Electrical Steel

NON-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.

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NON-ORIENTED

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

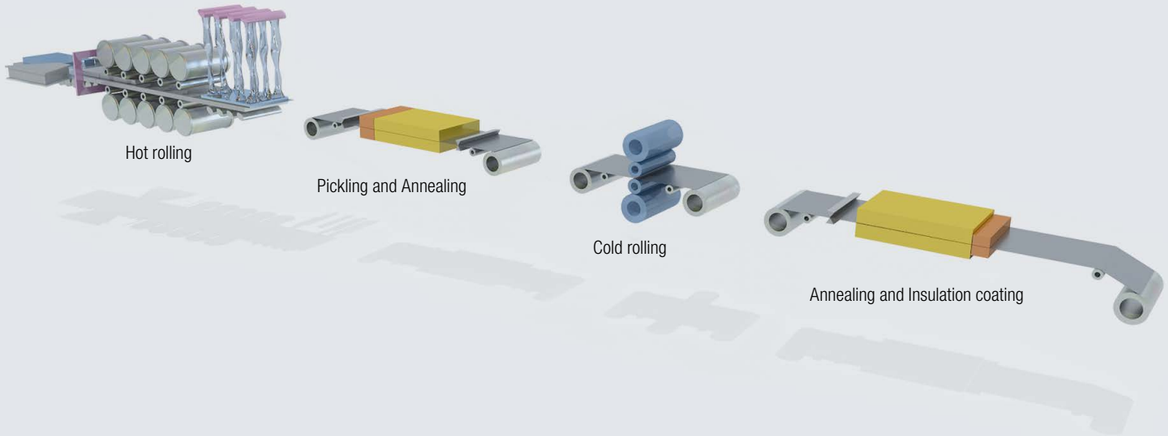
Realization of symbiotic values through the establishment of a robust industrial ecosystem with suppliers, partners, and customers

- 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.

Non-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

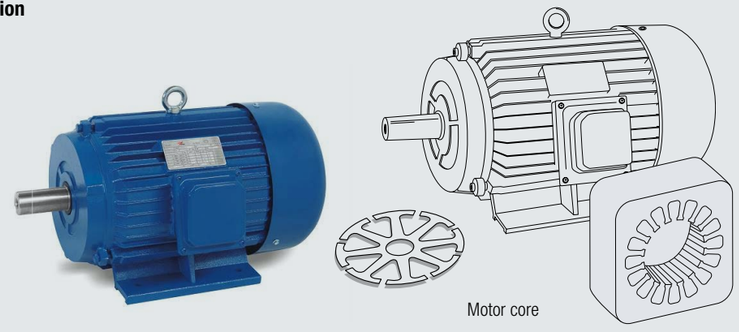
In this process, insulation coating is applied continuously to minimize eddy current losses, which are proportional to the sheet thickness. Grain-oriented electrical steel has two layers of coating; one is base coating with dark brown color which consists of Forsterite(Mg_2SiO_4), and the other is transparent insulation coating containing phosphates. For non grain-oriented electrical steel, there are various types of coating according to final usage and customer's requests.

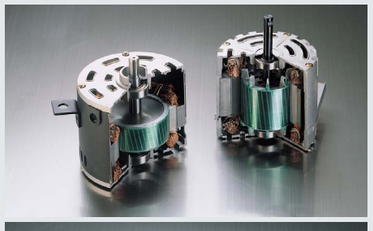
Specification & Main Application

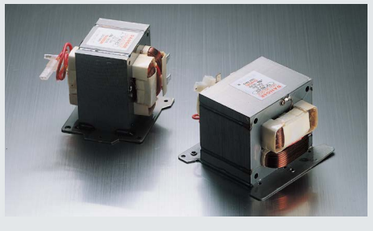
■ **Specification**

		Non-Oriented						
		PN-Core			PNM-Core	PNA-Core	PNF-Core	PNX-Core
		PN210 -400	PN440 -700	PN800 -1300	PNM500 -540	PNA300 -500	PNF1400 -1800	PNX1200 -1450
Rotating Machines	Large rotating machine	●						
	Medium rotating machine	●	●			●		
	General use AC motor		●	●		●	●	
	Compressor motor Hybrid/	●	●	●		●		
	Electric Vehicle motor	●					●	●
Static Machines	Small & medium size transformer							
	Reactor & magnetic amplifier	●						
	Small power transformer	●	●	●		●		
	Voltage transformer	●						
	Ballast stabilizer	●	●	●		●		
	Welding transformer		●					
	Magnetic switch core							

■ **Main Application**







PN-Core

Non grain-oriented electrical steel has homogeneous magnetic properties in all directions. They are used as core materials in rotating machines, from tiny precision electric motors to large power generators.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PN-Core	35PN 210, 35PN 230, 35PN 250, 35PN 270, 35PN 300, 35PN 330	0.35 (0.0138)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31) 1200 (47.24)	508 (20)
	50PN 250, 50PN 270, 50PN 290, 50PN 310, 50PN 330, 50PN 350	0.50 (0.0197)			
	65PN 310, 65PN 350	0.65 (0.0256)			
	35PN 360, 35PN 440	0.35 (0.0138)	950~1250 (37.40~49.21)		
	50PN 400, 50PN 470, 50PN 600, 50PN 700, 50PN 800, 50PN 1000, 50PN 1300	0.50 (0.0197)			
	65PN 400, 65PN 470, 65PN 600, 65PN 700, 65PN 800, 65PN 1000, 65PN 1300	0.65 (0.0256)			

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

■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.)
1000 (39.37) and over	0.35 (0.0138)	±0.035 (0.00138)	0.02 (0.0008) and under	+1.5 (0.0591)	1.0 (0.0394) and under
	0.50 (0.0197)	±0.040 (0.00158)	0.03 (0.0012) and under		
	0.65 (0.0256)	±0.052 (0.00205)	0.04 (0.0016) 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.

