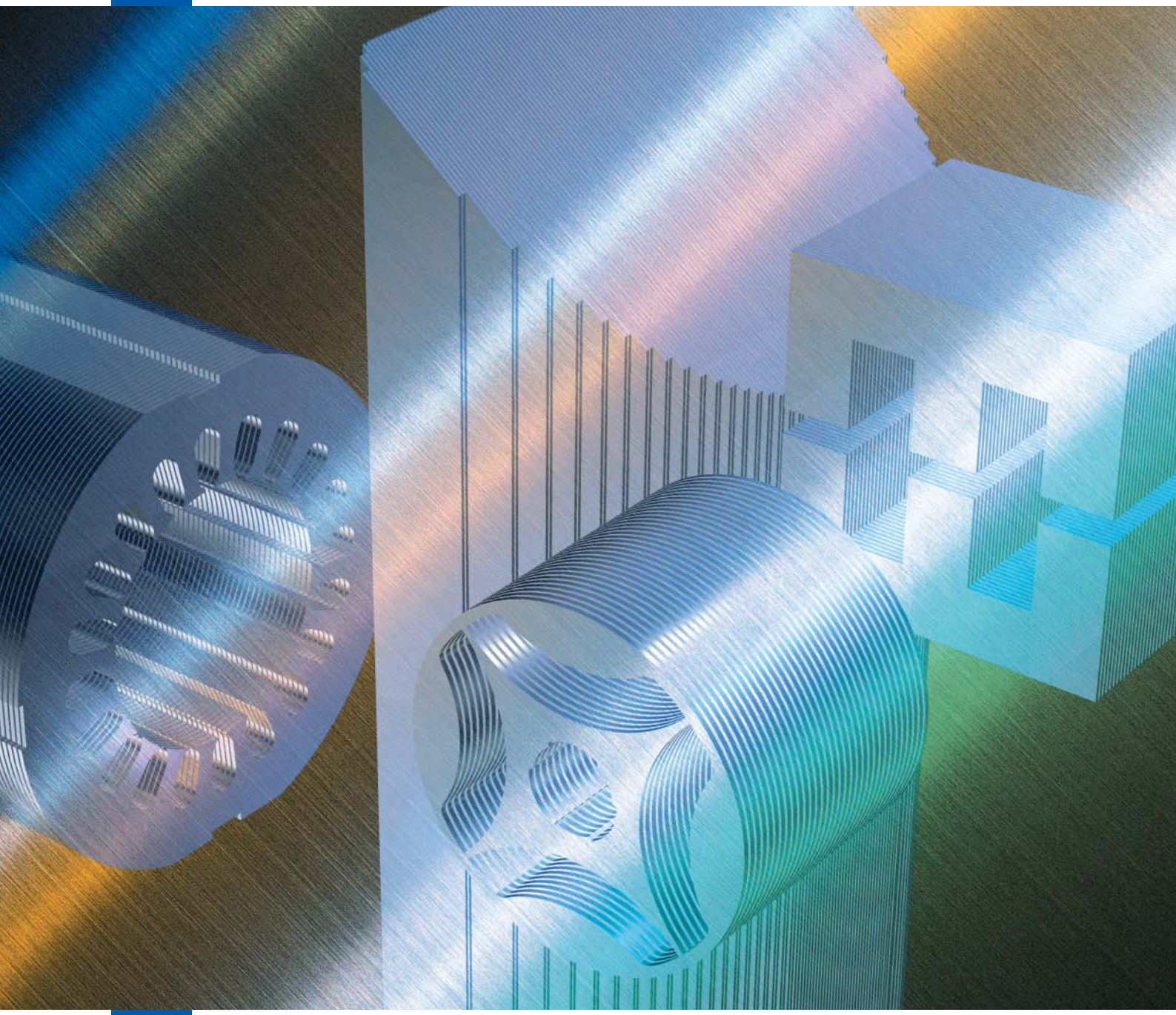
JFE

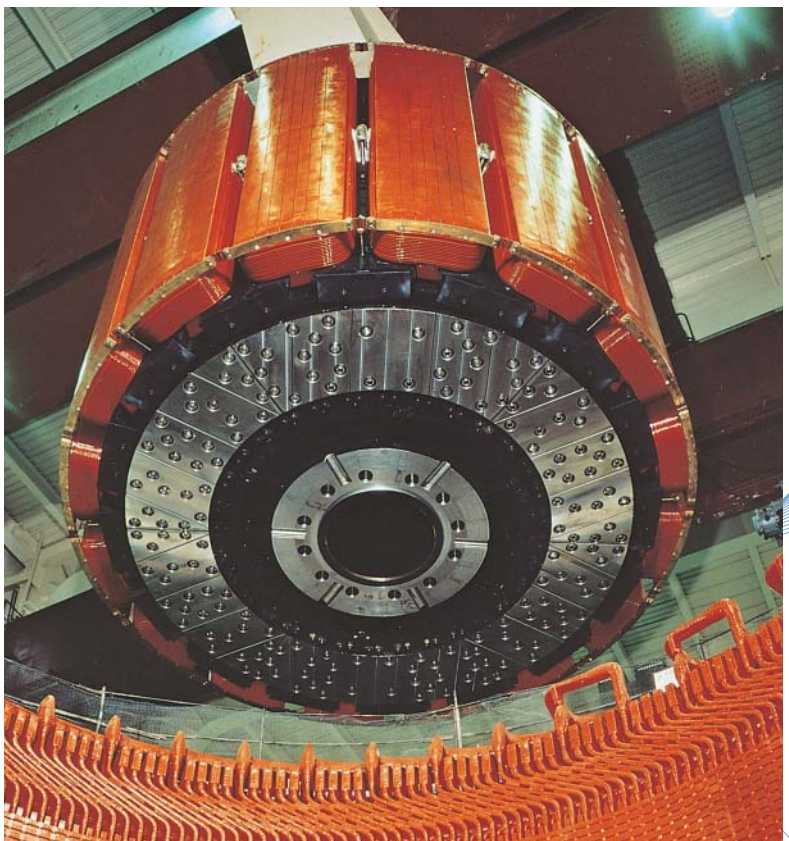
ELECTRICAL STEEL SHEETS

JFE G-CORE, JFE N-CORE



JFE Steel Corporation

Contents



Foreword

JFE Steel's electrical steel sheets have a long tradition dating back to 1931 when we started the production of hot-rolled magnetic steel sheets. Ever since, we have maintained the world's top-level track record through continuous quality improvements and the development of innovative products. Certified for compliance with the ISO9001 and ISO14001 standards, JFE Steel produces high-quality, energy-saving and environmentally compatible electrical steel sheets for a wide range of customers.

This catalog outlines the features and representative properties of various electrical steel sheets manufactured by JFE Steel. For detailed data and characteristic curves of each type of electrical steel sheet, please read the relevant separate catalog.

We at JFE Steel are committed to making continuous efforts so as to meet all requirements of our customers and ensure even greater customer satisfaction. We look forward to serving your current and future needs.

Types and Applications

Grain-Oriented Electrical Steel Sheets

JFE G-CORE

JGH CORE
JGS CORE
JGHD CORE
JGSD CORE
JG CORE

JFE G-CORE is so manufactured as to posses a well-aligned crystal orientation to the rolling direction.
Therefore, it has superior properties such as high permeability, low core loss and low magnetostriction.
JGHD, JGSD are core material with fine magnetic domains subdivided by grooves formed by electrolytical etching and is ideal with its low iron loss both in wound core and stacked core applications.
Used mainly for power transformers, and distribution transformers as well as for large rotating machines, JG, JGH, JGS, JGHD, JGSD CORE contribute greatly to improving the efficiency of machines and to reducing their weight.

