

KOBELCO

Kobe Steel's

Cold-rolled Steel Sheet



KOBE STEEL, LTD.

Kobe Steel's cold-rolled steel sheets support our society and lives

Cold-rolled steel sheets are used extensively to make daily necessities such as automobiles, TV sets, air-conditioners, refrigerators and tools. As our lifestyles improve significantly, the daily necessities become more diverse and upmarket and the technologies for processing materials progress. These facts translate to extremely rigorous requirements in terms of the quality of cold-rolled steel sheets.

Kobe Steel manufactures cold-rolled steel sheets with many different features. Kakogawa Works of the company makes this possible by consistently controlling the quality of the products.

Kobe Steel will continue working tirelessly to satisfy demand. Your continued support and patronage will be greatly appreciated.



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Note and disclaimer

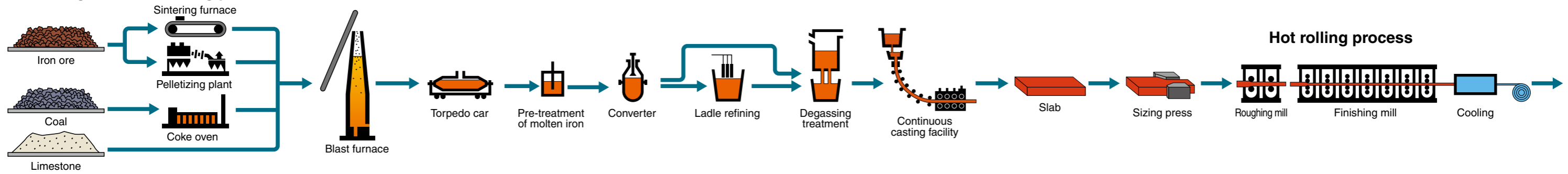
The technical information in this document is aimed at explaining the general features and performance of our products, but it does not guarantee anything as a result.

The technical information in this document may not apply depending on the objectives, environment, conditions or other factors.

The descriptions in this document may be changed without prior notice. For the latest information, contact the relevant department of Kobe Steel, Ltd.

Manufacturing process

Ironmaking and steelmaking process



Hot rolling process



Blast furnace



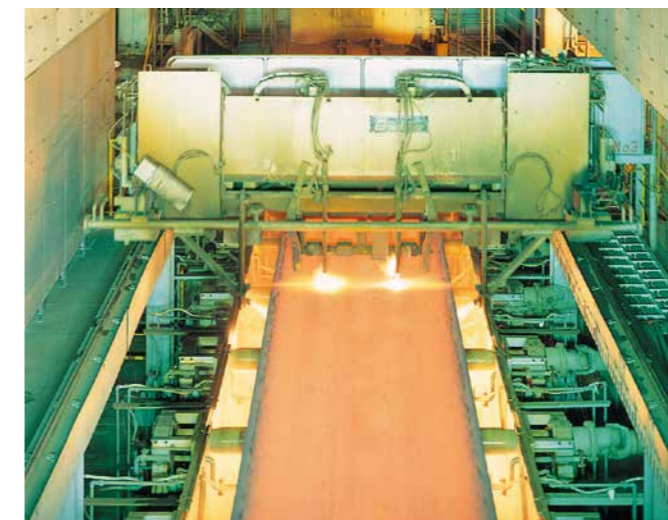
Converter



RH vacuum degassing apparatus



Continuous casting facility (inlet side)

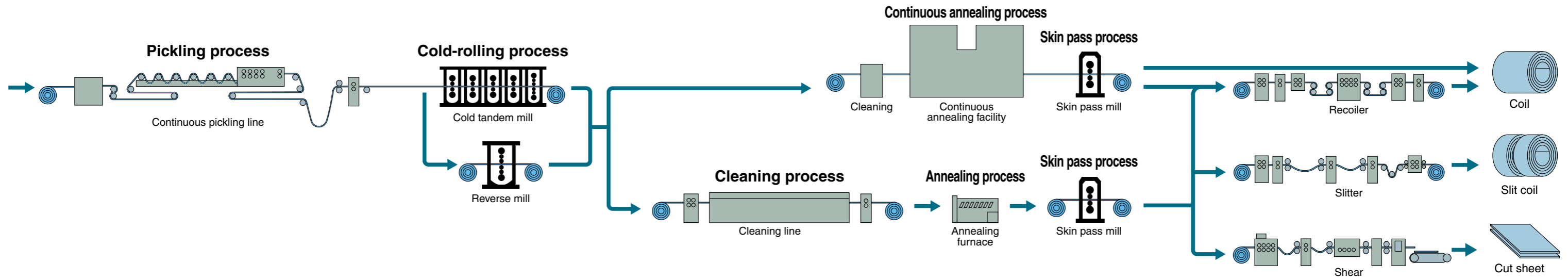


Continuous casting facility (outlet side)



Hot strip mill

Manufacturing process



Continuous pickling line



Cold tandem mill



Reverse mill



Continuous annealing facility



UAD batch-type annealing furnace



No.5 recoiler

Types and feasible range of production

Cold-rolled steel sheets

Code of type		Application	Tensile strength (N/mm ²)	Elongation(%)								Tensile test piece
				Thickness(mm)								
JIS Standards	KOBELCO standard			0.20 or more, but less than 0.25	0.25 or more, but less than 0.30	0.30 or more, but less than 0.40	0.40 or more, but less than 0.60	0.60 or more, but less than 1.0	1.0 or more, but less than 1.6	1.6 or more, but less than 2.5	2.5 or more	
SPCC		General use	—	—	—	—	—	—	—	—	—	No.5 Test Piece Rolling direction
	KPY-1	Mild drawing	270 or more	—	—	—	—	36 or more	37 or more	38 or more	—	
	KPY-2	Drawing	270 or more	—	—	—	—	38 or more	39 or more	40 or more	—	
SPCD		Drawing	270 or more	27 or more	30 or more	33 or more	36 or more	38 or more	39 or more	40 or more	41 or more	
SPCE		Deep drawing	270 or more	29 or more	32 or more	35 or more	38 or more	40 or more	41 or more	42 or more	43 or more	
SPCF ^{a)}		Non-aging deep drawing	270 or more	—	—	—	40 or more	42 or more	43 or more	44 or more	45 or more	
SPCG ^{a) b)}		Non-aging super-deep drawing	270 or more	—	—	—	42 or more	44 or more	45 or more	46 or more	—	

Note : a) SPCF and SPCG guarantee the non-aging properties of a product for six months after factory shipment. If a shipment is delayed due to the ordering party's request, however, the guarantee period would last for six months from the initially-scheduled date of shipment. Non-aging indicates that aging does not occur. Aging indicates that elongation in the above table becomes unsatisfactory or stretcher strain is generated during machining.
 b) SPCG products are usually manufactured with IF steel. IF steel is manufactured using a method that is designed to limit the amount of dissolved C and N as much as possible. The average plastic strain ratio is 1.5 or more (0.50 or thicker and 1.0 or thinner) and 1.4 or more (thicker than 1.0 and 1.6 or thinner).