PN-Core Non-oriented electrical steel

■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, %
		1.5T/50Hz	1.5T/60Hz	B50	
35PN 210	7.60	2.10 (0.95)	2.63 (1.20)	1.61	95.0
35PN 230	7.60	2.30 (1.04)	2.86 (1.30)	1.61	
35PN 250	7.60	2.50 (1.13)	3.12 (1.42)	1.62	
35PN 270	7.65	2.70 (1.23)	3.37 (1.53)	1.62	
35PN 300	7.65	3.00 (1.36)	3.72 (1.69)	1.62	
35PN 330	7.65	3.30 (1.50)	4.08 (1.85)	1.62	
35PN 360	7.65	3.60 (1.63)	4.42 (2.01)	1.63	
35PN 440	7.70	4.40 (2.00)	5.37 (2.44)	1.65	
50PN 250	7.60	2.50 (1.13)	3.22 (1.46)	1.62	96.0
50PN 270	7.60	2.70 (1.23)	3.46 (1.57)	1.62	
50PN 290	7.60	2.90 (1.32)	3.69 (1.67)	1.62	
50PN 310	7.65	3.10 (1.41)	3.95 (1.79)	1.62	
50PN 330	7.65	3.30 (1.50)	4.12 (1.87)	1.62	
50PN 350	7.65	3.50 (1.59)	4.34 (1.97)	1.62	
50PN 400	7.65	4.00 (1.81)	5.07 (2.30)	1.63	
50PN 470	7.70	4.70 (2.13)	5.94 (2.69)	1.64	
50PN 600	7.75	6.00 (2.72)	7.47 (3.39)	1.66	
50PN 700	7.80	7.00 (3.18)	8.72 (3.96)	1.70	
50PN 800	7.85	8.00 (3.63)	9.99 (4.53)	1.70	
50PN 1000	7.85	10.0 (4.54)	13.0 (5.90)	1.70	
50PN 1300	7.85	13.0 (5.90)	16.2 (7.35)	1.70	
65PN 310	7.60	3.10 (1.41)	4.01 (1.82)	1.62	97.0
65PN 350	7.60	3.50 (1.59)	4.48 (2.03)	1.62	
65PN 400	7.65	4.00 (1.81)	5.18 (2.35)	1.65	
65PN 470	7.70	4.70 (2.13)	6.00 (2.72)	1.65	
65PN 600	7.75	6.00 (2.72)	7.66 (3.47)	1.66	
65PN 700	7.80	7.00 (3.18)	9.06 (4.11)	1.70	
65PN 800	7.85	8.00 (3.63)	10.2 (4.63)	1.70	
65PN 1000	7.85	10.0 (4.54)	13.2 (5.96)	1.70	
65PN 1300	7.85	13.0 (5.90)	16.3 (7.38)	1.70	

Note) 1. Above test is conducted in accordance with IEC 60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.
2. 1.5T/50Hz indicates the core loss at the frequency of 50 Hz and the magnetic flux density of 1.5T.
3. B50 indicates the magnetic flux density at 5000A/m.
4. Uncoated specimens are used for lamination factor test.

PN-Core Non-oriented electrical steel

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10^{-8}	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T		
		1.0T/50Hz	1.5T/50Hz	1.0T/60Hz	1.5T/60Hz	B25	B50	B100
35PN 210	59	0.84 (0.38)	2.04 (0.93)	1.03 (0.47)	2.53 (1.15)	1.56	1.65	1.76
35PN 230	59	0.88 (0.40)	2.10 (0.95)	1.07 (0.49)	2.63 (1.19)	1.57	1.66	1.76
35PN 250	55	0.96 (0.44)	2.23 (1.01)	1.20 (0.54)	2.79 (1.27)	1.57	1.66	1.77
35PN 270	52	1.02 (0.46)	2.40 (1.09)	1.28 (0.58)	3.00 (1.36)	1.58	1.67	1.78
35PN 300	45	1.06 (0.48)	2.45 (1.11)	1.32 (0.60)	3.06 (1.39)	1.59	1.67	1.78
35PN 330	45	1.14 (0.52)	2.60 (1.18)	1.42 (0.64)	3.24 (1.47)	1.59	1.69	1.78
35PN 360	45	1.25 (0.57)	2.70 (1.22)	1.52 (0.69)	3.39 (1.54)	1.59	1.69	1.79
35PN 440	42	1.39 (0.63)	2.90 (1.32)	1.70 (0.77)	3.67 (1.66)	1.62	1.71	1.80
50PN 250	59	1.04 (0.47)	2.43 (1.10)	1.35 (0.61)	3.10 (1.41)	1.57	1.67	1.77
50PN 270	59	1.06 (0.48)	2.50 (1.13)	1.35 (0.61)	3.22 (1.46)	1.57	1.67	1.77
50PN 290	56	1.07 (0.49)	2.60 (1.18)	1.45 (0.66)	3.35 (1.52)	1.58	1.67	1.78
50PN 310	53	1.19 (0.54)	2.70 (1.22)	1.55 (0.70)	3.49 (1.58)	1.59	1.68	1.79
50PN 330	50	1.26 (0.57)	2.82 (1.28)	1.59 (0.72)	3.60 (1.63)	1.60	1.69	1.79
50PN 350	50	1.30 (0.59)	2.93 (1.33)	1.63 (0.74)	3.74 (1.70)	1.60	1.69	1.79
50PN 400	45	1.41 (0.64)	3.18 (1.44)	1.82 (0.83)	4.01 (1.82)	1.61	1.70	1.80
50PN 470	42	1.55 (0.70)	3.37 (1.53)	2.04 (0.93)	4.36 (1.98)	1.61	1.70	1.81
50PN 600	34	2.00 (0.91)	4.40 (2.00)	2.51 (1.14)	5.63 (2.55)	1.62	1.71	1.82
50PN 700	30	2.55 (1.16)	5.45 (2.47)	3.13 (1.42)	6.91 (3.13)	1.64	1.72	1.84
50PN 800	17	2.73 (1.24)	6.06 (2.75)	3.34 (1.51)	7.34 (3.33)	1.66	1.74	1.85
50PN 1000	17	3.00 (1.36)	6.49 (2.94)	3.77 (1.71)	8.02 (3.64)	1.67	1.75	1.85
50PN 1300	17	3.45 (1.56)	7.05 (3.20)	4.35 (1.97)	9.24 (4.19)	1.67	1.75	1.86
65PN 310	59	1.25 (0.57)	2.95 (1.34)	1.65 (0.75)	3.83 (1.74)	1.57	1.65	1.77
65PN 350	59	1.40 (0.64)	3.20 (1.45)	1.80 (0.82)	4.12 (1.87)	1.58	1.66	1.77
65PN 400	45	1.63 (0.74)	3.70 (1.68)	2.23 (1.01)	4.85 (2.20)	1.62	1.70	1.80
65PN 470	42	1.83 (0.83)	4.06 (1.84)	2.44 (1.11)	5.35 (2.43)	1.62	1.70	1.81
65PN 600	34	2.53 (1.15)	5.33 (2.42)	3.20 (1.45)	6.85 (3.11)	1.63	1.72	1.82
65PN 700	30	3.02 (1.37)	6.47 (2.93)	4.06 (1.84)	8.33 (3.78)	1.65	1.73	1.84
65PN 800	17	3.28 (1.49)	7.28 (3.30)	4.56 (2.07)	9.39 (4.26)	1.67	1.75	1.85
65PN 1000	17	3.64 (1.65)	7.86 (3.57)	5.00 (2.27)	10.1 (4.58)	1.68	1.75	1.85
65PN 1300	17	4.32 (1.96)	8.79 (3.99)	5.83 (2.64)	11.3 (5.13)	1.68	1.75	1.86

