Electrical Steel

GRAIN-ORIENTED

posco

Electrical steels have excellent electro-magnetic properties. There are two types of electrical steel: grain-oriented and non grain-oriented electrical steel. Today, as the needs to reduce energy loss are increasing sharply, demands for high quality electrical steel are also growing. POSCO produces 1 million tons of high quality electrical steel each year.

Contents

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ELECTRICAL STEEL

posco

Pohang & Gwangyang steelworks

Pohang Steelworks

Upon completion of its first-phase manufacturing facility in 1973, Pohang Steelworks, Korea's first integrated steel mill, was finally completed after 4 stages of construction at Young-il Bay in February 1981.
POSCO is capable of producing and processing a variety of carbon steels and stainless steels. The company's global competitiveness was further enhanced when we opened the world's first FINEX commercialization facility in May 2007.

Main products _ Hot-rolled steel, Plate, Cold-rolled steel, Wire rod, Electrical steel, Stainless steel, API steel, etc.
Crude steel production _ 16,852 million tons (as of 2021)

Gwangyang Steelworks

Gwangyang Steelworks is the world's largest integrated steel mill which features an optimal layout for processing carbon steel.
Products from Gwangyang works include automotive steel, high-strength hot rolled steel, high-quality API steel, and thick plates among other products.
With the goal of specializing in the manufacturing of the world's best automotive steels, Gwangyang Steelworks focuses on enhancing its competitive edge.

Main products _ Hot-rolled steel, Plate, Cold-rolled steel, Car steel, API steel, etc.
Crude steel production _ 21,412 million tons (as of 2021)

Creation of customer value by securing product quality and cost competitiveness

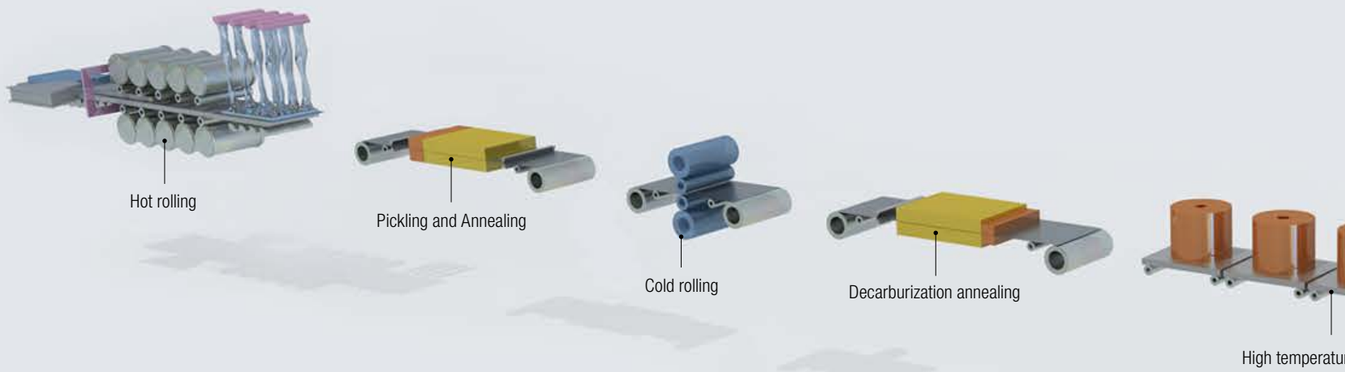
Realization of symbiotic values through the establishment of a robust industrial ecosystem with suppliers, partners, and customers

- Development of quality and top-notch products that can impress our customers
- Creating customer value by securing cost competitiveness with suppliers and partners
- Robust facility implementation and smart facility management that can be called the cornerstone of production and quality

Manufacturing processes & equipment

Cutting-edge facilities and state-of-art technologies enable us to meet customer's request for high quality products. Every process is controlled automatically to keep the best quality of products.