Non-Oriented Electrical Steel Sheets

JFE N-CORE

JN CORE
JNE CORE
JNEH CORE
JNA CORE

JFE N-CORE is so manufactured as to render magnetic properties almost uniform in any direction of the coil. Used mainly for medium and large rotating machines, and small transformers, JFE N-CORE contributes to improving machine efficiency.
JNE is a core material which can achieve low core loss and high permeability.
JNEH is a core material which can achieve low core loss in the high frequency range.
JNA is a core materal which can achieve low core loss and high permeability after stress relief annealing by customers.
For applications such as electric household appliances,office equipment and stabilizers, JN CORE, JNE CORE, JNEH CORE, JNA CORE provide superior coatings, coupled with excellent thickness accuracy, to say nothing of superior magnetic properties.

Applications \ Types		Grain-Oriented		Non-Oriented					
		JGH, JGS, JGHD, JGSD	JG	JN 210~400	JN 440~700	JN 800~1600	JNE 230~470	JNEH 1200~1500	JNA 300~500
Rotating Machines	Large Rotating Machines		■	■					
	Medium Rotating Machines			■	■				
	Hermetical Motors			■	■	■	■		■
	General use A.C. Motors			■	■	■	■		■
	Small Motors and Intermittent Service A.C. Motors			■	■		■	■	■
	Electrical Vehicle Driving Motors			■			■	■	■
Static Machines	Power Transformers	■	■						
	Distribution Transformers	■	■						
	Audio Transformers	■	■	■	■	■	■		■
	Current and Potential Transformers	■	■	■					
	Reactors and Magnetic Amplifiers	■	■	■					
	Magnetic Switches			■					
	Welding Transformers				■	■			
	Ballast			■	■	■	■		■

Grain-Oriented Electrical Steel Sheets

JFE G-CORE

Grades and Specifications in conformity with JIS

Core loss values are to be specified at either 50Hz or 60Hz and 1.7T and magnetic flux density values are to be specified at 800A/m.

JGH CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Max. Core Loss at 1.7T				Min.Magnetic Flux Density at 800A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
0.20 (0.0080)	20JGH090	7.65	0.90	1.19	0.41	0.54	1.86	94.0
	20JGH095		0.95	1.25	0.43	0.57	1.86	
0.23 (0.0090)	23JGH090		0.90	1.19	0.41	0.54	1.87	94.5
	23JGH095		0.95	1.25	0.43	0.57	1.87	
	23JGH100		1.00	1.32	0.45	0.60	1.87	
0.27 (0.0106)	27JGH100		1.00	1.32	0.45	0.60	1.88	95.0
	27JGH110		1.10	1.45	0.50	0.66	1.88	
0.30 (0.0118)	30JGH105		1.05	1.39	0.48	0.63	1.88	95.5
	30JGH110		1.10	1.45	0.50	0.66	1.88	
	30JGH120		1.20	1.58	0.54	0.72	1.88	
0.35 (0.0138)	35JGH115		1.15	1.52	0.52	0.69	1.88	96.0
	35JGH125		1.25	1.65	0.57	0.75	1.88	
	35JGH135		1.35	1.78	0.61	0.81	1.88	

JGS CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Max. Core Loss at 1.7T				Min.Magnetic Flux Density at 800A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
0.23 (0.0090)	23JGS090	7.65	0.90	1.19	0.41	0.54	1.90	94.5
	23JGS095		0.95	1.25	0.43	0.57	1.90	
0.27 (0.0106)	27JGS095		0.95	1.25	0.43	0.57	1.90	95.0
	27JGS100		1.00	1.32	0.45	0.60	1.90	
0.30 (0.0118)	30JGS100		1.00	1.32	0.45	0.60	1.90	95.5
	30JGS105		1.05	1.39	0.48	0.63	1.90	
0.35 (0.0138)	35JGS115		1.15	1.52	0.52	0.69	1.90	96.0
	35JGS125		1.25	1.65	0.57	0.75	1.90	

JGHD, JGSD CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Max. Core Loss at 1.7T				Min.Magnetic Flux Density at 800A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
0.20 (0.0080)	20JGHD085	7.65	0.85	1.12	0.39	0.51	1.83	94.0
	20JGHD090		0.90	1.19	0.41	0.54	1.83	
0.23 (0.0090)	23JGSD080		0.80	1.04	0.37	0.48	1.87	94.5
	23JGSD085		0.85	1.12	0.39	0.51	1.87	
	23JGSD090		0.90	1.19	0.41	0.54	1.87	
0.27 (0.0106)	27JGSD090		0.90	1.18	0.41	0.54	1.87	95.0
	27JGSD095		0.95	1.25	0.43	0.57	1.87	

JG CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Max. Core Loss at 1.7T				Min.Magnetic Flux Density at 800A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
0.23 (0.0090)	23JG110	7.65	1.10	1.45	0.50	0.66	1.80	94.5
0.27 (0.0106)	27JG120		1.20	1.58	0.54	0.72	1.80	95.0
	27JG130		1.30	1.72	0.59	0.78	1.80	
0.30 (0.0118)	30JG120		1.20	1.58	0.54	0.72	1.80	95.5
	30JG130		1.30	1.72	0.59	0.78	1.80	
	30JG140		1.40	1.85	0.64	0.84	1.80	
0.35 (0.0138)	35JG135		1.35	1.78	0.61	0.81	1.80	96.0
	35JG145		1.45	1.91	0.66	0.87	1.80	
	35JG155		1.55	2.04	0.70	0.93	1.80	

Note : The values are to be measured according to the method JIS C 2550 (2000) on the specimens sheared parallel to the rolling direction and annealed for stress relieving. The method JIS C 2550 (2000) is practically the same as ASTM A 34.

Grain-Oriented Electrical Steel Sheets

JFE G-CORE

Grades and Specifications in conformity with AISI

JGH, JGS grade is to be guaranteed in terms of maximum core loss at either 50Hz or 60Hz and 1.7T.
JG grade is to be guranteed in terms of maximum core loss at either 50Hz or 60Hz at 1.5T. Unless otherwise specified JGH, JGS supplied will have its core loss value at 1.7T and 50Hz, and JG supplied will have its core loss value at 1.5T and 50Hz.