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

PN-Core Non-oriented electrical steel

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
35PN 210	538	547	415	427	18	19	220	97.5
35PN 230	535	545	393	403	19	20	216	
35PN 250	522	539	370	385	19	21	214	
35PN 270	467	485	347	361	21	23	190	
35PN 300	456	469	336	351	21	23	188	
35PN 330	453	469	340	355	22	24	175	
35PN 360	450	470	350	366	23	25	170	
35PN 440	405	415	273	285	27	29	150	
50PN 250	550	570	413	426	20	22	223	98.0
50PN 270	535	550	406	460	22	23	205	
50PN 290	510	530	370	386	23	25	195	
50PN 310	483	505	355	361	25	28	189	
50PN 330	475	492	348	358	25	28	190	
50PN 350	470	489	344	354	25	28	189	
50PN 400	465	482	352	365	27	30	183	
50PN 470	415	420	275	285	34	36	143	
50PN 600	395	405	268	278	37	39	130	
50PN 700	385	395	270	280	38	39	120	
50PN 800	375	385	270	280	39	40	115	
50PN 1000	370	380	265	275	40	41	113	
50PN 1300	350	360	250	260	40	41	105	
65PN 310	540	543	411	415	21	20	225	98.0
65PN 350	522	531	410	413	15	14	222	
65PN 400	479	510	370	380	31	30	180	
65PN 470	425	440	300	315	35	36	146	
65PN 600	395	430	278	288	37	38	130	
65PN 700	386	405	273	285	39	41	121	
65PN 800	375	385	270	280	40	41	113	
65PN 1000	370	380	265	275	41	42	110	
65PN 1300	350	360	250	260	41	42	110	

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 6A coating are used for lamination factor test.

PNF-Core

PNF-Core has excellent magnetic properties at high frequencies. It is suitable for motors which needs low core loss at high frequencies.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNF-Core	20PNF1500	0.20 (0.0080)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31)	508 (20)
	25PNF1400	0.25 (0.0100)			
	27PNF1500	0.27 (0.0108)			
	30PNF1600	0.30 (0.0118)			
	35PNF1800	0.35 (0.0138)			

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, %
		1.0T/400Hz	B50	
20PNF1500	7.65	15.0 (6.80)	1.62	93.0
25PNF1400	7.60	14.0 (6.35)	1.62	93.5
27PNF1500	7.60	15.0 (6.80)	1.63	94.0
30PNF1600	7.60	16.0 (7.26)	1.64	94.5
35PNF1800	7.60	18.0 (8.16)	1.65	95.0

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.
2. 1.0T/400Hz indicates the core loss at the frequency of 400 Hz and magnetic flux density of 1.0T.
3. B50 indicates the magnetic flux density at 5000A/m. / 4. 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.)
1000 (39.37) and under	0.20 (0.0080)	±0.020 (0.0008)	0.02 (0.0008) and under	+1.5 (0.0591)	1.0 (0.0394) and under
	0.25 (0.0100)	±0.025 (0.0010)			
	0.27 (0.0108)	±0.027 (0.0011)			
	0.30 (0.0118)	±0.030 (0.0012)			
	0.35 (0.0138)	±0.035 (0.0014)			
1000 (39.37) and over	0.20 (0.0080)	±0.020 (0.0008)	0.03 (0.0012) and under		
	0.25 (0.0100)	±0.025 (0.0010)			
	0.27 (0.0108)	±0.027 (0.0011)			
	0.30 (0.0118)	±0.030 (0.0012)			
	0.35 (0.0138)	±0.035 (0.0014)			

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	1.0T/400Hz	1.0T/800Hz	1.0T/1000Hz	B25	B50	B100
20PNF1500	50	2.56 (1.16)	13.3 (6.03)	34.2 (15.5)	47.0 (21.3)	1.57	1.66	1.78
25PNF1400	58	2.13 (0.97)	12.8 (5.81)	35.3 (16.0)	49.8 (22.6)	1.56	1.65	1.76
27PNF1500	58	2.14 (0.97)	13.2 (5.99)	36.8 (16.7)	51.3 (23.3)	1.56	1.65	1.76
30PNF1600	59	2.16 (0.98)	14.4 (6.53)	41.5 (18.8)	59.3 (26.9)	1.57	1.66	1.77
35PNF1800	59	2.19 (0.99)	16.5 (7.48)	50.1 (22.7)	72.4 (32.8)	1.57	1.66	1.77

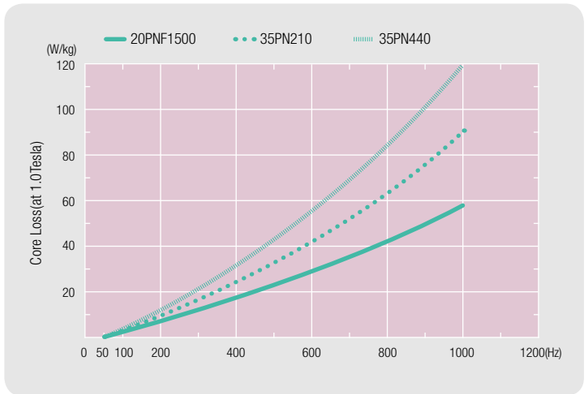
Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
20PNF1500	481	490	363	381	17	19	195	97.0
25PNF1400	530	541	405	411	17	18	224	97.0
27PNF1500	535	543	405	412	17	18	225	97.5
30PNF1600	535	545	415	426	18	19	223	97.5
35PNF1800	540	548	409	418	19	20	224	97.5

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 6A coating are used for lamination factor test.