Grain-oriented electrical steel



Preliminary Annealing

In this process, scales on the surface of hot rolled coil are removed by scale breaker and hydrochloric acid cleaning. This process improves cold rolling properties of steel as well as it's magnetic properties.

Cold Rolling

In order to obtain specific thickness and material properties, cold rolling process should be conducted. For uniform thickness and width of strip, this process is controlled automatically.

Annealing

Annealing is a recrystallizing process of hardened cold rolled structures by heat treatment. There are two annealing processes for grain-oriented electrical steel : decarbonization and high temperature annealing. During decarbonization annealing, excess carbon in the steel is removed and MgO coating is applied on the surface of the steel. High temperature annealing produces secondary recrystallized structures having superior magnetic properties. Non grain-oriented electrical steel is recrystallized and insulation coating is applied during annealing process.

Insulation Coating

In this process, insulation coating is applied continuously to minimize eddy current losses, which are proportional to the sheet thickness. Grain-oriented electrical steel has two layers of coating; one is base coating with dark brown color which consists of Forsterite(Mg2SiO4), and the other is transparent insulation coating containing phosphates. For non grain-oriented electrical steel, there are various types of coating according to final usage and customer's requests.

Specification & Main Application

■ Specification

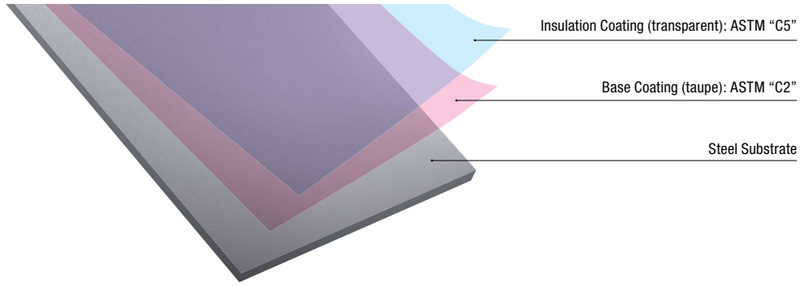
		Grain-Oriented		
		PHD-Core	PH-Core	PG-Core
Rotating Machines	Large rotating machine			●
Static Machines	Large size transformer	●	●	●
	Small & medium size transformer	●	●	●
	Distribution transformer	●	●	●
	Reactor & magnetic amplifier	●	●	●
	Small power transformer	●	●	●
	Voltage transformer	●	●	●

■ Main Application




POSCO Insulation Coating

■ POSCO insulation coating.



■ Insulation Coating

Coating Name		OA	Remark
ASTM Type		C-2+C-5	-
Composition		Inorganic(Phosphate Base)	
Thickness (Before SRA, μm)		2~5	
Interlaminar resistance (Ωcm^2/lam.)	Before SRA	15	ASTM A 717, SRA Condition : 750 x 2hr in D X rich gas
	After SRA	5	
Annealing		Good	N_2 or DX rich gas
Heat resistance (flaking after SRA)	Continuous	Not recogniozed	155℃×24hr in Air
	Short	Not recogniozed	750℃×2hr in DX rich gas
Adhesion (Before SRA)	Pipe bending	≤ 30 mmø	ISO 1519
	Cross cut	5B(Top level)	ASTM D 3359B
Anti-Corrosion		Good	35℃, 5% NaCl, 8hrs
Weathering		Good	65℃, 95% humidity, 72hrs
Weldability(TIG)		Excellent	**Current**:100-150A / **Ar 99% flow**:10~20L/min **Speed**:0.25~0.50mpm
Punchability		Excellent	-
Lamination Factor(%)		Good	JIS C 2550

Note) Above values are not guaranteed. Please designate surface insulation according to usage. Regarding coating properties, please contact us.

Stress relief annealing is a process to obtain desired magnetic properties of electrical steel sheets by relieving stress generated in the process of shearing and punching. It is conducted at a proper temperature for a certain period of time.