Thickness in. (mm)	Grade	Assumed Density kg/dm³	Max. Core Loss at 1.5T				Max. Core Loss at 1.7T				Min.Magnetic Flux Density at 800A/m T
			Watts per kilogram		Watts per pound		Watts per kilogram		Watts per pound		
			50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz	
0.0080 (0.20)	M-0H	7.65	0.66	0.86	0.29	0.39	0.98	1.30	0.44	0.59	1.86
0.0090 (0.23)	M-0H		0.67	0.88	0.30	0.40	1.00	1.32	0.45	0.60	1.87
	M-3		0.79	1.04	0.36	0.47	1.18	1.55	0.54	0.70	1.80
0.0106 (0.27)	M-0H		0.73	0.95	0.33	0.43	1.03	1.36	0.47	0.62	1.88
	M-1H		0.77	1.01	0.35	0.46	1.09	1.44	0.49	0.65	1.88
	M-3		0.83	1.09	0.38	0.49	1.21	1.59	0.55	0.72	1.80
	M-4		0.89	1.17	0.40	0.53	1.27	1.68	0.58	0.76	1.80
0.0118 (0.30)	M-0H		0.76	0.99	0.34	0.45	1.05	1.39	0.48	0.63	1.88
	M-1H		0.80	1.06	0.36	0.48	1.11	1.45	0.50	0.66	1.88
	M-2H		0.85	1.15	0.39	0.52	1.17	1.54	0.53	0.70	1.88
	M-4		0.90	1.19	0.41	0.54	1.32	1.74	0.60	0.79	1.80
	M-5		0.97	1.28	0.44	0.58	1.39	1.83	0.63	0.83	1.80
0.0138 (0.35)	M-1H		0.87	1.15	0.39	0,52	1.16	1.53	0.53	0.69	1.88
	M-2H		0.90	1.19	0.41	0.54	1.22	1.59	0.55	0.72	1.88
	M-3H		0.96	1.28	0.44	0.58	1.28	1.68	0.58	0.76	1.88
	M-5		1.01	1.32	0.46	0.60	1.45	1.91	0.66	0.87	1.80
	M-6		1.11	1.46	0.50	0.66	1.57	2.07	0.71	0.94	1.80

Note : The values are to be measured according to the method JIS C 2550 (2000) on the specimens sheared parallel to the rolling direction and annealed for stress relieving. The method JIS C 2550 (2000) is practically the same as ASTM A 34.

Grain-Oriented Electrical Steel Sheets

JFE G-CORE

Typical Electrical and Magnetic Properties

JGH CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Resistivity μ Ω-cm	Core Loss								Magnetic Flux Density T		
				Watts per kilogram				Watts per pound						
				W15/50	W17/50	W15/60	W17/60	W15/50	W17/50	W15/60	W17/60	B 3	B 8	B 25
0.20 (0.0080)	20JGH090	7.65	49	0.61	0.88	0.80	1.13	0.28	0.40	0.36	0.51	1.80	1.88	1.93
	20JGH095			0.63	0.91	0.83	1.17	0.29	0.41	0.37	0.53	1.80	1.88	1.93
	M-0H			0.63	0.91	0.83	1.17	0.29	0.41	0.37	0.53	1.80	1.88	1.93
0.23 (0.0090)	23JGH090		49	0.63	0.88	0.81	1.15	0.28	0.40	0.37	0.52	1.81	1.89	1.94
	23JGH095			0.64	0.91	0.84	1.19	0.29	0.41	0.38	0.54	1.81	1.89	1.94
	23JGH100			0.66	0.95	0.86	1.23	0.30	0.43	0.39	0.56	1.81	1.89	1.94
	M-0H			0.65	0.93	0.85	1.20	0.30	0.42	0.38	0.55	1.81	1.89	1.94
0.27 (0.0106)	27JGH100		49	0.71	0.98	0.93	1.30	0.32	0.44	0.42	0.59	1.81	1.89	1.94
	27JGH110			0.74	1.03	0.97	1.34	0.34	0.47	0.44	0.61	1.81	1.89	1.94
	M-0H			0.72	1.01	0.95	1.32	0.32	0.46	0.43	0.60	1.81	1.89	1.94
	M-1H			0.74	1.05	0.97	1.37	0.34	0.48	0.44	0.62	1.81	1.89	1.94
0.30 (0.0118)	30JGH105		49	0.75	1.03	0.97	1.36	0.34	0.47	0.44	0.62	1.82	1.89	1.94
	30JGH110			0.78	1.07	1.01	1.41	0.35	0.49	0.46	0.64	1.82	1.89	1.94
	30JGH120			0.83	1.14	1.10	1.50	0.38	0.52	0.50	0.68	1.82	1.89	1.94
	M-0H			0.75	1.04	0.99	1.37	0.34	0.47	0.45	0.62	1.82	1.89	1.94
	M-1H			0.78	1.08	1.01	1.41	0.35	0.49	0.46	0.64	1.82	1.89	1.94
	M-2H			0.81	1.13	1.06	1.50	0.37	0.51	0.48	0.68	1.82	1.89	1.94
0.35 (0.0138)	35JGH115		49	0.86	1.13	1.15	1.53	0.39	0.51	0.52	0.70	1.83	1.89	1.96
	35JGH125			0.89	1.22	1.19	1.60	0.40	0.55	0.54	0.73	1.83	1.89	1.96
	35JGH135			0.91	1.26	1.21	1.65	0.41	0.57	0.55	0.75	1.83	1.89	1.96
	M-1H			0.86	1.14	1.14	1.54	0.39	0.52	0.52	0.70	1.83	1.89	1.96
	M-2H			0.88	1.20	1.17	1.59	0.40	0.54	0.53	0.72	1.83	1.89	1.96
	M-3H			0.90	1.24	1.19	1.63	0.41	0.56	0.54	0.74	1.83	1.89	1.96

JGS CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Resistivity μ Ω-cm	Core Loss								Magnetic Flux Density T		
				Watts per kilogram				Watts per pound						
				W15/50	W17/50	W15/60	W17/60	W15/50	W17/50	W15/60	W17/60	B 3	B 8	B 25
0.23 (0.0090)	23JGS090	7.65	48	0.63	0.87	0.82	1.12	0.29	0.39	0.37	0.51	1.89	1.92	1.97
	23JGS095			0.64	0.90	0.83	1.16	0.29	0.41	0.38	0.53	1.89	1.92	1.97
0.27 (0.0106)	27JGS095		48	0.69	0.93	0.91	1.22	0.31	0.42	0.41	0.55	1.90	1.93	1.98
	27JGS100			0.70	0.96	0.92	1.25	0.32	0.44	0.42	0.57	1.90	1.93	1.98
0.30 (0.0118)	30JGS100		48	0.74	0.99	0.98	1.31	0.34	0.45	0.44	0.59	1.90	1.93	1.98
	30JGS105			0.75	1.02	1.01	1.35	0.34	0.46	0.46	0.61	1.90	1.93	1.98
0.35 (0.0138)	35JGS115		48	0.87	1.14	1.13	1.50	0.39	0.52	0.51	0.68	1.90	1.93	1.98
	35JGS125			0.91	1.20	1.18	1.58	0.41	0.55	0.54	0.72	1.89	1.92	1.97

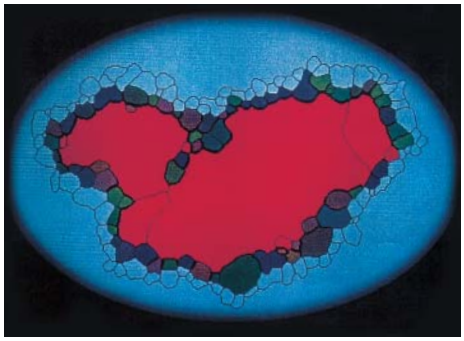
JGHD, JGSD CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Resistivity μ Ω-cm	Core Loss								Magnetic Flux Density T		
				Watts per kilogram				Watts per pound						
				W15/50	W17/50	W15/60	W17/60	W15/50	W17/50	W15/60	W17/60	B 3	B 8	B 25
0.20 (0.0080)	20JGHD085	7.65	49	0.56	0.82	0.74	1.05	0.25	0.37	0.34	0.48	1.77	1.84	1.90
	20JGHD090			0.60	0.87	0.78	1.12	0.27	0.39	0.35	0.51	1.77	1.84	1.90
0.23 (0.0090)	23JGSD080		48	0.55	0.75	0.73	0.97	0.25	0.34	0.33	0.44	1.82	1.88	1.93
	23JGSD085			0.57	0.78	0.75	1.02	0.26	0.35	0.34	0.46	1.82	1.88	1.93
	23JGSD090			0.61	0.83	0.80	1.09	0.27	0.38	0.36	0.49	1.82	1.88	1.93
0.27 (0.0106)	27JGSD090		48	0.61	0.84	0.81	1.11	0.28	0.38	0.37	0.50	1.82	1.88	1.93
	27JGSD095			0.64	0.88	0.85	1.16	0.29	0.40	0.39	0.53	1.82	1.88	1.93