■Comparison of Core Loss with Frequency



PNF-Core of 0.20mm has lower iron loss than 0.35mm product due to less eddy current loss in high frequency. 20PNF1500 has 30% improved magnetic properties(1.0T/400Hz) compared to 35PN 210.

PNX-Core Non-oriented electrical steel

PNX-Core

PNX-Core is optimized core for traction motor in electrical vehicle(EV). It has low core loss at high frequencies, and has high mechanical strength for excellent endurance.
Among the PNX-Core, 27PNX1400FY and 30PNX1500FY are grades with more improved strength.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNX-Core	20PNX1150F	0.20 (0.0079)	950~1150 (37.40~45.28)	1000 (39.37) 1100 (43.31)	508 (20)
	20PNX1200F	0.20 (0.0079)			
	25PNX1250F	0.25 (0.0098)			
	27PNX1350F	0.27 (0.0106)			
	27PNX1400FY	0.27 (0.0106)			
	30PNX1450F	0.30 (0.0118)			
	30PNX1500FY	0.30 (0.0118)			

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, %
		1.0T/400Hz	B50	
20PNX1150F	7.60	11.5 (5.21)	1.60	93.0
20PNX1200F	7.60	12.0 (5.44)	1.60	93.0
25PNX1250F	7.60	12.5 (5.66)	1.63	93.5
27PNX1350F	7.60	13.5 (6.12)	1.63	94.0
27PNX1400FY	7.60	14.0 (6.35)	1.61	94.0
30PNX1450F	7.60	14.5 (6.57)	1.64	94.5
30PNX1500FY	7.60	15.0(6.80)	1.61	94.5

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.
2. 1.0T/400Hz indicates the core loss at the frequency of 400 Hz and magnetic flux density of 1.0T.
3. B50 indicates the magnetic flux density at 5000A/m. / 4. 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.)
1000 (39.37) and over	0.20 (0.0080)	±0.020 (0.0008)	0.03 (0.0012) and under	+1.5 (0.0591)	1.0 (0.0394) and under
	0.25 (0.0100)	±0.025 (0.0010)			
	0.27 (0.0106)	±0.027 (0.0011)			
	0.30 (0.0118)	±0.030 (0.0012)			

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

PNX-Core Non-oriented electrical steel

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T		
		1.5T/50Hz	1.0T/400Hz	1.0T/800Hz	1.0T/1000Hz	B25	B50	B100
20PNX1150F	65	2.03 (0.92)	10.6 (4.80)	27.7 (12.5)	38.1 (17.3)	1.53	1.63	1.76
20PNX1200F	59	2.06 (0.93)	10.9 (4.94)	29.0 (13.1)	40.2 (18.2)	1.54	1.64	1.77
25PNX1250F	59	1.97 (0.89)	12.1 (5.49)	33.9 (15.4)	47.7 (21.6)	1.57	1.66	1.78
27PNX1350F	59	1.98 (0.90)	12.7 (5.76)	35.9 (16.3)	50.9 (23.1)	1.57	1.66	1.78
27PNX1400FY	59	2.23 (1.01)	13.3 (6.03)	36.3 (16.5)	51.1 (23.2)	1.57	1.66	1.77
30PNX1450F	59	2.00 (0.91)	13.8 (6.26)	39.8 (18.1)	57.1 (25.9)	1.57	1.66	1.78
30PNX1500FY	59	2.26 (1.03)	14.1 (6.40)	39.5 (17.9)	56.1 (25.5)	1.57	1.66	1.77

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

■Typical Mechanical Properties and Lamination Factor

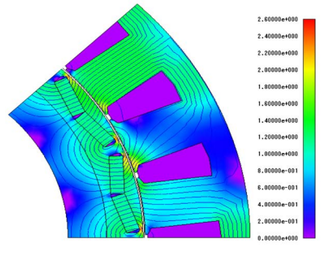
Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
20PNX1150F	570	577	450	458	16	15	235	96.5
20PNX1200F	530	537	420	430	15	14	225	96.5
25PNX1250F	538	545	415	424	15	16	224	97.0
27PNX1350F	547	556	421	432	17	16	220	97.5
27PNX1400FY	570	580	445	453	19	20	228	97.5
30PNX1450F	536	551	413	428	17	16	222	97.5
30PNX1500FY	576	584	450	459	20	21	230	97.5

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 6A coating are used for lamination factor test.

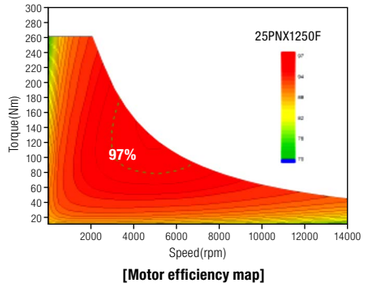
■Motor design and vehicle performance analysis

Performance simulation

· Finite Element Analysis (FEA)
· Core loss evaluation



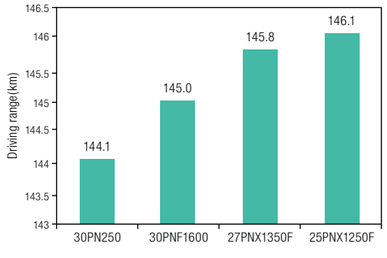
[Electromagnetic FEA]



[Motor efficiency map]

EV performance

· EV driving range analysis
· Driving performance calculation : Lowest cost to performance



[EV driving range, City mode]

PNA-Core

PNA-Core has low core loss, high induction and good punchability after SRA(Stress Relief Annealing).