Feasible range of production

The manufacturability range varies depending on the use purpose. Please contact us for more information.

Figure-1 SPCC ※ Please consult us regarding the area marked in orange.

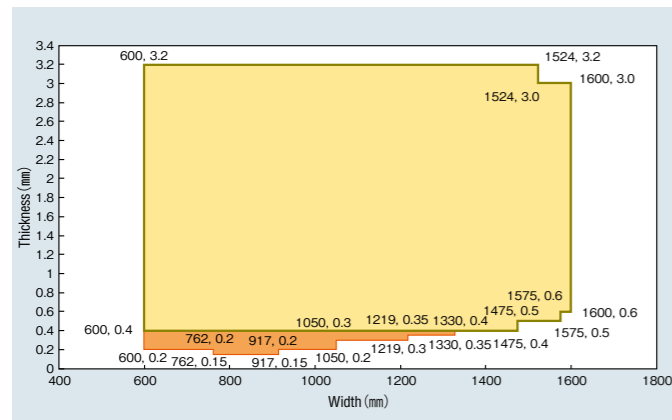
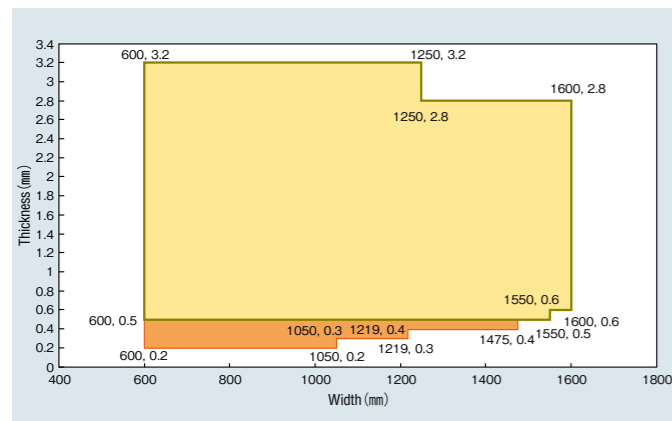


Figure-2 SPCD, SPCE, KPY-1 and KPY-2 ※ Please consult us regarding the area marked in orange.



Hard material

Classification of thermal refining	Hardness		Bending test	
	HRB	HV	Bending angle	No. of inner spacers
1/8 hard	50 ~ 71	95 ~ 130	180°	0 (Adhesion)
1/4 hard	65 ~ 80	115 ~ 150	180°	1
1/2 hard	74 ~ 89	135 ~ 185	180°	2
Hard	85 or more	170 or more	—	—

Dimension tolerance (JIS G 3141)

Thickness	Width				
	Less than 600	600 or more, but less than 1000	1000 or more, but less than 1250	1250 or more, but less than 1600	1600 or more
Less than 0.25	±0.03	±0.03	±0.03	—	—
0.25 or more, but less than 0.40	±0.04	±0.04	±0.04	—	—
0.40 or more, but less than 0.60	±0.05	±0.05	±0.05	±0.06	—
0.60 or more, but less than 0.80	±0.06	±0.06	±0.06	±0.06	±0.07
0.80 or more, but less than 1.00	±0.06	±0.06	±0.07	±0.08	±0.09
1.00 or more, but less than 1.25	±0.07	±0.07	±0.08	±0.09	±0.11
1.25 or more, but less than 1.60	±0.08	±0.09	±0.10	±0.11	±0.13
1.60 or more, but less than 2.00	±0.10	±0.11	±0.12	±0.13	±0.15
2.00 or more, but less than 2.50	±0.12	±0.13	±0.14	±0.15	±0.17
2.50 or more, but less than 3.15	±0.14	±0.15	±0.16	±0.17	±0.20
3.15 or more	±0.16	±0.17	±0.19	±0.20	—

(2) Width tolerance

Width	Category	
	Width tolerance A	
Less than 1,250	+7 -0	
1,250 or more	+10 -0	

(3) Length tolerance

Length	Category	
	Length tolerance	
Less than 2,000	+10 -0	
2,000 or more, but less than 4,000	+15 -0	
4,000 or more, but less than 6,000	+20 -0	

Shape (JIS G 3141)

Classification by nominal width	Type of strain	Unit mm		
		Warpage	Ear waves	Center waves
Less than 1,000		12	8	6
1,000 or more, but less than 1,250		15	9	8
1,250 or more, but less than 1,600		15	11	8
1,600 or more		20	13	9

(2) Camber (maximum)

Classification by nominal width	Steel sheet		Steel strip
	Shorter than 2,000	2,000 or longer	
30 or more, but less than 40	8	8 per any length of 2,000	
40 or more, but less than 600	4	4 per any length of 2,000	
600 or more	2	2 per any length of 2,000	

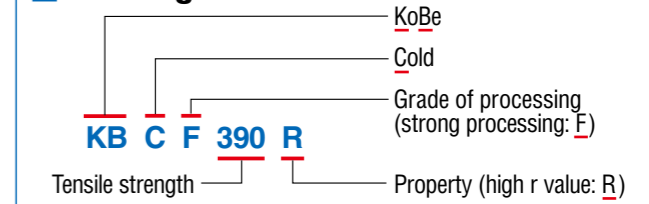
Surface finish

Classification	Code	Description
Dull finish	D	A matte roll with a physically or chemically rough surface
Bright finish	B	A smoothly-finished roll

The table does not apply to steel sheets and strips that are unprocessed after annealing.