JG CORE

Thickness mm (in.)	Grade	Assumed Density kg/dm³	Resistivity μ Ω-cm	Core Loss								Magnetic Flux Density T		
				Watts per kilogram				Watts per pound						
				W15/50	W17/50	W15/60	W17/60	W15/50	W17/50	W15/60	W17/60	B 3	B 8	B 25
0.23 (0.0090)	23JG110	7.65	49	0.70	1.00	0.93	1.30	0.32	0.45	0.42	0.59	1.76	1.85	1.92
	M-3			0.70	1.00	0.93	1.30	0.32	0.45	0.42	0.59	1.76	1.85	1.92
0.27 (0.0106)	27JG120		46	0.78	1.14	1.01	1.47	0.36	0.52	0.46	0.67	1.76	1.85	1.92
	27JG130			0.83	1.23	1.08	1.59	0.38	0.56	0.49	0.72	1.74	1.84	1.91
	M-3			0.80	1.17	1.06	1.52	0.36	0.53	0.48	0.69	1.76	1.85	1.92
	M-4			0.82	1.22	1.08	1.59	0.37	0.55	0.49	0.72	1.74	1.84	1.91
0.30 (0.0118)	30JG120		46	0.83	1.17	1.10	1.54	0.38	0.54	0.50	0.70	1.76	1.85	1.92
	30JG130			0.87	1.24	1.15	1.63	0.39	0.56	0.52	0.74	1.74	1.84	1.91
	30JG140			0.90	1.32	1.19	1.71	0.41	0.60	0.54	0.78	1.73	1.83	1.91
	M-4			0.87	1.24	1.15	1.63	0.39	0.56	0.52	0.74	1.74	1.85	1.91
	M-5			0.90	1.32	1.19	1.71	0.41	0.60	0.54	0.78	1.73	1.84	1.91
0.35 (0.0138)	35JG135		46	0.95	1.33	1.26	1.76	0.43	0.60	0.57	0.80	1.77	1.85	1.91
	35JG145			0.98	1.38	1.30	1.81	0.44	0.63	0.59	0.82	1.76	1.84	1.91
	35JG155			1.02	1.47	1.34	1.92	0.46	0.67	0.61	0.87	1.74	1.83	1.90
	M-5			0.97	1.36	1.30	1.79	0.44	0.62	0.59	0.81	1.76	1.84	1.91
	M-6			1.02	1.47	1.34	1.92	0.46	0.67	0.61	0.87	1.74	1.83	1.90

Note :
1. Values were measured according to the method JIS C 2550 (2000).
2. Test specimens were sheared to the rolling direction and annealed for stress relieving.
3. W17/50 indicates the core loss at the frequency of 50Hz, maximum magnetic flux density of 1.7T.
   B8 indicates the magnetic flux density at the magnetizing force of 800A/m.
4. Values shown are the typical ones, not for guarantee.



Grain-Oriented Electrical Steel Sheets

JFE G-CORE

Typical Mechanical Properties

Grade	Thickness mm (in.)	Yield Point N/mm² L	Yield Point N/mm² C	Yield Point lb/in² L	Yield Point lb/in² C	Tensile Strength N/mm² L	Tensile Strength N/mm² C	Tensile Strength lb/in² L	Tensile Strength lb/in² C	Elongation % L	Elongation % C	Hardness Hv (1)	Number of Bends L	Number of Bends C	Lamination Factor %
JGH CORE	0.20 (0.0080)	320	339	46,400	49,200	339	395	49,200	57,300	8	29	200	22	14	96.4
	0.23 (0.0090)	330	342	47,900	49,600	350	400	50,800	58,000	9	29	200	21	14	97.0
	0.27 (0.0106)	330	341	47,900	49,500	348	402	50,500	58,300	10	28	200	21	14	97.4
	0.30 (0.0118)	333	339	48,300	49,200	350	404	50,800	58,600	8	32	200	20	13	97.6
	0.35 (0.0138)	339	344	49,200	49,900	357	408	51,800	59,200	9	32	200	20	12	97.9
JGS CORE	0.23 (0.0090)	330	358	47,900	51,900	348	411	50,500	59,600	11	31	204	21	15	97.0
	0.27 (0.0106)	330	356	47,900	51,600	346	412	50,200	59,800	11	31	204	21	14	97.4
	0.30 (0.0118)	322	346	46,700	50,200	338	405	49,000	58,700	10	29	204	21	14	97.7
	0.35 (0.0138)	327	350	47,400	50,800	345	405	50,000	58,700	10	28	204	20	13	98.0
JGHD CORE	0.20 (0.0080)	320	339	46,400	49,200	339	396	49,200	57,400	8	29	200	22	14	96.0
JGSD CORE	0.23 (0.0090)	334	360	48,400	52,200	350	411	50,800	59,600	10	30	204	21	15	96.7
	0.27 (0.0106)	330	356	47,900	51,600	346	411	50,200	59,600	10	30	204	21	14	97.0
JG CORE	0.27 (0.0106)	285	295	41,300	42,800	310	360	45,000	52,200	9	32	188	20	14	97.6
	0.30 (0.0118)	285	297	41,300	43,100	313	362	45,400	52,500	11	35	188	20	14	97.9
	0.35 (0.0138)	296	302	42,900	43,800	326	369	47,300	53,500	10	35	188	20	12	98.2

Note : 1. "L" and "C" means the specimens cut parallel and traverse to the rolling direction, respectively.
2. Tension tests were made on No.13A specimens according to JIS Z 2201 (1998).
3. Bend and lamination factor tests were made according to the method JIS C 2550 (2000).
4. The specimens were tested as sheared.
5. Test values shown above are the typical ones, not for guarantee.

Dimensions and Tolerances

Dimensions

Form	Grade	Thickness	Available width range	Inside coil diameter
Coils	JGH CORE	0.20mm (0.0080 in.) 0.23mm (0.0090 in.) 0.27mm (0.0106 in.) 0.30mm (0.0118 in.) 0.35mm (0.0138 in.)	from 50mm (2 in.) to 1,160mm (45.67 in.)	508mm (20 in.)
	JGS CORE	0.23mm (0.0090in.) 0.27mm (0.0106in.)	from 50mm (2 in.) to 1,050mm (41.34 in.)	
		0.30mm (0.0118 in.) 0.35mm (0.0138 in.)	from 50mm (2 in.) to 1,100mm (43.30 in.)	
	JGHD CORE	0.20mm (0.0080 in.)	from 50mm (2 in.) to 1,050mm (41.34 in.)	
	JGSD CORE	0.23mm (0.0090in.) 0.27mm (0.0106in.)		
	JG CORE	0.23mm (0.0090 in.) 0.27mm (0.0106 in.) 0.30mm (0.0118 in.) 0.35mm (0.0138 in.)	from 50mm (2 in.) to 1,160mm (45.67 in.)	