Annealing Temperature

If the annealing temperature is too low, it is difficult to achieve adequate magnetic properties. If the temperature is too high, it may erode surface insulation, cause fusion between layers, and degrade core properties. The optimum annealing temperature to produce desirable magnetic properties is 750°C to 840°C for grain-oriented electrical steel and 750°C to 800°C for non-oriented electrical steel.

Annealing Time

Annealing time means the in-furnace time of materials at the highest temperature during the annealing process. During this time, the materials in the furnace should be heated evenly. The annealing time varies depending upon amount of materials or type of furnace. Generally, the annealing time is between 1.5 to 2.5 hours.

Heating and Cooling Speed

Abrupt heating and cooling must be avoided to prevent any deformation of the iron core. Slow cooling must be applied until it reaches 300~350°C.

Furnace Atmosphere

Furnace atmosphere should be controlled to minimize carburization or oxidization which can diminish magnetic properties. Therefore, a pure nitrogen atmosphere is ideal and the dew point of gas should be maintained as low as possible(below 0°C is adequate). The oil used in shearing and punching should be removed completely. Otherwise both sides of piled-up core will be damaged during the annealing process, deteriorating the work capacity.

PG-Core Grain-oriented electrical steel

PG-Core

PG-core has excellent magnetic properties in the rolling direction. It is widely used for large or mid/small-size transformers.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PG-Core	27PG 130	0.27 (0.0106)	900~1200 (35.43~47.24)	1000 (39.37) 1200 (47.24)	508 (20)
	30PG 120	0.30 (0.0118)			
	30PG 130				
	35PG 145	0.35 (0.0138)			
	35PG 155				

Note) For non-standard sizes, please contact us.

■Specification

Magnetic properties and lamination factor

Grade	Density, kg/dm³	Core Loss, Max, W/kg (W/lb)		Magnetic Flux Density, Min, T	Lamination Factor, Min, %
		1.7T/50Hz	1.7T/60Hz	B8	
27PG 130	7.65	1.30 (0.59)	1.67 (0.76)	1.80	95.0
30PG 120		1.20 (0.54)	1.63 (0.74)		95.5
30PG 130		1.30 (0.59)	1.73 (0.78)		
35PG 145		1.45 (0.66)	2.03 (0.92)		96.0
35PG 155		1.55 (0.70)	2.07 (0.94)		

Note) Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1). B8 indicates the magnetic flux density at 800A/m. Core loss and magnetic flux density are measured after stress relief annealing and speciemen is parallel to the rolling direction. (Annealing condition: 840°C, 1hr, non-oxidation atmosphere)
Uncoated specimens are used for lamination factor test.

■Dimension & Shape Tolerance

Width, mm (in.)	Thickness, mm (in.)	Thickness Tolerance, mm (in.)	Thickness deviation in Width, mm (in.)	Width Tolerance, mm (in.)	Camber (Length:2m), mm (in.)
900 (35.43) and over	0.27 (0.0106)	±0.03 (0.0012)	0.03 (0.0012) and under	+0.6 (0.0236)	1.0 (0.0394) and under
	0.30 (0.0118)				
	0.35 (0.0138)				

Note) Thickness deviation in width means the gap between the thickness of center and the one section 15mm away from the edge part.

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T
		1.5T/50Hz	1.7T/50Hz	1.5T/60Hz	1.7T/60Hz	B8
27PG 130	48	0.82 (0.37)	1.22 (0.55)	1.07 (0.49)	1.55 (0.70)	1.84
30PG 120		0.83 (0.38)	1.17 (0.53)	1.09 (0.49)	1.53 (0.69)	1.85
30PG 130		0.87 (0.39)	1.25 (0.57)	1.12 (0.51)	1.61 (0.73)	1.84
35PG 145		0.98 (0.44)	1.37 (0.62)	1.29 (0.59)	1.80 (0.82)	1.84
35PG 155		1.01 (0.46)	1.45 (0.66)	1.33 (0.60)	1.89 (0.86)	1.83

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method. Specimen is parallel to the rolling direction and annealed for magnetic properties.