Types and feasible range of production

Meaning of KOBELCO standard code



In addition to those described in the tables below, our steel sheets may be available in other forms. Please contact us.

Cold-rolled high-tensile strength steel sheets for processing

Standard		Characteristics	Tensile strength (minimum) (N/mm ²)	Yield point or 0.2% Yield strength (minimum) (N/mm ²)	Elongation (minimum) (%)		Level of paint bake-hardening (N/mm ²)	Bending test	r value				n value
JIS Standards (JIS G 3135)	KOBELCO standard				Thickness (mm)				Thickness (mm)				
					0.6 or more, but less than 1.0	1.0 or more, but no more than 2.3			0.7	1.2	1.6	2.3	
SPFC340	KBCF340	For drawing	340	175	34	35	—	Adhesion	—	—	—	—	—
SPFC340H	KBCF340RBH	Bake-hardenable type	340	185	34	35	30 or more	Adhesion	(1.7)	(1.6)	(1.5)	—	—
SPFC370	KBCF370	For drawing	370	205	32	33	—	Adhesion	—	—	—	—	—
SPFC390	KBCF390	For processing	390	235	30	31	—	Adhesion	—	—	—	—	—
—	KBCF390R	For drawing	390	225	31	33	—	Adhesion	(1.6)	(1.5)	(1.4)	—	—
SPFC440	KBCF440	For processing	440	265	26	27	—	Adhesion	—	—	—	—	—
SPFC490	KBCF490	For processing	490	295	23	24	—	Adhesion	—	—	—	—	—
SPFC540	KBCF540	For processing	540	325	20	21	—	0.5 times the thickness	—	—	—	—	—
SPFC590	KBCF590	For processing	590	355	17	18	—	1.0 times the thickness	—	—	—	—	—
SPFC490Y	KBCF490D	Low yield ratio type	490	225	24	25	—	Adhesion	—	—	—	—	[≥ 0.20]
SPFC540Y	KBCF540D	Low yield ratio type	540	245	21	22	—	0.5 times the thickness	—	—	—	—	[≥ 0.20]
SPFC590Y	KBCF590D	Low yield ratio type	590	265	18	19	—	1.0 times the thickness	—	—	—	—	[≥ 0.20]
SPFC780Y	KBCF780D	Low yield ratio type	780	365	13	14	—	3.0 times the thickness	—	—	—	—	—
SPFC980Y	KBCF980D	Low yield ratio type	980	490	6	7	—	4.0 times the thickness	—	—	—	—	—

Remarks: 1. Level of bake-hardening (BH level) means the amount of elevation of yield point after 2% pre-straining and before and after 20-minute heating at 170°C. 2. The numbers in parentheses are target values, while the numbers in square brackets are reference values.

3. Our tensile tests pull a JIS 5 test piece orthogonally in the direction of rolling. 4. Our bending tests bend a JIS 3 test piece orthogonally in the direction of rolling at a bending angle of 180 degrees.

Feasible range of production

The manufacturability range varies depending on the use purpose. Please contact us for more information.

Figure-3 SPFC and SPCG

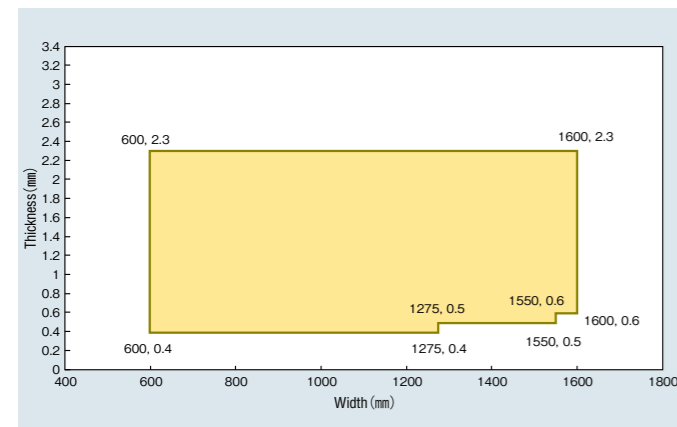


Figure-5 SPFC370 and SPFC390 ※ Please consult us regarding the area marked in orange.

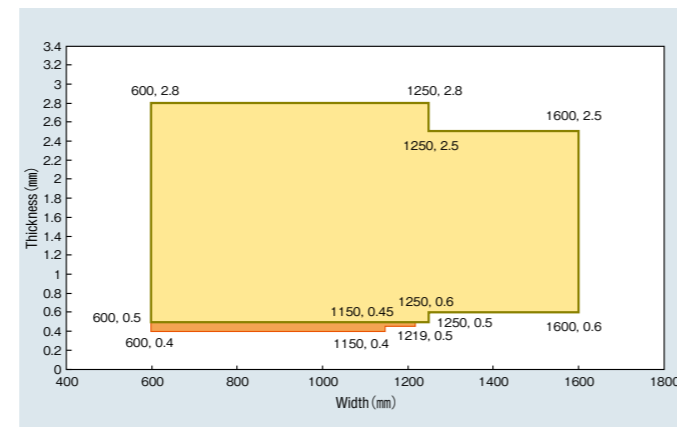


Figure-7 SPFC590 and SPFC590Y

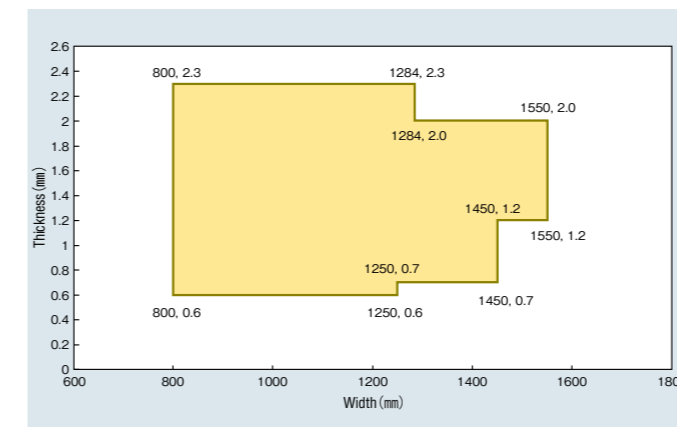


Figure-9 SPFC980Y ※ Please consult us regarding the area marked in orange.