Tolerances in Dimension and Shape

Tolerances in dimension and shape conform to JIS C 2553

Width mm	Thickness mm	Tolerance				
		Thickness mm	Deviation of thickness in transverse direction mm	Width mm	Camber in any 2 meters (Slit Products) mm	Shear Burr mm
150 or under	0.20	±0.02	0.02 or under	+0.2 0	1.0 or under	0.035 or under
	0.23	±0.02				
	0.27	±0.03				
	0.30	±0.03				
	0.35	±0.03				
Over 150 to 400	0.20	±0.02	0.02 or under	+0.3 0		
	0.23	±0.02				
	0.27	±0.03				
	0.30	±0.03				
	0.35	±0.03				
Over 400 to 750	0.20	±0.02	0.03 or under	+0.5 0		
	0.23	±0.02				
	0.27	±0.03				
	0.30	±0.03				
	0.35	±0.03				
Over 750	0.20	±0.02	0.03 or under	+0.6 0		
	0.23	±0.02				
	0.27	±0.03				
	0.30	±0.03				
	0.35	±0.03				

Note : Stipulation of camber shall be applied only for the steel strips (width 75 mm over).

Non-Oriented Electrical Steel Sheets

JFE N-CORE

Grades and Specifications in conformity with JIS

Core loss values are to be specified at either 50Hz or 60Hz,and at 1.0T or 1.5T each, but not at both.
Magnetic flux density is to be specified at 5000A/m.
Unless otherwise specified, each grade supplied will have its core loss value at 50Hz and at 1.5T.

JN CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Max. Core Loss								Min.Magnetic Flux Density at 5000A/m T	Min. Lamination Factor %
			Watts per kilogram				Watts per pound					
			50Hz		60Hz		50Hz		60Hz			
			1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	1.0T	1.5T		
35JN210	0.35 (0.0138)	7.60	0.90	2.10	1.15	2.65	0.41	0.95	0.52	1.20	1.62	95.0
35JN230		7.60	0.95	2.30	1.20	2.90	0.43	1.04	0.54	1.32	1.62	
35JN250		7.60	1.00	2.50	1.25	3.20	0.45	1.13	0.57	1.45	1.62	
35JN270		7.65	1.10	2.70	1.40	3.45	0.50	1.22	0.64	1.56	1.62	
35JN300		7.65	1.20	3.00	1.50	3.80	0.54	1.36	0.68	1.72	1.62	
35JN360		7.65	1.45	3.60	1.85	4.55	0.66	1.63	0.84	2.06	1.63	
35JN440		7.70	1.80	4.40	2.30	5.60	0.82	2.00	1.04	2.54	1.65	
50JN230	0.50 (0.0197)	7.60	1.00	2.30	1.30	2.95	0.45	1.04	0.59	1.34	1.62	96.0
50JN250		7.60	1.05	2.50	1.35	3.20	0.48	1.13	0.61	1.45	1.62	
50JN270		7.60	1.10	2.70	1.40	3.45	0.50	1.22	0.64	1.56	1.62	
50JN290		7.60	1.15	2.90	1.45	3.70	0.52	1.32	0.66	1.68	1.62	
50JN310		7.65	1.25	3.10	1.60	3.95	0.57	1.41	0.73	1.79	1.62	
50JN350		7.65	1.50	3.50	1.90	4.45	0.68	1.59	0.86	2.02	1.62	
50JN400		7.65	1.70	4.00	2.15	5.10	0.77	1.81	0.98	2.31	1.63	
50JN470		7.70	2.00	4.70	2.55	5.95	0.91	2.13	1.16	2.70	1.64	
50JN600		7.75	2.60	6.00	3.30	7.60	1.18	2.72	1.50	3.45	1.66	
50JN700		7.80	3.00	7.00	3.80	8.90	1.36	3.18	1.72	4.04	1.70	
50JN800		7.80	3.60	8.00	4.55	10.15	1.63	3.63	2.06	4.60	1.70	
50JN1000		7.85	4.40	10.00	5.60	12.70	2.00	4.54	2.54	5.76	1.70	
50JN1300		7.85	5.80	13.00	7.35	16.50	2.63	5.90	3.33	7.48	1.70	
65JN800	0.65 (0.0256)	7.80	3.60	8.00	4.55	10.15	1.63	3.63	2.07	4.60	1.70	97.0
65JN1000		7.80	4.40	10.00	5.60	12.70	2.00	4.54	2.54	5.76	1.70	
65JN1300		7.85	5.80	13.00	7.35	16.50	2.63	5.90	3.33	7.48	1.70	
65JN1600		7.85	7.10	16.00	9.00	20.30	3.22	7.26	4.09	9.22	1.70	

Note : The values are to be measured to the method JIS C 2550 (2000) on the specimens consisted of half the strip sheared parallel and half sheared transverse to the rolling direction.
The specimens are to be tested as sheared.

JNE CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Max. Core Loss				Min.Magnetic Flux Density at 5000A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
			1.5T	1.5T	1.5T	1.5T		
35JNE230	0.35 (0.0138)	7.65	2.30	2.90	1.04	1.32	1.66	95.0
35JNE250		7.65	2.50	3.20	1.13	1.45	1.67	
35JNE300		7.70	3.00	3.80	1.36	1.72	1.69	
35JNE440		7.75	4.40	5.60	2.00	2.52	1.70	
50JNE300	0.50 (0.0197)	7.65	3.00	3.80	1.36	1.72	1.67	96.0
50JNE350		7.70	3.50	4.45	1.59	2.02	1.70	
50JNE470		7.75	4.70	5.95	2.13	2.70	1.72	

Note : The values are to be measured to the method JIS C 2550 (2000) on the specimens consisted of half the strip sheared parallel and half sheared transverse to the rolling direction.
The specimens are to be tested as sheared.

JNEH CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Max. Core Loss		Min.Magnetic Flux Density at 5000A/m T	Min. Lamination Factor %
			Watts per kilogram	Watts per pound		
			400Hz	400Hz		
			1.0T	1.0T		
20JNEH1200	0.20 (0.0080)	7.65	12.00	5.44	1.62	93.0
20JNEH1500		7.65	15.00	6.80	1.63	

Note : The values are to be measured to the method JIS C 2550 (2000) on the specimens consisted of half the strip sheared parallel and half sheared transverse to the rolling direction.
The specimens are to be tested as sheared.

JNA CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Max. Core Loss				Min.Magnetic Flux Density at 5000A/m T	Min. Lamination Factor %
			Watts per kilogram		Watts per pound			
			50Hz	60Hz	50Hz	60Hz		
			1.5T	1.5T	1.5T	1.5T		
50JNA300	0.50 (0.0197)	7.75	3.00	3.80	1.36	1.72	1.72	96.0
50JNA350		7.80	3.50	4.52	1.59	2.05	1.74	
50JNA500		7.80	5.00	6.50	2.27	2.95	1.72	

Note : The values are to be measured to the method JIS C 2550 (2000) on the specimens consisted of half the strip sheared parallel and half sheared transverse to the rolling direction.
The specimens are to be tested after stress relief annealing.
Annealing condition : 750˚C (1380˚F) × 2hrs. under neutral atmosphere.