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNA-Core	50PNA300	0.50 (0.0197)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31) 1200 (47.24)	508 (20)
	50PNA350				
	50PNA450				
	50PNA500				

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, %
		1.5T/50Hz	1.5T/60Hz	B50	
50PNA300	7.75	3.00 (1.36)	3.86 (1.75)	1.70	96.0
50PNA350	7.75	3.50 (1.59)	4.48 (2.03)		
50PNA450	7.85	4.50 (2.04)	5.79 (2.63)		
50PNA500	7.85	5.00 (2.27)	6.49 (2.94)		

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using specimens one half parallel and one half transverse to the rolling direction. Core loss and magnetic flux density are measured after stress relief annealing. (Annealing condition : 750°C×2hrs, under non-oxidation atmosphere)
2. 1.5T/50Hz indicates the core loss at the frequency of 50 Hz and magnetic flux density of 1.5T.
3. B50 indicates the magnetic flux density at 5000A/m. / 4. 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.)
1000 (39.37) and under	0.50 (0.0197)	±0.040 (0.00158)	0.03 (0.0012) and under	+1.5 (0.0591)	1.0 (0.0394) and under
1000 (39.37) and over	0.50 (0.0197)	±0.040 (0.00158)	0.04 (0.0016) 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		
		1.0T/50Hz	1.5T/50Hz	1.0T/60Hz	1.5T/60Hz	B25	B50	B100
50PNA300	37	1.29 (0.59)	2.70 (1.22)	1.72 (0.78)	3.71 (1.68)	1.65	1.73	1.83
50PNA350	33	1.36 (0.62)	3.05 (1.38)	1.83 (0.83)	3.91 (1.77)	1.67	1.74	1.83
50PNA450	19	1.73 (0.78)	3.89 (1.76)	2.22 (1.01)	5.11 (2.32)	1.63	1.72	1.82
50PNA500	17	1.88 (0.85)	4.46 (2.02)	2.41 (1.09)	5.86 (2.66)	1.64	1.72	1.82

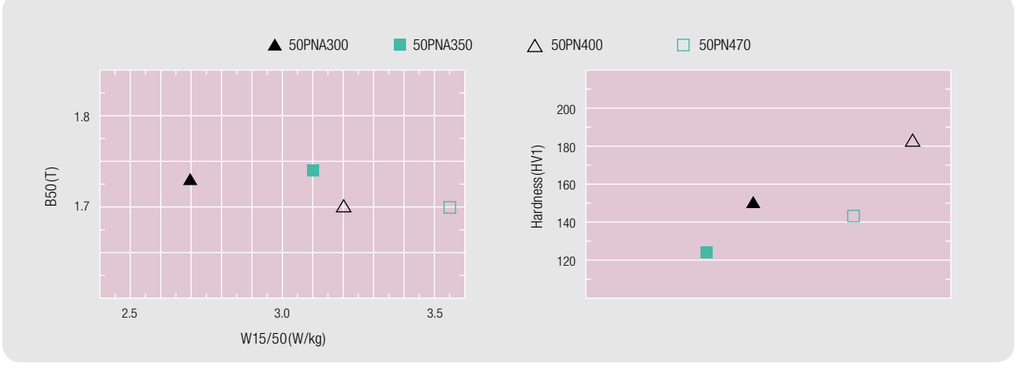
Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, after stress relief annealing.
(Annealing conditions : 750°C (1380°F) × 2hrs, under neutral atmosphere)

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
50PNA300	402	415	260	269	37	39	141	98.0
50PNA350	382	401	268	278	36	38	124	
50PNA450	372	381	269	270	37	38	117	
50PNA500	376	382	270	272	37	38	113	

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 6A coating are used for lamination factor test.

■Comparison of magnetic properties and hardness (PNA VS PN-Core)



Through higher induction and lower hardness, PNA-core features higher efficiency of products and longer life of dies.

PNH-Core Non-oriented electrical steel

PNH-Core

PNH-Core has superior induction properties than other non grain-oriented cores. It is widely used for industrial motors.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNH-Core	23PNH270	0.23 (0.0091)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31) 1200 (47.24)	508 (20)
	30PNH230	0.30 (0.0118)			
	35PNH230	0.35 (0.0138)			
	35PNH250				
	50PNH300	0.50 (0.0197)			
	50PNH470				
	65PNH470	0.65 (0.0256)			

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, %
		1.5T/50Hz	1.5T/60Hz	B50	
23PNH270	7.75	2.7 (1.22)	3.32 (1.51)	1.70	93.0
30PNH230	7.65	2.3 (1.04)	2.87 (1.30)	1.65	94.5
35PNH230	7.65	2.3 (1.04)	2.87 (1.30)	1.65	95.0
35PNH250	7.65	2.5 (1.13)	3.11 (1.41)	1.67	
50PNH300	7.70	3.0 (1.36)	3.85 (1.75)	1.67	96.0
50PNH470	7.75	4.7 (2.13)	5.89 (2.67)	1.72	
65PNH470	7.75	4.7 (2.13)	6.08 (2.76)	1.72	97.0

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half longitudinal and one half transverse to the rolling direction.
2. 1.5T/50Hz indicates the core loss at the frequency of 50 Hz and the magnetic flux density of 1.5T.
3. B50 indicates the magnetic flux density at 5000A/m.
4. 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.)
1000 (39.37) and over	0.23 (0.0091)	±0.023 (0.00091)	0.02 (0.0008) and under	+1.5 (0.0591)	1.0 (0.0394) and under
	0.30 (0.0118)	±0.030 (0.0012)	0.03 (0.0012) and under		
	0.35 (0.0138)	±0.035 (0.00138)			
	0.50 (0.0197)	±0.040 (0.00158)			
	0.65 (0.0256)	±0.052 (0.00205)			

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

PNH-Core Non-oriented electrical steel

■Typical Electrical and Magnetic Properties

Grade	Resistivity, Ω·m ×10⁻⁸	Core Loss, W/kg (W/lb)				Magnetic Flux Density, T		
		1.0T/50Hz	1.5T/50Hz	1.0T/60Hz	1.5T/60Hz	B25	B50	B100
23PNH270	34	1.26 (0.57)	2.68 (1.22)	1.54 (0.70)	3.28 (1.49)	1.64	1.72	1.83
30PNH230	49	0.87 (0.39)	2.06 (0.93)	1.09(0.49)	2.57 (1.17)	1.59	1.70	1.81
35PNH230	49	0.90 (0.41)	2.06 (0.93)	1.14 (0.52)	2.58 (1.17)	1.57	1.68	1.78
35PNH250	46	1.08 (0.49)	2.36 (1.07)	1.35 (0.61)	2.97 (1.35)	1.57	1.68	1.79
50PNH300	42	1.22 (0.55)	2.72 (1.23)	1.58 (0.72)	3.51 (1.59)	1.62	1.71	1.82
50PNH470	34	1.46 (0.66)	3.19 (1.45)	1.87 (0.85)	4.10 (1.86)	1.65	1.74	1.84
65PNH470	34	1.64 (0.74)	3.45 (1.56)	2.21 (1.00)	4.46 (2.02)	1.65	1.73	1.84

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
23PNH270	400	411	264	277	24	26	156	97.0
30PNH230	477	487	365	372	17	18	202	97.5
35PNH230	485	488	363	369	13	13	205	97.5
35PNH250	477	487	359	372	18	19	194	
50PNH300	456	467	330	346	27	29	176	98.0
50PNH470	386	398	245	256	34	36	140	
65PNH470	392	395	252	258	35	36	141	

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 6A coating are used for lamination factor test.