■Typical Mechanical Properties and Lamination Factor

Thickness, mm (in.)	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
0.27 (0.0106)	344	385	322	340	11	44	182	97.5
0.30 (0.0118)	345	412	330	350	12	49	180	98.0
0.35 (0.0138)	364	423	345	357	10	40	181	98.4

Note) 1. Above values are not guaranteed. Tests are conducted in accordance with JIS Z 2241 and 2244.
2. L: Specimen is parallel to the rolling direction. / C: Specimen is transverse to the rolling direction.
3. Specimens with 0A coating are used for lamination factor test.

PH-Core

Through highly advanced texture control technologies, PH-core has superior magentic properties. This is widely used for energy efficient transformer.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PH-Core	23PH 085	0.23 (0.0091)	900~1200 (35.43~47.24)	1000 (39.37) 1200 (47.24)	508 (20)
	23PH 090				
	23PH 095				
	27PH 095	0.27 (0.0106)			
	27PH 100				
	30PH 100	0.30 (0.0118)			
	30PH 105				

Note) For non-standard sizes, please contact us.

■Specification

Magnetic properties and lamination factor

Grade	Density, kg/dm³	Core Loss, Max, W/kg (W/lb)		Magnetic Flux Density, Min, T	Lamination Factor, Min, %
		1.7T/50Hz	1.7T/60Hz	B8	
23PH 085	7.65	0.85 (0.39)	1.17 (0.53)	1.88	94.5
23PH 090		0.90 (0.41)	1.26 (0.57)		
23PH 095		0.95 (0.43)	1.28 (0.58)		
27PH 095		0.95 (0.43)	1.30 (0.59)		95.0
27PH 100		1.00 (0.45)	1.35 (0.61)		
30PH 100		1.00 (0.45)	1.40 (0.64)		95.5
30PH 105		1.05 (0.48)	1.45 (0.66)		

Note) Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1). B8 indicates the magnetic flux density at 800A/m. Core loss and magnetic flux density are measured after stress relief annealing and speciemen is parallel to the rolling direction. (Annealing condition: 840°C, 1hr, non-oxidation atmosphere)

■Dimension & Shape Tolerance

Width, mm (in.)	Thickness, mm (in.)	Thickness Tolerance, mm (in.)	Thickness deviation in Width, mm (in.)	Width Tolerance, mm (in.)	Camber(Length: 2m), mm (in.)
900 (35.43) and over	0.23 (0.0091)	±0.02 (0.0008)	0.02 (0.0008) & under	+0.6 (0.0236)	1.0 (0.0394) & under
	0.27 (0.0106)	±0.03 (0.0012)	0.03 (0.0012) & under		
	0.30 (0.0118)				

Note) Thickness deviation in width means the gap between the thickness of center and the one section 15mm away from the edge part.

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T
		1.5T/50Hz	1.7T/50Hz	1.5T/60Hz	1.7T/60Hz	B8
23PH 085	48	0.62 (0.28)	0.83 (0.38)	0.81 (0.37)	1.09 (0.49)	1.91
23PH 090		0.64 (0.29)	0.88 (0.40)	0.84 (0.38)	1.14 (0.52)	1.91
23PH 095		0.65 (0.29)	0.90 (0.41)	0.86 (0.39)	1.17 (0.53)	1.91
27PH 095		0.70 (0.32)	0.93 (0.42)	0.92 (0.42)	1.22 (0.55)	1.91
27PH 100		0.71 (0.32)	0.96 (0.44)	0.93 (0.42)	1.26 (0.57)	1.90
30PH 100		0.74 (0.34)	0.99 (0.45)	0.98 (0.44)	1.29 (0.59)	1.91
30PH 105		0.76 (0.34)	1.01 (0.46)	1.00 (0.45)	1.33 (0.60)	1.90

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method. Specimen is parallel to the rolling direction and annealed for magnetic properties.