Non-Oriented Electrical Steel Sheets

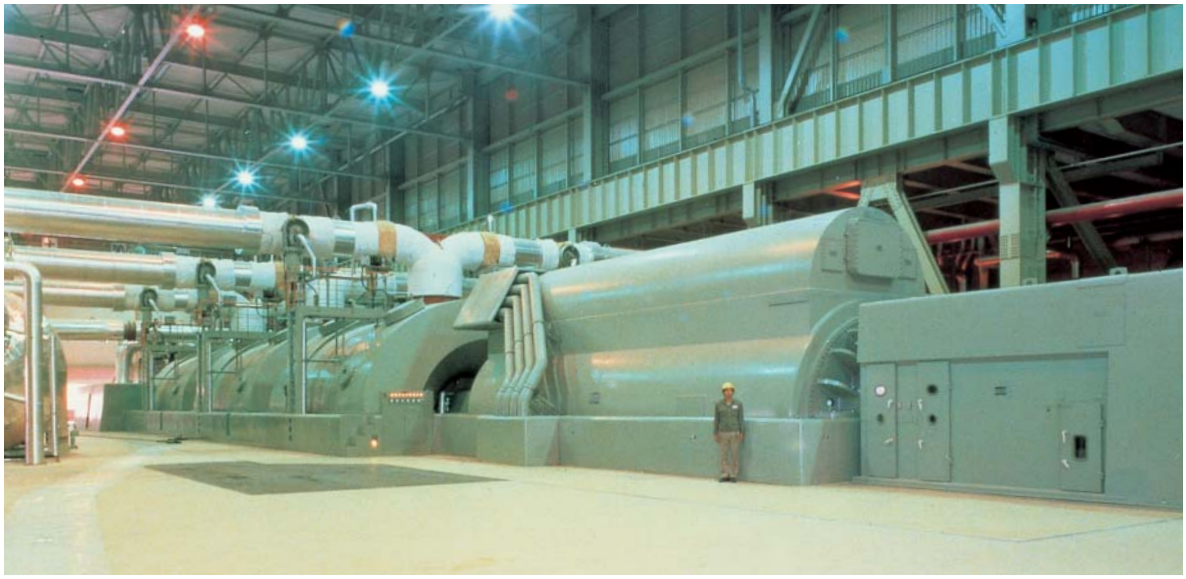
JFE N-CORE

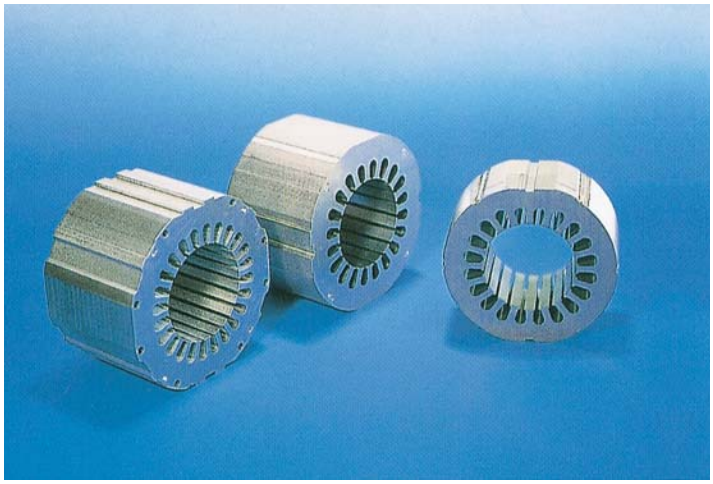
Grades and Specifications in conformity with AISI

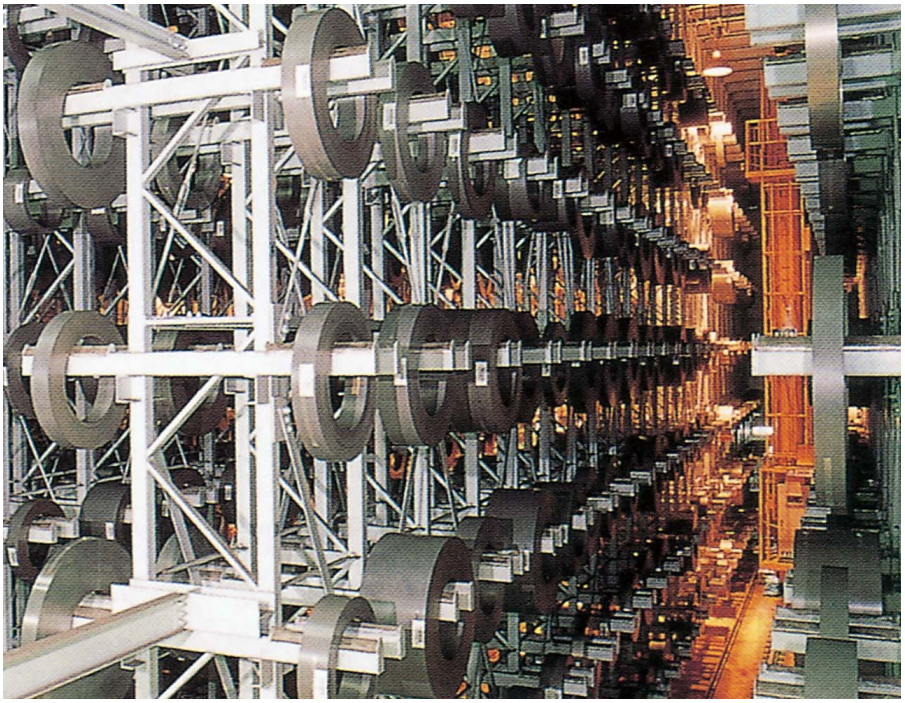
Core loss values are to be specified at either 50Hz or 60Hz, and 1.5T, but not at both. Unless otherwise specified, each grade supplied will have its core loss value at 60Hz and at 1.5T.

Grade	Thickness in. (mm)	Max. Core Loss at 1.5T			
		Watts per kilogram		Watts per pound	
		50Hz	60Hz	50Hz	60Hz
M-15	0.014 (0.36)	2.53	3.20	1.15	1.45
M-19		2.75	3.48	1.25	1.58
M-22		2.93	3.70	1.33	1.68
M-27		3.13	3.97	1.42	1.80
M-36		3.31	4.19	1.50	1.90
M-15	0.0185 (0.47)	2.93	3.70	1.33	1.68
M-19		3.03	3.83	1.37	1.74
M-22		3.22	4.08	1.46	1.85
M-27		3.31	4.19	1.50	1.90
M-36		3.57	4.52	1.62	2.05
M-43		4.01	5.07	1.82	2.30
M-45		5.31	6.72	2.41	3.05
M-47		6.96	8.82	3.16	4.00
M-19	0.025 (0.64)	3.62	4.58	1.64	2.08
M-22		3.80	4.80	1.72	2.18
M-27		3.92	4.96	1.78	2.25
M-36		4.18	5.29	1.90	2.40
M-43		4.70	5.95	2.13	2.70
M-45		6.27	7.93	2.84	3.60
M-47		8.53	10.80	3.87	4.90

Note : The Values are to be measured to the method JIS C 2550 (2000) on the specimens consisted of half the strip sheared parallel and half sheared transverse to the rolling direction. The specimens are to be tested as sheared.