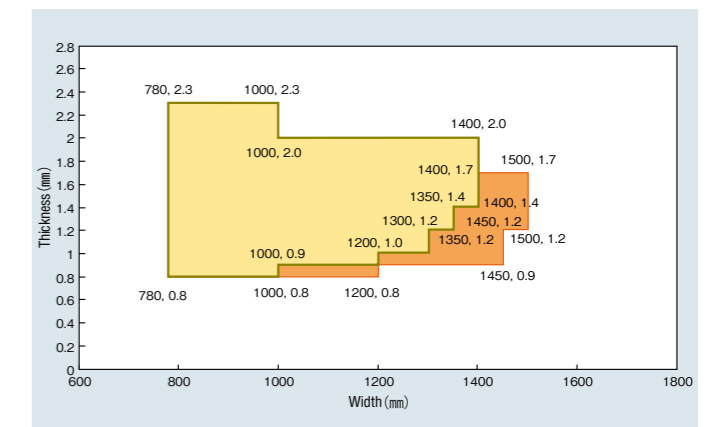


Figure-4 SPFC340 ※ Please consult us regarding the area marked in orange.

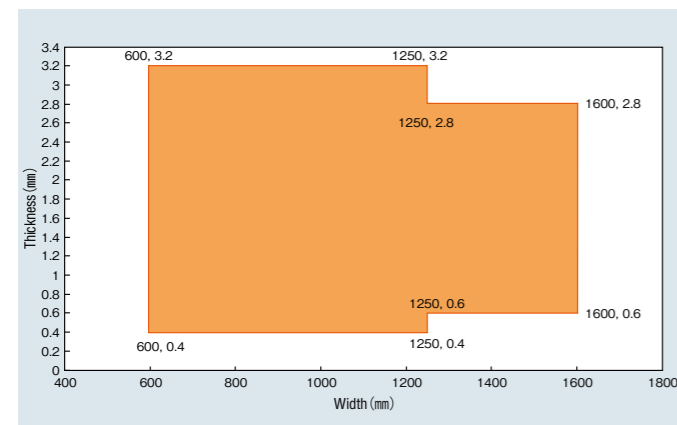


Figure-6 SPFC440

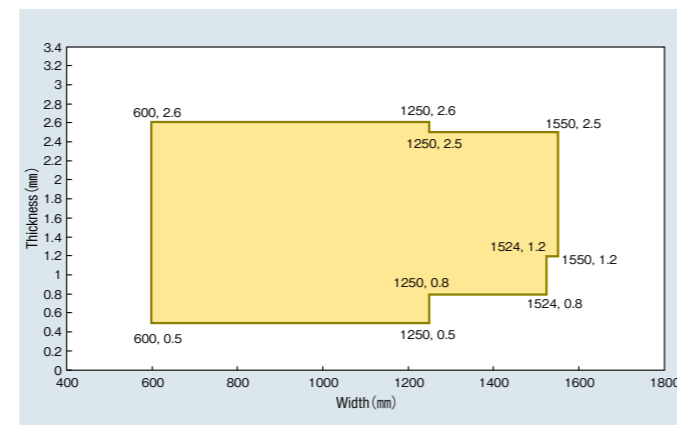
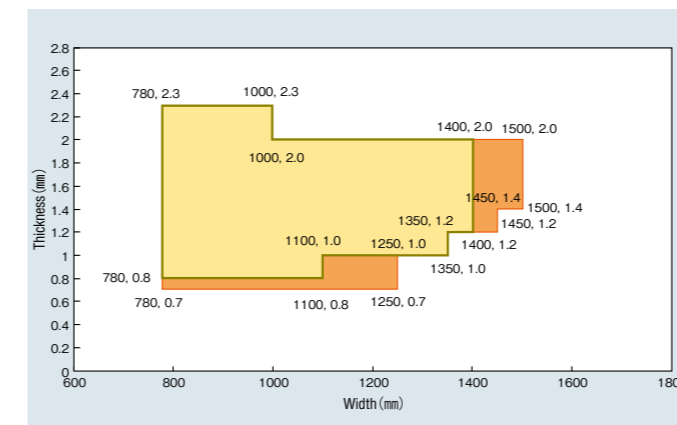


Figure-8 SPFC780Y ※ Please consult us regarding the area marked in orange.



Types and feasible range of production

Dimension tolerance (JIS G 3135)

(1) Thickness tolerance

Application classification by tensile strength	Thickness	Width				
		Less than 630	630 or more, but less than 1000	1000 or more, but less than 1250	1250 or more, but less than 1600	1600 or more
Lower limit of standard tensile strength is below 780 N/mm ²	0.60 or more, but less than 0.80	±0.06	±0.06	±0.06	±0.07	±0.08
	0.80 or more, but less than 1.00	±0.07	±0.07	±0.08	±0.09	±0.10
	1.00 or more, but less than 1.25	±0.08	±0.08	±0.09	±0.10	±0.12
	1.25 or more, but less than 1.60	±0.09	±0.10	±0.11	±0.12	±0.14
	1.60 or more, but less than 2.00	±0.10	±0.11	±0.12	±0.14	±0.16
2.00 or more, but no more than 2.30	±0.12	±0.13	±0.14	±0.16	±0.18	
Lower limit of standard tensile strength is 780 N/mm ² or greater	0.80 or more, but less than 1.00		±0.09		±0.10	—
	1.00 or more, but less than 1.25		±0.10		±0.12	—
	1.25 or more, but less than 1.60		±0.12		±0.15	—
	1.60 or more, but no more than 2.00		±0.14		±0.16	—

(2) Width tolerance

Width	Category	Width tolerance A
Less than 1,250		+7 -0
1,250 or more		+10 -0

(3) Length tolerance

Length	Category	Length tolerance
Less than 2,000		+10 -0
2,000 or more, but less than 4,000		+15 -0
4,000 or more, but less than 6,000		+20 -0

Shape (JIS G 3135)

(1) Flatness (maximum)

Width	Type of strain	Grade	Warpage			Ear waves			Center waves		
			1	2	3	1	2	3	1	2	3
Less than 1,000			12	16	18	8	11	12	6	8	9
1,000 or more, but less than 1,250			15	19	21	10	12	13	8	10	11
1,250 or more, but less than 1,600			15	19	21	12	14	15	9	11	12
1,600 or more			20	—	—	14	—	—	10	—	—

Remarks : Grades 1, 2 and 3 apply to steel sheets whose lower limit of standard tensile strength is below 780 N/mm², 780 N/mm² and 980 N/mm² each.