PNE-Core Non-oriented electrical steel

PNE-Core

PNE-Core has the highest magnetic flux density among non grain-oriented cores. It is widely used for industrial motors.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNE-Core	50PNE300	0.50 (0.0197)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31) 1200 (47.24)	508 (20)
	50PNE470				

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, %
		1.5T/50Hz	1.5T/60Hz	B50	
50PNE300	7.70	3.00 (1.36)	3.85 (1.75)	1.69	96.0
50PNE470	7.75	4.70 (2.13)	5.89 (2.67)	1.74	

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half longitudinal and one half transverse to the rolling direction.
2. 1.5T/50Hz indicates the core loss at the frequency of 50 Hz and the magnetic flux density of 1.5T.
3. B50 indicates the magnetic flux density at 5000A/m.
4. 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.)
1000 (39.37) and over	0.50 (0.0197)	±0.040 (0.00158)	0.04 (0.0016) and under	+1.5 (0.0591)	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		
		1.0T/50Hz	1.5T/50Hz	1.0T/60Hz	1.5T/60Hz	B25	B50	B100
50PNE300	41	1.21 (0.55)	2.69 (1.22)	1.56 (0.71)	3.48 (1.58)	1.64	1.72	1.84
50PNE470	34	1.43 (0.65)	3.05 (1.38)	1.83 (0.83)	3.93 (1.78)	1.66	1.75	1.86

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
50PNE300	426	437	310	321	26	28	177	98.0
50PNE470	411	422	293	304	31	33	153	

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 6A coating are used for lamination factor test.

PNM-Core Non-oriented electrical steel

PNM-Core

PNM-Core has a improved wear resistance and low residual magnetism. This product is suitable for magnetic switches.

■Standard Size

Product	Grade	Thickness, mm (in.)	Width, mm (in.)		Inner diameter, mm (in.)
			Available	Standard	
PNM-Core	65PNM540	0.65 (0.0256)	950~1200 (37.40~47.24)	1000 (39.37) 1100 (43.31) 1200 (47.24)	508 (20)
	70PNM500	0.70 (0.0276)			

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, %
		1.5T/50Hz	1.5T/60Hz	B50	
65PNM540	7.70	5.40 (2.45)	6.82 (3.09)	1.66	97.0
70PNM500	7.65	5.00 (2.27)	6.37 (2.89)	1.65	

Note) 1. Above test is conducted in accordance with IEC60404-2 (or JIS C 2550-1), using as-sheared specimens taken one half longitudinal and one half transverse to the rolling direction.
2. 1.5T/50Hz indicates the core loss at the frequency of 50 Hz and the magnetic flux density of 1.5T.
3. B50 indicates the magnetic flux density at 5000A/m. / 4. 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.)
1000 (39.37) and over	0.65 (0.0256)	±0.052 (0.00205)	0.4 (0.0016) and under	+1.5 (0.0591)	1.0 (0.0394) and under
	0.70 (0.0276)	±0.056 (0.00221)			

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		
		1.0T/50Hz	1.5T/50Hz	1.0T/60Hz	1.5T/60Hz	B25	B50	B100
65PNM540	42	1.75 (0.79)	3.72 (1.69)	2.25 (1.02)	4.85 (2.20)	1.64	1.72	1.83
70PNM500	44	1.70 (0.77)	3.69 (1.67)	2.18 (0.99)	4.82 (2.19)	1.61	1.70	1.81

Note) Above values are not guaranteed. Tests are conducted in accordance with IEC 60404-2 (or JIS C 2550-1) method, using as-sheared specimens taken one half parallel and one half transverse to the rolling direction.

■Typical Mechanical Properties and Lamination Factor

Grade	Tensile Strength, N/mm²		Yield Point, N/mm²		Elongation, %		Hardness HV1	Lamination Factor, %
	L	C	L	C	L	C		
65PNM540	437	452	300	315	32	33	155	98.0
70PNM500	485	496	356	371	31	32	177	

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 6A coating are used for lamination factor test.