Non-Oriented Electrical Steel Sheets

JFE N-CORE

Typical Electrical and Magnetic Properties

JN CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Resistivity μΩ-cm	Core Loss								Magnetic Flux Density T			
				Watts per kilogram				Watts per pound							
				50Hz		60Hz		50Hz		60Hz					
				1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	B10	B25	B50	B100
35JN210	0.35 (0.0138)	7.60	59	0.85	2.05	1.05	2.55	0.39	0.93	0.48	1.16	1.47	1.57	1.65	1.77
35JN230		7.60	55	0.89	2.10	1.10	2.60	0.40	0.95	0.50	1.18	1.47	1.57	1.66	1.78
35JN250		7.60	54	0.93	2.25	1.20	2.75	0.42	1.02	0.54	1.25	1.48	1.57	1.66	1.78
35JN270		7.65	54	1.00	2.40	1.25	2.95	0.45	1.09	0.57	1.34	1.48	1.58	1.67	1.79
35JN300		7.65	51	1.10	2.60	1.40	3.20	0.50	1.18	0.64	1.45	1.50	1.59	1.68	1.80
35JN360		7.65	47	1.25	2.95	1.60	3.60	0.57	1.34	0.73	1.63	1.51	1.61	1.69	1.81
35JN440		7.70	38	1.45	3.40	1.77	4.23	0.66	1.54	0.80	1.92	1.53	1.62	1.71	1.82
50JN230	0.50 (0.0197)	7.60	59	0.95	2.25	1.22	2.93	0.43	1.02	0.55	1.33	1.48	1.57	1.66	1.78
50JN250		7.60	55	1.00	2.40	1.30	3.05	0.45	1.09	0.59	1.38	1.49	1.57	1.67	1.79
50JN270		7.60	55	1.05	2.50	1.35	3.17	0.48	1.13	0.61	1.44	1.49	1.57	1.67	1.80
50JN290		7.60	54	1.08	2.60	1.40	3.25	0.49	1.18	0.64	1.47	1.49	1.58	1.67	1.79
50JN310		7.65	54	1.15	2.70	1.45	3.35	0.52	1.22	0.66	1.52	1.49	1.59	1.67	1.79
50JN350		7.65	51	1.30	3.00	1.64	3.75	0.59	1.36	0.74	1.70	1.50	1.59	1.68	1.80
50JN400		7.65	47	1.45	3.25	1.85	4.05	0.66	1.47	0.84	1.84	1.52	1.61	1.69	1.81
50JN470		7.70	38	1.65	3.65	2.10	4.65	0.75	1.66	0.95	2.11	1.54	1.63	1.71	1.82
50JN600		7.75	32	2.00	4.50	2.50	5.62	0.91	2.04	1.13	2.55	1.52	1.61	1.70	1.81
50JN700		7.80	28	2.52	5.50	3.30	6.90	1.14	2.49	1.50	3.13	1.55	1.65	1.73	1.84
50JN800		7.80	24	2.95	6.30	3.65	8.00	1.34	2.86	1.66	3.63	1.57	1.66	1.74	1.84
50JN1000		7.85	18	3.25	7.20	4.15	9.15	1.47	3.27	1.88	4.15	1.59	1.69	1.75	1.85
50JN1300		7.85	15	3.75	8.10	4.75	10.20	1.70	3.67	2.15	4.63	1.58	1.67	1.76	1.87
65JN800	0.65 (0.0256)	7.80	28	3.25	7.00	4.20	8.90	1.47	3.18	1.91	4.04	1.56	1.64	1.72	1.82
65JN1600		7.85	15	4.90	9.90	6.15	13.00	2.22	4.49	2.79	5.90	1.57	1.67	1.76	1.86

Note : 1. Values above were measured according to the method JIS C 2550 (2000).
2. Test samples were consisted of half the strips sheared parallel and half sheared transverse to the rolling direction.
3. W15/50 indicates the core loss at 50Hz and 1.5T. B50 indicates the magnetic flux density at 5000A/m.
4. The specimens were tested as sheared.
5. The values shown above are the typical ones, not for guarantee.

JNE CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Resistivity μΩ-cm	Core Loss								Magnetic Flux Density T			
				Watts per kilogram				Watts per pound							
				50Hz		60Hz		50Hz		60Hz					
				1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	B10	B25	B50	B100
35JNE230	0.35 (0.0138)	7.65	55	0.98	2.15	1.20	2.70	0.44	0.97	0.54	1.22	1.51	1.59	1.69	1.82
35JNE250		7.65	47	1.02	2.30	1.27	2.90	0.46	1.04	0.58	1.31	1.53	1.60	1.70	1.83
35JNE300		7.70	41	1.14	2.60	1.42	3.25	0.52	1.18	0.64	1.47	1.54	1.63	1.72	1.85
35JNE440		7.75	36	1.35	3.00	1.70	3.75	0.61	1.36	0.77	1.70	1.55	1.64	1.73	1.85
50JNE300	0.50 (0.0197)	7.65	47	1.18	2.70	1.51	3.45	0.53	1.22	0.68	1.56	1.53	1.61	1.70	1.83
50JNE350		7.70	41	1.41	3.10	1.80	3.95	0.64	1.41	0.82	1.79	1.55	1.64	1.73	1.85
50JNE470		7.75	36	1.43	3.20	1.81	4.00	0.65	1.45	0.82	1.82	1.56	1.65	1.74	1.86

Note : 1. Values above were measured according to the method JIS C 2550 (2000).
2. Test samples were consisted of half the strips sheared parallel and half sheared transverse to the rolling direction.
3. W15/50 indicates the core loss at 50Hz and 1.5T. B50 indicates the magnetic flux density at 5000A/m.
4. The specimens were tested as sheared.
5. The values shown above are the typical ones, not for guarantee.

JNEH CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Resis-tivity μΩ-cm	Core Loss										Magnetic Flux Density T			
				Watts per kilogram					Watts per pound								
				50Hz		60Hz		400Hz	50Hz		60Hz		400Hz				
				1.0T	1.5T	1.0T	1.5T	1.0T	1.0T	1.5T	1.0T	1.5T	1.0T	B10	B25	B50	B100
20JNEH1200	0.20 (0.0080)	7.65	55	0.92	2.13	1.12	2.62	11.0	0.42	0.97	0.51	1.19	4.85	1.46	1.57	1.67	1.78
20JNEH1500		7.65	47	1.09	2.55	1.33	3.13	12.5	0.49	1.16	0.60	1.42	5.67	1.48	1.57	1.66	1.79

Note : 1. Values above were measured according to the method JIS C 2550 (2000).
2. Test samples were consisted of half the strips sheared parallel and half sheared transverse to the rolling direction.
3. W15/50 indicates the core loss at 50Hz and 1.5T. B50 indicates the magnetic flux density at 5000A/m.
4. The specimens were tested as sheared.
5. The values shown above are the typical ones, not for guarantee.

JNA CORE

Grade	Thickness mm (in.)	Assumed Density kg/dm³	Resistivity μΩ-cm	Core Loss								Magnetic Flux Density T			
				Watts per kilogram				Watts per pound							
				50Hz		60Hz		50Hz		60Hz					
				1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	1.0T	1.5T	B10	B25	B50	B100
50JNA300	0.50 (0.0197)	7.75	36	1.21	2.66	1.55	3.44	0.55	1.21	0.70	1.56	1.59	1.66	1.74	1.86
50JNA350		7.80	32	1.40	3.10	1.88	4.05	0.64	1.41	0.85	1.84	1.60	1.68	1.75	1.86
50JNA500		7.80	20	2.08	4.60	2.60	6.02	0.94	2.09	1.18	2.73	1.59	1.68	1.74	1.84

Note : 1. Values above were measured according to the method JIS C 2550 (2000).
2. Test samples were consisted of half the strips sheared parallel and half sheared transverse to the rolling direction.
3. W15/50 indicates the core loss at 50Hz and 1.5T. B50 indicates the magnetic flux density at 5000A/m.
4. The specimens were tested after stress relief annealing.
Annealing condition : 750℃ (1380℉) × 2hrs. under neutral atmosphere.
5. The values shown above are the typical ones, not for guarantee.