■Typical Mechanical Properties and Lamination Factor

Thickness, mm (in.)	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
0.23 (0.0091)	381	424	356	383	14	42	183	97.0
0.27 (0.0106)	361	415	337	367	14	42	182	97.5
0.30 (0.0118)	345	412	330	358	16	45	184	98.0

Note) 1. Above values are not guaranteed. Tests are conducted in accordance with JIS Z 2241 and 2244.
2. L: Specimen is parallel to the rolling direction. / C: Specimen is transverse to the rolling direction.
3. Specimens with 0A coating are used for lamination factor test.

PHD-Core

PHD-core has excellent magnetic properties by domain refining technologies which can achieve significant loss reduction.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PHD-Core	23PHD080	0.23 (0.0091)	900~1200 (35.43~47.24)	1000 (39.37) 1200 (47.24)	508 (20)
	23PHD085				
	23PHD090				
	27PHD085	0.27 (0.0106)			
	27PHD090				
	27PHD095				
	30PHD095	0.30 (0.0118)			
	30PHD100				

Note) For non-standard sizes, please contact us.

■Specification

Magnetic properties and lamination factor

Grade	Density, kg/dm³	Core Loss, Max, W/kg (W/lb)		Magnetic Flux Density, Min, T	Lamination Factor, Min, %
		1.7T/50Hz	1.7T/60Hz	B8	
23PHD080	7.65	0.80 (0.36)	1.14 (0.52)	1.88	94.5
23PHD085		0.85 (0.39)	1.17 (0.53)		
23PHD090		0.90 (0.41)	1.19 (0.54)		
27PHD085		0.85 (0.39)	1.17 (0.53)		95.0
27PHD090		0.90 (0.41)	1.22 (0.55)		
27PHD095		0.95 (0.43)	1.26 (0.57)		
30PHD095		0.95 (0.43)	1.30 (0.59)		95.5
30PHD100		1.00 (0.45)	1.36 (0.62)		

Note) 1. Above test is conducted in accordance with IEC60404-3 (or JIS C 2556), using single sheet tester, without stress relief annealing.
2. Domain refining effect of PHD core will be nullified by annealing.
3. B8 indicates the magnetic flux density at 800A/m.

■Dimension & Shape Tolerance

Width, mm (in.)	Thickness, mm (in.)	Thickness Tolerance, mm (in.)	Thickness deviation in Width, mm (in.)	Width Tolerance, mm (in.)	Camber (Length:2m), mm (in.)
900 (35.43) and over	0.23 (0.0091)	±0.02 (0.0008)	0.02 (0.0008) and under	+0.6 (0.0236)	1.0 (0.0394) and under
	0.27 (0.0106)	±0.03 (0.0012)	0.03 (0.0012) and under		
	0.30 (0.0118)				

Note) Thickness deviation in width means the gap between the thickness of center and the one section 15mm away from the edge part.

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T
		1.5T/50Hz	1.7T/50Hz	1.5T/60Hz	1.7T/60Hz	B8
23PHD080	48	0.57 (0.26)	0.77 (0.35)	0.75 (0.34)	1.01 (0.46)	1.91
23PHD085		0.59 (0.27)	0.80 (0.36)	0.78 (0.35)	1.05 (0.48)	1.91
23PHD090		0.62 (0.28)	0.83 (0.38)	0.80 (0.36)	1.09 (0.49)	1.91
27PHD085		0.62(0.28)	0.81 (0.37)	0.83 (0.38)	1.06 (0.48)	1.91
27PHD090		0.64 (0.29)	0.84 (0.38)	0.86 (0.39)	1.10 (0.50)	1.91
27PHD095		0.66 (0.30)	0.88 (0.40)	0.86 (0.39)	1.18 (0.54)	1.91
30PHD095		0.68 (0.31)	0.93 (0.42)	0.91 (0.41)	1.23 (0.56)	1.91
30PHD100		0.70 (0.32)	0.95 (0.43)	0.93 (0.42)	1.26 (0.57)	1.91

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC60404-3 (or JIS C 2556) method, using as-sheared specimen which is parallel to the rolling direction, without stress relief annealing.

