



Little change in color tone of ECOGAL-Neo when kept in hot, humid area.

Weldability

Spot Weldability



Welding force: 400 kgf
Sheet thickness: 1.6 mm
Weld time: 16 cycles (50 Hz)
Electrode shape: CuCr CF type, tip diameter: 6 mm

With appropriate adjustment, spot welding is possible in a wide current range.

Packaging and labeling/Description of steel grade/Instructions for ordering

Packaging and labeling

● Packaging

Products are packaged 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 product.

Description of steel grade

SGCC∗NC-Z08 JM
(A) (B)(C) (E) (F) (G)

JFE-CC-GZ∗JM-60/60
(A) (B)(C) (D) (E) (F)

(A) Standards: SG=JIS hot dip zinc-coated steel sheets standard, JFE=JFE Standard
(B) Base metal used: C=Cold rolled steel sheets, H=Hot rolled steel sheets
(C) Classification:(JIS Standard) C=Commercial quality, D1=Drawing quality, class 1, D2=Drawing quality, class 2, D3=Drawing quality, class 3
(JFE Standard) B=Commercial quality, C=Forming quality, D=Drawing quality, E=Deep drawing quality
(D) Zn coating: GZ=JFE GALVAZINC=JFE hot-dip zinc-coated steel sheets
(E) Type of chromate-free chemical treatment (1): JIS Standard=NC, JFE Standard=JM
(F) Zinc coating weight (Top side/Bottom side)
(G) Type of chromate-free chemical treatment (2): JFE Standard equivalent to JIS Standard NC=JM

Instructions 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	Other requirements (Surface finish, edge form, strip shape, oiling, etc.)

Handling precautions

In using hot dip galvanized steel sheets, the following precautions should betaken in order to ensure optimum use:.

[Storage]
- When receiving product, 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 strips and sheets 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 carefully in handling and work around storage areas.

[Processing]
- Some types of lubricating oil erode zinc. Prior testing before using 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 a smooth and uniform water film.

[Painting]
- Dirt or other foreign matter on the surface will cause paint defects. Degrease 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.

[Black discoloration]
- Galvanized products (GZ : nonalloytype) may display a unique black discoloration phenomenon which is caused by a very thin oxidized film near the zinc surface. This results in changes in light absorption and reflection, causing the material to appear black, but does not affect the basic quality.
- Black discoloration tends to increase over time. The time until noticeable discoloration occurs depends on operating conditions and the storage environment after production. As an oxidation phenomenon, discoloration is generally accelerated by high temperature, high humidity conditions.
- Black discoloration is unavoidable, but can be delayed by oil coating. Quick use of products I recommended, as discoloration will increase if the product is stored for an extended period.

Cat.No.B1E-004-11

JFE Steel Corporation

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