POSCO Insulation Coating

■ Insulation Coating

Typical coating properties

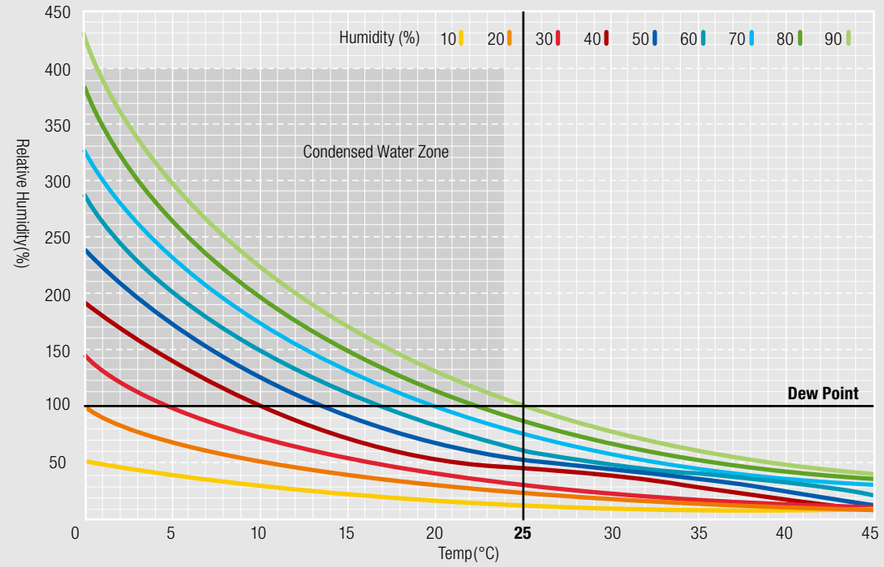
POSCO Coating Type		General (Chromate base)		Eco-friendly (Phosphate base)				Self bonding		Remark
		6H	9H	NS	NM	NR	NT	SM	SH	
ASTM Code		C-5	C-5	C-5	C-5	C-5	C-6	C-3 (similar)	C-5	-
Composition		Organic + Inorganic	Organic + Inorganic	Organic + Inorganic	Organic + Inorganic	Organic + Inorganic	Organic + Inorganic filler	Mostly Organic	Organic + Inorganic	
Thickness (μm)		0.5~1.0	1.2~1.8	0.5~1.0	1.2~1.8	2.0~4.0	4.0~8.0	2.0~4.0	2.0~4.0	
Interlaminar Resistance (Ω-㎠/lam.)	Before SRA	1.0	5.0	3.0	5.0	30	50	10	10	ASTM A 717 SRA Condition: 750℃ x 2hrs in DX rich gas
	After SRA	0.5	3.0	1.5	2.5	5	SRA not Accepted	SRA not Accepted	5	
Lamination Factor (%)		98.0	98.0	98.0	98.0	97.5	97.0	97.5	97.5	JI C 2550, 1.0MPa ±0.05 in Pressure, Specimen:0.5mmt
Heat Resistance	Continuous	Not observed	Not observed	Not observed	Not observed	Not observed	SRA not Accepted	SRA not Accepted	Not observed	155℃×24hrs in Air
	Short	Not observed	Not observed	Not observed	Not observed	Not observed	SRA not Accepted	SRA not Accepted	Not observed	750℃×2hrs in DX rich gas
Weathering (powdering)		Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	Not observed	65℃, 95% humidity, 72hrs
Adhesion	Before SRA	10 mmø	10 mmø	10 mmø	10 mmø	10 mmø	20 mmø	10 mmø	10 mmø	ISO 1519
	After SRA	5B	5B	5B	5B	5B	5B	5B	5B	ASTM D 3359B
Resistance to refrigerants	Change of surface	Not observed	Not observed	Not observed	Not observed	Not observed	-	Not observed	Not observed	R-134a/Freol@ 15C=65g/100g (130℃, 21days, 0.45㎛ filter paper)
	Change of weight	Not observed	Not observed	Not observed	Not observed	Not observed	-	Not observed	Not observed	
Weldability		Good	Normal	Good	Normal	Not allowed	Not allowed	Not allowed	Not allowed	Current:100-150A Ar 99% flow:10~20L/min Speed:0.25~0.50mpm
Bonding Strength (MPa)	Before SRA	-	-	-	-	-	-	≥ 2.0	-	ISO 4587, Shear Strength, SRA Condition: 780℃x2hrs in DXrich gas
	After SRA	-	-	-	-	-	-	-	≥ 0.1	

Note) Above values are not guaranteed. Please designate surface insulation according to usage. Regarding coating properties, please contact us.
Self-bonding coated steel sheet does not guarantee T-peel Strength and Roller peel Strength values.
Self-bonding coated steel requires the precise process control during bonding process, So please contact us before use

Surface condensation in relation to humidity and temperature

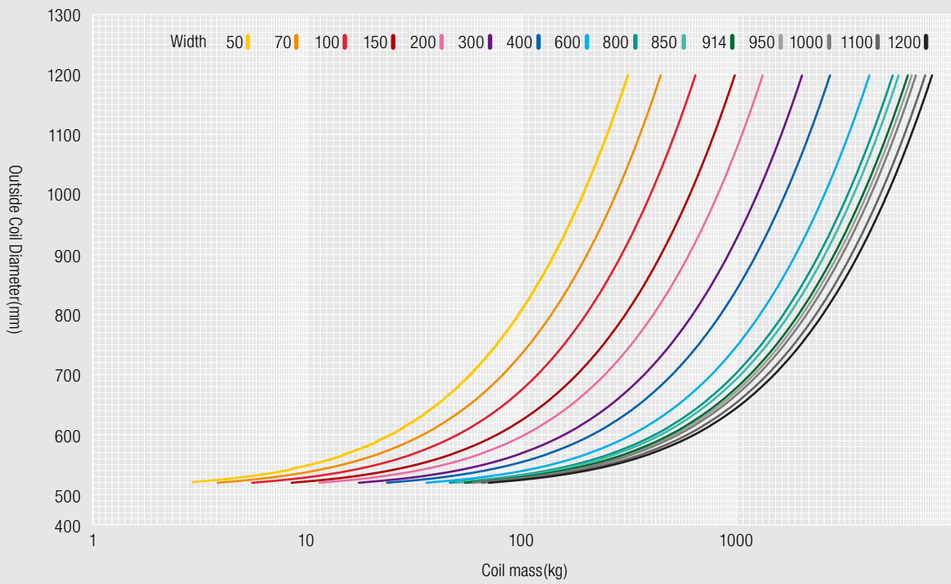
■ Reference for rust

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.