(2) Bowing (maximum)

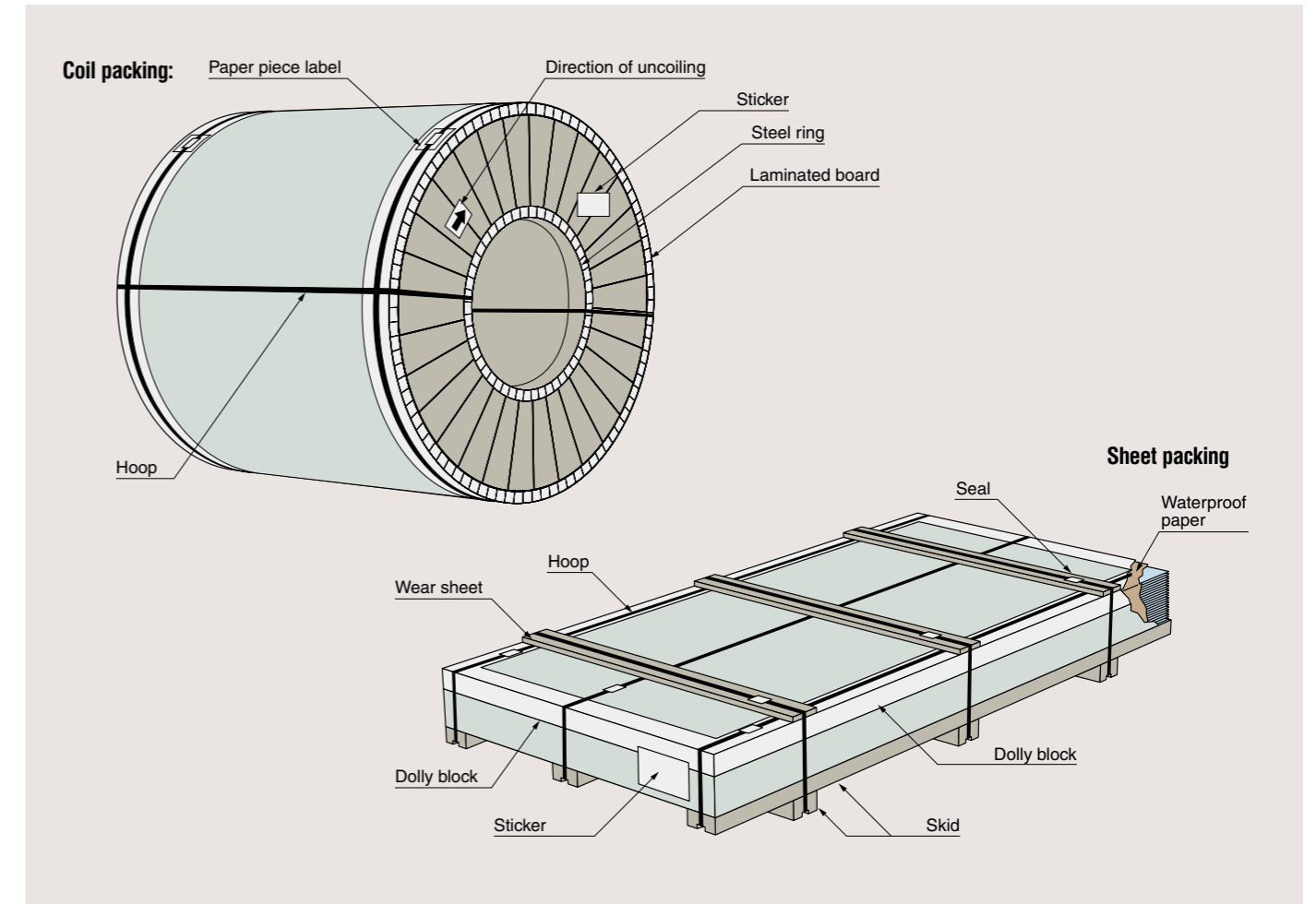
Application classification by tensile strength	Steel sheet or steel strip	Steel sheet		Steel strip
		Shorter than 2,000	2,000 or longer	
Lower limit of standard tensile strength is below 780 N/mm ²	Less than 630	4	4 when the arbitrary length is 2,000	
	630 or more	2	2 when the arbitrary length is 2,000	
Lower limit of standard tensile strength is 780 N/mm ² or greater	Less than 630	4	4 when the arbitrary length is 2,000	
	630 or more	3	3 when the arbitrary length is 2,000	

Surface finish

The surface finish is divided into a fine dull finish and a medium dull finish.

Packing and sticker indication

Examples of packing



Sticker indication

Sticker and service card

Information such as the standard, package number, dimensions, mass, number of sheets (cut sheets only), grade and customer's name is indicated on the sticker and service card on the outer package.

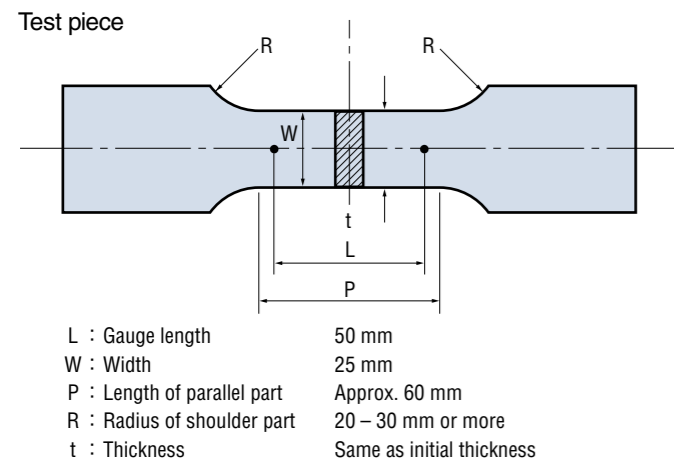
KOBELCO COLD ROLLED STEEL SHEET IN COIL		JIS J1C9A QA0507017
SPEC SPCC-SD		
SIZE	1,600MM X 1219MM X COIL	PACK. NO. 759730
NET-MASS	8250 KG	GROSS-MASS 8304 KG
DATE PRODUCED	C.NO. 20171126 X03162	
KOBELCO, LTD. MADE IN JAPAN		C9XCC101
		PACK. NO. 759730 KOBELCO, LTD. MADE IN JAPAN

Testing methods

The properties of a cold-rolled steel sheet are determined mainly by the following methods.