■Typical Mechanical Properties and Lamination Factor

Thickness, mm (in.)	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
0.23 (0.0091)	381	424	356	383	14	42	183	97.0
0.27 (0.0106)	361	415	337	367	14	42	182	97.5
0.30 (0.0118)	345	412	330	358	16	45	184	98.0

Note) 1. Above values are not guaranteed. Tests are conducted in accordance with JIS Z 2241 and 2244.
2. L: Specimen is parallel to the rolling direction. / C: Specimen is transverse to the rolling direction.
3. Specimens with 0A coating are used for lamination factor test.

PHE-Core Grain-oriented electrical steel

PHE-Core

PHE-core has a domain refining effect even after heat treatment for stress relief, so it can also be used for wound core type transformer.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PHE-Core	23PHE080	0.23 (0.0091)	900~1200 (35.43~47.24)	1000 (39.37) 1200 (47.24)	508 (20)
	23PHE085				

Note) For non-standard sizes, please contact us.

■Specification Magnetic properties and lamination factor

Grade	Density, kg/dm³	Core Loss, Max, W/kg (W/lb)		Magnetic Flux Density, Min T	Lamination Factor, Min, %
		1.7T/50Hz	1.7T/60Hz	B8	
23PHE080	7.65	0.80 (0.36)	1.14 (0.52)	1.87	94.5
23PHE085		0.85 (0.39)	1.17 (0.53)		

Note) Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1). B8 indicates the magnetic flux density at 800A/m. Core loss and magnetic flux density are measured after stress relief annealing and speciemen is parallel to the rolling direction. (Annealing condition: 840°C, 1hr, non-oxidation atmosphere)

■Dimension & Shape Tolerance

Width, mm (in.)	Thickness, mm (in.)	Thickness Tolerance, mm (in.)	Thickness deviation in Width, mm (in.)	Width Tolerance, mm (in.)	Camber (Length:2m), mm (in.)
900 (35.43) and over	0.23 (0.0091)	±0.02 (0.0008)	0.02 (0.0008) and under	+0.6 (0.0236)	1.0 (0.0394) and under

Note) Thickness deviation in width means the gap between the thickness of center and the one section 15mm away from the edge part.

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T
		1.5T/50Hz	1.7T/50Hz	1.5T/60Hz	1.7T/60Hz	B8
23PHE080	48	0.57 (0.26)	0.77 (0.35)	0.75 (0.34)	1.00 (0.45)	1.89
23PHE085		0.60 (0.27)	0.81 (0.37)	0.78 (0.35)	1.05 (0.48)	1.89

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method. Specimen is parallel to the rolling direction and annealed for magnetic properties.

■Typical Mechanical Properties and Lamination Factor

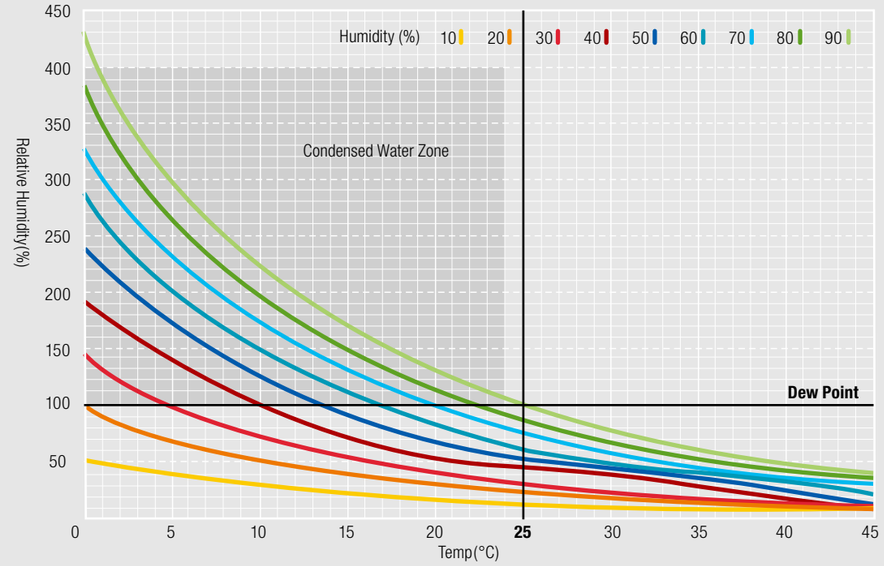
Thickness, mm (in.)	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
0.23 (0.0091)	381	424	356	383	14	42	183	97.0