Thickness, mm (in.)	POSCO (2019)		JIS C 2552 (2014)		ASTM A 677 (2016)		EN10106 (2016)	
	Grade	Core Loss, Max, W/kg (W/lb) 1.5T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.5T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.5T/50Hz	Grade	Core Loss, Max, W/kg (W/lb) 1.5T/50Hz
0.35 (0.0138)	35PN 210	2.10 (0.95)	35A210	2.10 (0.95)	-	-	M210-35A	2.10 (0.95)
	35PN 230	2.30 (1.04)	35A230	2.30 (1.04)	-	-	M235-35A	2.35 (1.07)
	35PN 250	2.50 (1.13)	35A250	2.50 (1.13)	-	-	M250-35A	2.50 (1.13)
	35PN 270	2.70 (1.22)	35A270	2.70 (1.22)	-	-	M270-35A	2.70 (1.22)
	35PN 300	3.00 (1.36)	35A300	3.00 (1.36)	36F145	3.20 (1.45)	M300-35A	3.00 (1.36)
	35PN 330	3.30 (1.50)	35A330	3.30 (1.50)	36F155	3.42 (1.55)	M330-35A	3.30 (1.50)
	35PN 360	3.60 (1.63)	35A360	3.60 (1.63)	36F165	3.64 (1.63)	-	-
	35PN 440	4.40 (2.00)	35A440	4.40 (2.00)	36F205	4.52 (2.00)	-	-
0.50 (0.0197)	50PN 250	2.50 (1.13)	50A250	2.50 (1.13)	-	-	M250-50A	2.50 (1.13)
	50PN 270	2.70 (1.22)	50A270	2.70 (1.22)	-	-	M270-50A	2.70 (1.22)
	50PN 290	2.90 (1.32)	50A290	2.90 (1.32)	-	-	M290-50A	2.90 (1.32)
	50PN 310	3.10 (1.41)	50A310	3.10 (1.41)	-	-	M310-50A	3.10 (1.41)
	50PN 330	3.30 (1.50)	50A330	3.30 (1.50)	-	-	M330-50A	3.30 (1.50)
	50PN 350	3.50 (1.59)	50A350	3.50 (1.59)	47F165	3.64 (1.65)	M350-50A	3.50 (1.59)
	50PN 400	4.00 (1.81)	50A400	4.00 (1.81)	47F190	4.19 (1.90)	M400-50A	4.00 (1.81)
	50PN 470	4.70 (2.13)	50A470	4.70 (2.13)	47F240	5.29 (2.40)	M470-50A	4.70 (2.13)
	50PN 600	6.00 (2.72)	50A600	6.00 (2.72)	47F280	6.17 (2.80)	M600-50A	6.00 (2.72)
	50PN 700	7.00 (3.18)	50A700	7.00 (3.18)	-	-	M700-50A	7.00 (3.18)
	50PN 800	8.00 (3.63)	50A800	8.00 (3.63)	47F400	8.82 (4.00)	M800-50A	8.00 (3.63)
	50PN 1000	10.00 (4.54)	50A1000	10.00 (4.54)	-	-	M940-50A	9.40 (4.26)
	50PN 1300	13.00 (5.90)	50A1300	13.00 (5.90)	-	-	-	-
0.65 (0.0256)	65PN 310	3.10 (1.41)	65A310	3.10 (1.41)	-	-	M310-65A	3.10 (1.41)
	65PN 350	3.50 (1.59)	65A350	3.50 (1.59)	-	-	M350-65A	3.50 (1.59)
	65PN 400	4.00 (1.81)	65A400	4.00 (1.81)	64F200	4.41 (2.00)	M400-65A	4.00 (1.81)
	65PN 470	4.70 (2.13)	65A470	4.70 (2.13)	64F225	4.96 (2.25)	M470-65A	4.70 (2.13)
	65PN 600	6.00 (2.72)	65A600	6.00 (2.72)	64F275	6.06 (2.75)	M600-65A	6.00 (2.72)
	65PN 700	7.00 (3.18)	65A700	7.00 (3.18)	64F320	7.05 (3.20)	M700-65A	7.00 (3.18)
	65PN 800	8.00 (3.63)	65A800	8.00 (3.63)	-	-	M800-65A	8.00 (3.63)
	65PN 1000	10.00 (4.54)	65A1000	10.00 (4.54)	64F500	11.02 (5.00)	M1000-65A	10.00 (4.54)
	65PN 1300	13.00 (5.90)	65A1300	13.00 (5.90)	-	-	-	-

■Stress Relief Annealing

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.

Self-Bonding Technology

■ Introduction to Self-Bonding Technology

· Self-bonding technology allows cores to be assembled by the coating itself to minimize core efficiency degradation due to the adhesion method in motor core manufacturing.

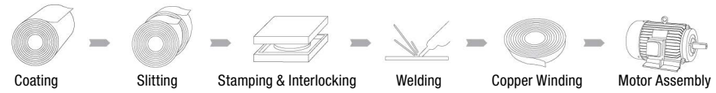
■ Structure and feature comparison

· SM : Self-bonding coating with high adhesion to the coating itself for high motor efficiency
· SH : Self-bonding coating for SRA(Stress Relief Annealing) to maximize motor efficiency

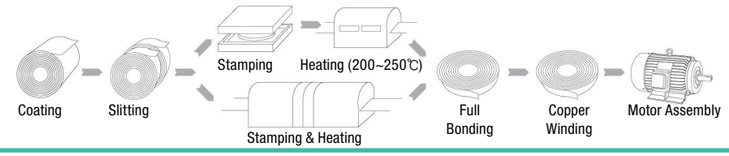
Conventional Fixation (Interlocking / Welding)	Self Bonding (SM, SH)
 · Damage to the motor core - Negatively affects its magnetic properties (Core loss, Flux density)	 · Skip welding or Interlocking - Improve electrical properties - Opimize motor design
 Embo · No Adhesion in Teeth - Teeth vibration in use (vibration, noise)	 Self Bonding · Strong adhesion of whole surface - Reduce vibration and noise - Remove compression plates (in large size)

■Manufacturing process comparison

Conventional Fixation
(Interlocking/Welding)



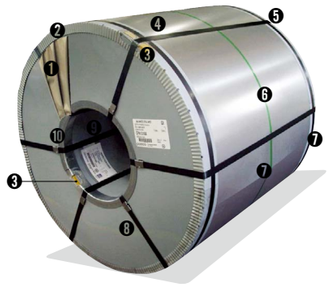
Self Bonding
(SM / SH)



Packaging & marking

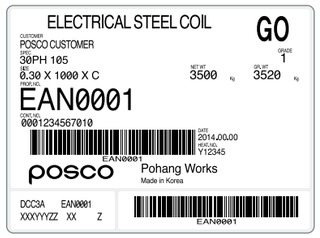
NO	Name	Meterial
❶	PP VCI WRAP	VINYL
❷	OUTER RING	STEEL
❸	CORNER WRAP	ANTI-RUST BOARD
❹	OUTER PROTECT BOARD	STEEL
❺	HORIZONTAL BAND	STEEL
❻	CENTER BAND	PET
❼	VERTICAL BAND	STEEL
❽	SIDE BOARD	PLASTIC
❾	INNER PROTECT BOARD	PLASTIC
❿	INNER RING	STEEL
⓫	OUTER PROTECT BOARD	ANTI-RUST BOARD

* Packing Type and materials are changeable.

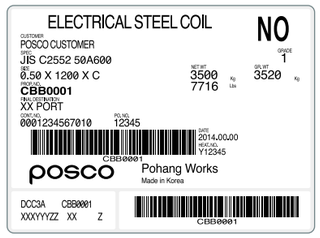


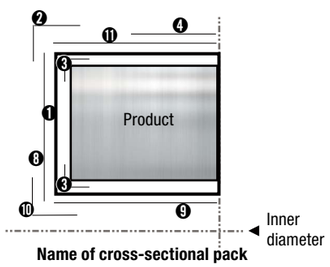
Name of outer pack

Domestic



Export





Name of cross-sectional pack

NON-ORIENTED

ELECTRICAL STEEL

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