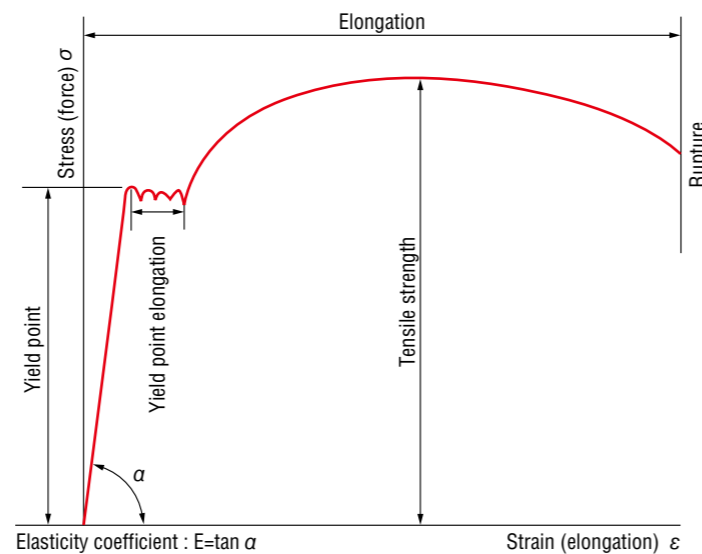
(1) Tensile testing

Tensile testing is the most basic and important kind of test for understanding the properties of a steel material. Usually, tensile testing involves gradually pulling a test piece until it ruptures. Tensile testing usually uses a JIS 5 test piece.



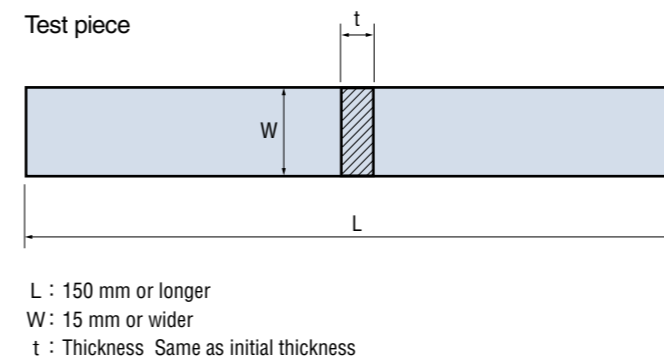
The result of tensile testing provides a lot of information that is useful in determining the press formability.

Tensile strength	TS: Rupture strength of material
Yield point	YP: The smaller YP is, the more easily the product can be shaped.
Yield ratio	YR: (yield point/tensile strength) The smaller YR is, the more easily the product's stretch forming becomes.
Elongation	EI: The larger EI is, the better the formability that the product can obtain.
Work-hardening coefficient	n value: (n value when the stress-strain curve is approximated $\sigma = c \epsilon^n$). The larger the coefficient is, the easier the product's stretch forming becomes.
Lankford value	r value: $\ln(w_0/w)$ wo,w... Width before and after tension $\ln(t_0/t)$ to,t... Thickness before and after tension The larger the r value is, the more drawable the product becomes.

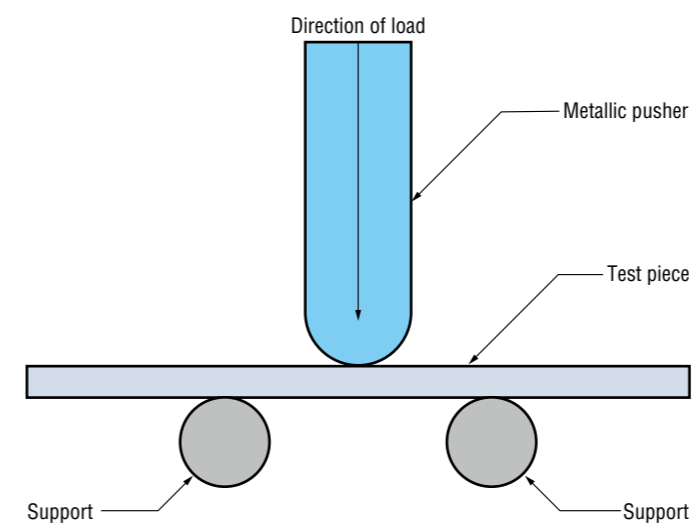


(2) Bending test

A bending test for determining the bending ability of a steel material is usually performed using the following procedure. A bending test uses a JIS 3 test piece.



In a bending test, a test piece is placed on two supports. A metallic pusher with a certain bending radius is pushed against the center of the test piece to gradually apply a load until the piece is bent to a predetermined angle. After that, tears on the external bend of the test piece and other defects are checked to determine the bending ability. The bending angle of a cold-rolled steel sheet is 180 degrees.



(3) Hardness test

The hardness of a steel material is known to have to do with the strength, drawability and other properties of the steel material, and can be determined with relative ease. A hardness test is performed to estimate these properties. A hardness test with a cold-rolled steel sheet is usually performed using the Rockwell hardness testing method, the Rockwell T hardness testing method or the Vickers hardness testing method. For comparisons with other hardness values, see the hardness conversion table.

Rockwell hardness testing method and Rockwell T hardness testing method

This method uses a steel ball indenter. First, the preliminary load is applied to the indenter to push it. The load is applied continuously until the test load is reached. The preliminary load is then resumed and the hardness of the indenter is calculated from the difference in the depth of the dent between the two different preliminary loads, namely those before and after the test load.

Rockwell hardness testing reads the Rockwell hardness from Scale B or F. Rockwell Hardness Scale B involves the use of a steel ball indenter of 1.5875 millimeters in diameter. This assumes the preliminary load to be 98.07 N and the test load to be 980.7 N.