Note) 1. Above values are not guaranteed. Tests are conducted in accordance with JIS Z 2241 and 2244.
2. L: Specimen is parallel to the rolling direction. / C: Specimen is transverse to the rolling direction.
3. Specimens with OA coating are used for lamination factor test.

Surface condensation in relation to humidity and temperature

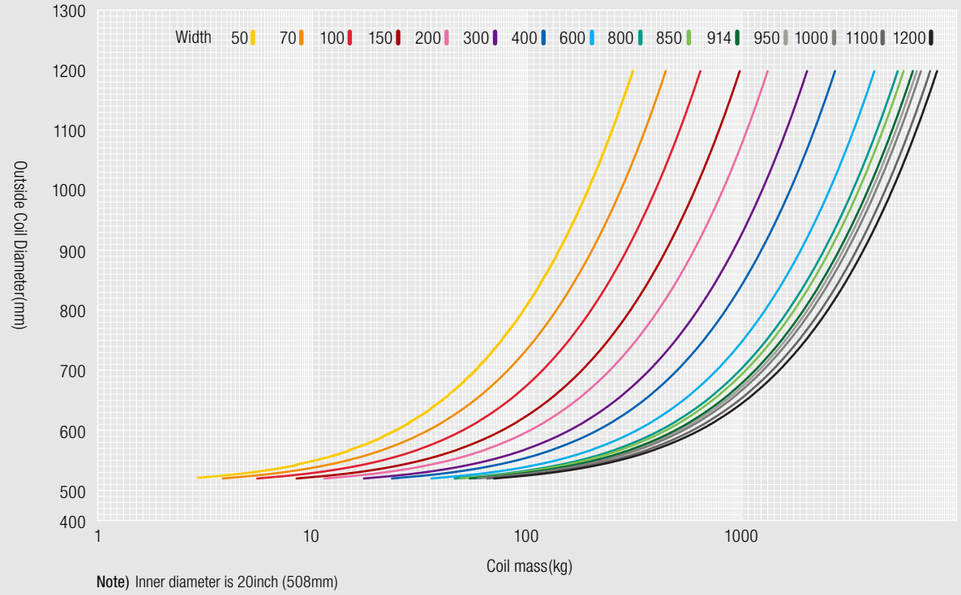
■Reference for rust

Condensed Water on steel surface Graph according to Humidity and Temperature



Water is condensed on the steel surface in certain temperature and humidity in store place and steel is likely to get rusty.
Ex) In a place of 25°C, humidity 80%, water is condensed when temp decrease to 22°C.

■Relation among weight, outside diameter and width of coil



Note) Inner diameter is 20inch (508mm)

Major international standards

When ordering, please be sure to consult our latest and check the specifications or standards of products may change.