Rockwell Scale F assumes the test load to be 588.4 N.

Rockwell T hardness testing involves the use of Scale 30T.

Rockwell T Hardness Scale 30T involves the use of a steel ball or a tungsten carbide ball of 1.5875 millimeters in diameter. This assumes the preliminary load to be 29.42 N and the test load to be 294.2 N.

The measurement of a thicker steel sheet (0.8 mm or thicker) uses Scale B, whereas the measurement of a thin steel sheet uses Scale F or 30T.

Vickers hardness testing method

Vickers hardness is calculated by dividing the load when a pyramid-shaped dent is made in the test surface with the use of a diamond quadrangular pyramid indenter with a 136-degree angle between the opposite faces, by the surface area found by the length of a diagonal line of the permanent dent. It is calculated using the following formula.

$$Hv = 0.1891 \frac{F}{d^2}$$

Hv : Vickers hardness (N/mm²)
 F : Load (N)
 d : Average length of the diagonal line of the dent (mm)

Mass conversion tables

Sheet mass conversion table

Sheet thickness (mm)	Width x length (mm)		Unit kg								
	Unit mass kg/m ²	Name	762x1829	762x2438	762x3048	914x1829	914x2438	914x3048	1219x1829	1219x2438	1219x3048
0.23	1.806		2.52	3.36	4.20	3.02	4.02	5.03	4.03	5.37	6.71
0.25	1.962		2.74	3.65	4.56	3.28	4.37	5.47	4.38	5.83	7.29
0.26	2.041		2.85	3.79	4.74	3.41	4.55	5.69	4.55	6.07	7.58
0.29	2.276		3.17	4.23	5.29	3.81	5.07	6.34	5.08	6.76	8.46
0.30	2.355		3.28	4.38	5.47	3.94	5.25	6.56	5.25	7.00	8.75
0.32	2.512		3.50	4.67	5.84	4.20	5.60	7.00	5.60	7.47	9.33
0.35	2.748		3.83	5.11	6.38	4.59	6.12	7.66	6.13	8.17	10.2
0.40	3.140		4.38	5.83	7.29	5.25	7.00	8.75	7.00	9.33	11.7
0.45	3.532		4.92	6.56	8.20	5.91	7.87	9.84	7.88	10.5	13.1
0.50	3.925		5.47	7.29	9.12	6.56	8.74	10.9	8.75	11.7	14.6
0.55	4.318		6.02	8.02	10.0	7.22	9.62	12.0	9.63	12.8	16.0
0.60	4.710		6.57	8.75	10.9	7.88	10.5	13.1	10.5	14.0	17.5
0.65	5.102		7.11	9.48	11.9	8.53	11.4	14.2	11.4	15.2	19.0
0.70	5.495		7.66	10.2	12.8	9.19	12.2	15.3	12.3	16.3	20.4
0.75	5.888		8.21	10.9	13.7	9.84	13.1	16.4	13.1	17.5	21.9
0.80	6.280		8.75	11.7	14.6	10.5	14.0	17.5	14.0	18.7	23.3
0.85	6.672		9.30	12.4	15.5	11.2	14.9	18.6	14.9	19.8	24.8
0.90	7.065		9.85	13.1	16.4	11.8	15.7	19.7	15.8	21.0	26.3
0.95	7.458		10.4	13.9	17.3	12.5	16.6	20.8	16.6	22.2	27.7
1.00	7.850		10.9	14.6	18.2	13.1	17.5	21.9	17.5	23.3	29.2
1.20	9.400		13.1	17.5	21.9	15.8	21.0	26.2	21.0	28.0	35.0
1.40	10.99		15.3	20.4	25.5	18.4	24.5	30.6	24.5	32.7	40.8
1.60	12.56		17.5	23.3	29.2	21.0	28.0	35.0	28.0	37.3	46.7
1.80	14.13		19.7	26.3	32.8	23.6	31.5	39.4	31.5	42.0	52.5
2.00	15.70		21.9	29.2	36.5	26.2	35.0	43.7	35.0	46.7	58.3
2.30	18.06		25.2	33.6	42.0	30.2	40.2	50.3	40.3	53.7	67.1
2.60	20.41		28.5	37.9	47.4	34.1	45.5	56.9	45.5	60.7	75.8
2.90	22.76		31.7	42.3	52.9	38.0	50.7	63.4	50.8	67.6	84.6
3.20	25.12		35.0	46.7	58.4	42.0	56.0	70.0	56.0	74.7	93.3

Remarks : Unit mass means the mass versus the unit area of the surface (one side) of a steel sheet.

Coil mass conversion table

Outside diameter of a coil		Mass coefficient (kg/mm)	
mm	(in)	Inside diameter of coil : 508mm	Inside diameter of coil : 610mm
610	(24)	0.69	—
650		0.99	0.30
700		1.40	0.71
725		1.62	0.93
750		1.84	1.15
762	(30)	1.95	1.26
775		2.07	1.38
800		2.31	1.62
825		2.55	1.86
850		2.80	2.12
875		3.07	2.38
900		3.33	2.65
914	(36)	3.49	2.81
925		3.61	2.92
950		3.89	3.21
975		4.18	3.49
1000		4.48	3.79
1016	(48)	4.68	3.99
1025		4.79	4.10
1050		5.10	4.41
1075		5.42	4.73
1100		5.75	5.06
1125		6.08	5.40
1150		6.43	5.74
1175		6.78	6.09
1200		7.14	6.45
1219		7.42	6.73
1225		7.50	6.82
1250		7.88	7.19
1270	(50)	8.18	7.50
1275		8.26	7.57
1300		8.65	7.96
1325		9.04	8.36
1350		9.45	8.76
1375		9.86	9.17
1400		10.28	9.59
1450		11.14	10.45
1475		11.58	10.89
1500		12.03	11.34
1524	(60)	12.47	11.78
1550		12.95	12.26
1575		13.42	12.73
1600		13.90	13.22
1625		14.39	13.70
1650		14.88	14.20
1675		15.38	14.70
1700		15.89	15.21
1725		16.41	15.72
1750		16.94	16.25
1775		17.47	16.78
1800		18.01	17.32
1829	(72)	18.64	17.95

The coefficients represent the coil mass per 1 millimeter width.

Calculation example : Inside diameter of a coil : 610 mm (24")

Width of a coil : 1,524 mm

Outside diameter of a coil : 1,300 mm

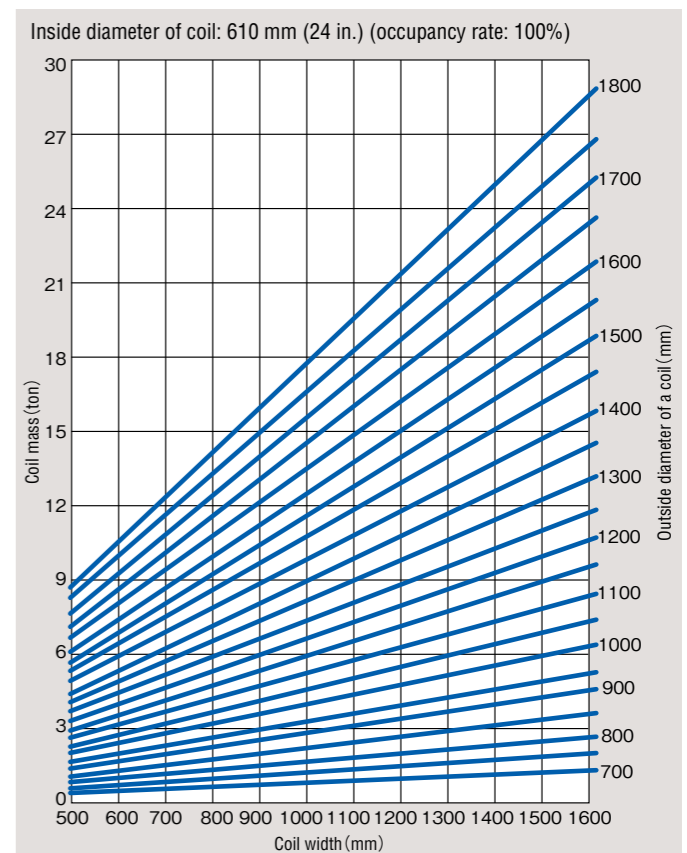
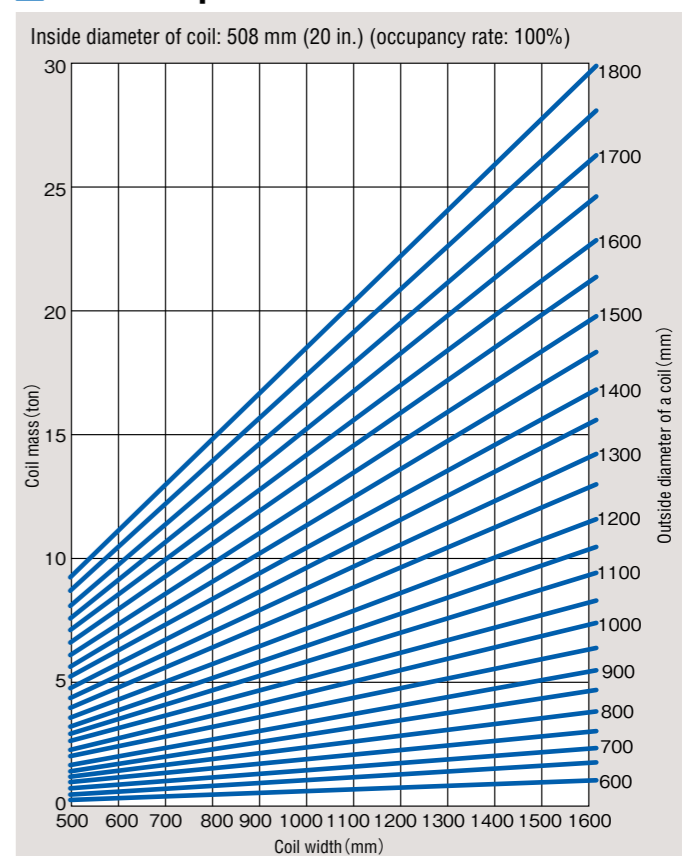
Find the coil mass based on the above conditions.

From the table above, find the coefficient where the outside diameter is 1,300 mm and the inside diameter is 610 mm. The coefficient is 7.96 kg/mm.

$7.96 \times 1,524 = 12,131.0$ kg

Remarks: The above table assumes that the specific gravity of a steel sheet is 7.85 and its occupancy rate is 98%.

Relationship between coil mass and sheet width



Order guide and contact

See the following guide before contacting us to place an order.

- ① **Standard** : Choose an appropriate standard in accordance with the purpose of use of the product, the degree of processing, the method of processing and other factors.
- ② **Dimensions** : In principle, an order may be accepted from 0.1 millimeter in thickness and 1 millimeter in width and length.
- ③ **Unit of packing**
Sheet : Usually, the standard weight of a sheet is 2 tons or greater.
Coil : Usually, a coil is manufactured within a range between 5 and 20 tons.
Also specify the maximum single mass (and the minimum single mass if necessary).
- ④ **Inside and outside diameter of a coil** : Inside diameter of 508 mm (20") or 610 mm (24") is the standard.
- ⑤ **Classification of thermal refining** : Choose one from the standard thermal refining or the four other types of thermal refining.
- ⑥ **Oil application** : Usually, rust preventive oil is applied to the product.
- ⑦ **Appearance quality** : Usually, our cut sheets and coils have guaranteed quality on the upper surface and the outer surface, respectively.
- ⑧ **Ear finish** : Specify either mill edge or slit edge.
- ⑨ **Welded part** : Usually, a cold-rolled coil has welded parts. We recommend that you remove the welded parts before using the product. If this is difficult, please include in your order a request to remove the welded parts before shipment.
- ⑩ **Other** : Please inform us of the purpose of using the product, your request for a specific processing method and other requests. If a defect has occurred, collect the defective coil and inform us of the inspection number or coil number of the relevant coil.

● Precautions

- The edge of a cold-rolled steel sheet is very sharp. When handling it, be sure to take safety measures such as wearing protective equipment.
- Even if rust preventive oil has been applied to the product, rust may occur if it becomes wet from water, dew condensation or other causes.

● Contact

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Nagoya Branch Office
Chugoku Sales Office
Kyushu Sales Office

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