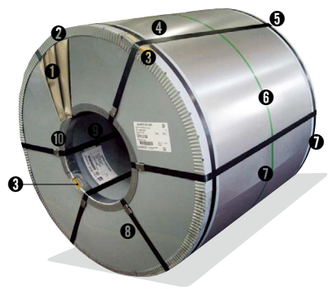
■ **Grain-Oriented Electrical Steel**

Thickness, mm (in.)	POSCO (2019)		JIS C 2553 (2019)		ASTM A 876 (2017)		EN10107 (2014)	
	Grade	Core Loss, Max, W/kg (W/lb) 1.7T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.7T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.7T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.7T/50Hz
0.23 (0.0091)	23PHD080	0.80 (0.36)	23R080	0.80 (0.36)	-	-	-	-
	23PHD085	0.85 (0.39)	23R085	0.85 (0.39)	-	-	M85-23P[b]	0.85 (0.39)
	23PHD090	0.90 (0.41)	23R090	0.90 (0.41)	23Q054	0.90 (0.41)	M90-23P[b]	0.90 (0.41)
	23PH 085	0.85 (0.39)	23P085	0.85 (0.39)	-	-	-	-
	23PH 090	0.90 (0.41)	23P090	0.90 (0.41)	-	-	-	-
	23PH 095	0.95 (0.43)	23P095	0.95 (0.43)	-	-	M95-23P	0.90 (0.41)
0.27 (0.0106)	27PHD085	0.85 (0.39)	27R085	0.85 (0.39)	-	-	-	-
	27PHD095	0.95 (0.43)	27R095	0.95 (0.43)	27Q057	0.96 (0.43)	M95-27P[b]	0.95 (0.43)
	27PH 095	0.95 (0.43)	27P095	0.95 (0.43)	-	-	-	-
	27PH100	1.00 (0.45)	27P100	1.00 (0.45)	27P066	1.11 (0.50)	M100-27P	1.00 (0.45)
	27PG130	1.30 (0.59)	27G130	1.30 (0.59)	-	-	M130-27S	1.30 (0.59)
0.30 (0.0118)	30PHD095	0.95 (0.43)	-	-	-	-	-	-
	30PHD100	1.00 (0.45)	-	-	-	-	-	-
	30PH 100	1.00 (0.45)	30P100	1.00 (0.45)	-	-	-	-
	30PH 105	1.05 (0.48)	30P105	1.05 (0.48)	-	-	M105-30P	1.05 (0.48)
	30PG 120	1.20 (0.54)	30G120	1.20 (0.54)	-	-	M120-30S	1.20 (0.54)
	30PG 130	1.30 (0.59)	30G130	1.30 (0.59)	30H083	1.39 (0.63)	M130-30S	1.30 (0.59)
0.35 (0.0138)	35PG145	1.45 (0.66)	35G145	1.45 (0.66)	-	-	M145-35S	1.45 (0.66)
	35PG155	1.55 (0.70)	35G155	1.55 (0.70)	35H094	1.57 (0.71)	M155-35S	1.55 (0.70)

Packaging & marking

NO	Name	Meterial
❶	PP VCI WRAP	VINYL
❷	OUTER RING	STEEL
❸	CORNER WRAP	ANTI-RUST BOARD
❹	OUTER PROTECT BOARD	STEEL
❺	HORIZONTAL BAND	STEEL
❻	CENTER BAND	PET
❼	VERTICAL BAND	STEEL
❽	SIDE BOARD	PLASTIC
❾	INNER PROTECT BOARD	PLASTIC
❿	INNER RING	STEEL
⓫	OUTER PROTECT BOARD	ANTI-RUST BOARD

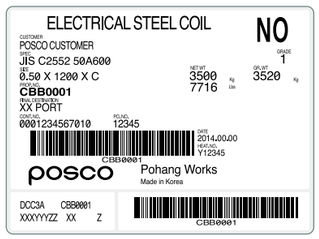
* Packing Type and materials are changeable.

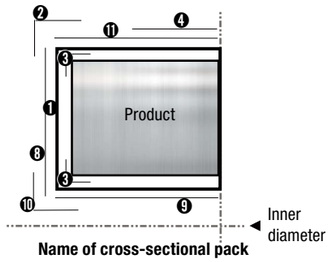


Name of outer pack

Domestic

Export





Name of cross-sectional pack

GRAIN-ORIENTED

ELECTRICAL STEEL

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