Non-Oriented Electrical Steel Sheets

JFE N-CORE

Typical Mechanical Properties

JN CORE

Grade	Thickness mm (in.)	Yield Point N/mm² L	Yield Point N/mm² C	Yield Point lb/in² L	Yield Point lb/in² C	Tensile Strength N/mm² L	Tensile Strength N/mm² C	Tensile Strength lb/in² L	Tensile Strength lb/in² C	Elongation % L	Elongation % C	Hardness Hv (1)	Number of Bends L	Number of Bends C	Lamination Factor %
35JN210	0.35 (0.0138)	432	450	62,700	65,300	555	574	80,500	83,200	19	20	222	5	5	98.3
35JN230		401	413	58,200	59,900	527	543	76,400	78,800	20	22	215	5	5	98.3
35JN250		405	417	58,700	60,500	531	546	77,000	79,200	20	22	215	5	5	98.3
35JN270		415	429	60,200	62,200	540	556	78,300	80,600	20	21	216	10	9	98.3
35JN300		393	402	57,000	58,300	523	541	75,900	78,500	24	25	201	11	10	98.3
35JN360		351	356	50,900	51,600	489	504	70,900	73,100	27	28	182	15 or more	15 or more	98.3
35JN440		278	279	40,300	40,500	418	430	60,600	62,400	32	33	150	15 or more	15 or more	98.3
50JN230	0.50 (0.0197)	435	453	63,100	65,700	557	576	80,800	83,500	19	20	221	4	5	98.8
50JN250		407	421	59,000	61,100	534	552	77,400	80,100	21	23	213	4	5	98.8
50JN270		410	424	59,500	61,500	534	555	77,400	80,500	22	24	213	4	5	98.8
50JN290		414	427	60,000	61,900	534	560	77,400	81,200	23	25	213	5	5	98.8
50JN310		414	427	60,000	61,900	534	560	77,400	81,200	23	25	213	12	11	98.8
50JN350		389	403	56,400	58,400	529	547	76,700	79,300	27	28	207	14	13	98.8
50JN400		332	343	48,200	49,700	476	494	69,000	71,600	29	31	184	15 or more	15 or more	98.8
50JN470		285	290	41,300	42,100	423	433	61,300	62,800	34	35	153	15 or more	15 or more	98.8
50JN600		265	268	38,400	38,900	400	406	58,000	58,900	34	36	137	15 or more	15 or more	98.8
50JN700		276	278	40,000	40,300	398	402	57,700	58,300	35	36	127	15 or more	15 or more	99.0
50JN800		275	276	39,900	40,000	390	395	56,600	57,300	36	37	125	15 or more	15 or more	99.0
50JN1000		260	262	37,700	38,000	367	370	53,200	53,700	37	39	117	15 or more	15 or more	99.0
50JN1300		256	258	37,100	37,400	358	360	51,900	52,200	39	39	112	15 or more	15 or more	99.0
65JN800	0.65 (0.0256)	276	278	40,000	40,300	398	402	57,700	58,300	36	37	127	15 or more	15 or more	99.3
65JN1600		256	258	37,100	37,400	358	360	51,900	52,200	39	39	112	15 or more	15 or more	99.3

JNE CORE

Grade	Thickness mm (in.)	Yield Point N/mm²		Yield Point lb/in²		Tensile Strength N/mm²		Tensile Strength lb/in²		Elongation %		Hardness Hv (1)	Number of Bends		Lamination Factor %
		L	C	L	C	L	C	L	C	L	C		L	C	
35JNE230	0.35 (0.0138)	398	396	57,700	57,400	515	531	74,700	77,000	20	21	201	15 or more	15 or more	98.5
35JNE250		349	351	50,600	50,900	468	482	67,900	69,900	21	22	182	15 or more	15 or more	98.5
35JNE300		305	308	44,200	44,700	438	453	63,500	65,700	27	28	159	15 or more	15 or more	98.5
35JNE440		296	291	43,000	42,200	415	399	60,200	57,900	33	33	140	15 or more	15 or more	98.5
50JNE300	0.50 (0.0197)	350	354	50,800	51,300	478	494	69,300	71,600	25	26	182	15 or more	15 or more	99.0
50JNE350		315	318	45,700	46,100	441	457	63,900	66,300	31	32	156	15 or more	15 or more	99.0
50JNE470		264	265	38,300	38,400	388	398	56,300	57,700	32	34	140	15 or more	15 or more	99.0

JNEH CORE

Grade	Thickness mm (in.)	Yield Point N/mm²		Yield Point lb/in²		Tensile Strength N/mm²		Tensile Strength lb/in²		Elongation %		Hardness Hv (1)	Number of Bends		Lamination Factor %
		L	C	L	C	L	C	L	C	L	C		L	C	
20JNEH1200	0.20 (0.0080)	375	388	54,300	56,200	496	515	71,900	74,700	16	16	199	10	9	97.0
20JNEH1500		370	377	53,700	54,700	481	497	69,800	72,100	18	19	187	15 or more	15 or more	97.0

JNA CORE

Grade	Thickness mm (in.)	Yield Point N/mm²		Yield Point lb/in²		Tensile Strength N/mm²		Tensile Strength lb/in²		Elongation %		Hardness Hv (1)	Number of Bends		Lamination Factor %
		L	C	L	C	L	C	L	C	L	C		L	C	
50JNA300	0.50 (0.0197)	264	265	38,300	38,400	388	398	56,300	57,700	32	34	140	15 or more	15 or more	99.0
50JNA350		260	263	37,700	38,100	370	380	53,700	55,100	36	38	127	15 or more	15 or more	99.0
50JNA500		248	253	36,000	36,700	362	364	52,500	52,800	38	39	115	15 or more	15 or more	99.0

Note : 1. "L" and "C" means the specimens cut parallel and traverse to the rolling direction, respectively.
2. Tension tests were made on No.13A specimens according to JIS Z 2201 (1998).
3. Bend and lamination factor tests were made according to the method JIS C 2550 (2000).
4. The specimens were tested as sheared.
5. Test values shown above are the typical ones, not for guarantee.
6. The specimens with A coating were used for lamination factor tests.

Non-Oriented Electrical Steel Sheets

JFE N-CORE

Dimensions and Tolerances

Dimensions

Form	Grade		Thickness	Available width range	Inside coil diameter
Coils	JN CORE	35JN210	0.35 (0.0138)	from 50 mm (2 in.) to 1,160 mm (45.67 in.)	508mm (20 in.)
		50JN230	0.50 (0.0197)		
		35JN230, 35JN250, 35JN270	0.35 (0.0138)	from 50 mm (2 in.) to 1,230 mm (48.42 in.)	
		50JN250, 50JN270, 50JN290, 50JN310	0.50 (0.0197)		
		35JN300, 35JN360, 35JN440	0.35 (0.0138)	from 50 mm (2 in.) to 1,250 mm (49.21 in.)	
		50JN350, 50JN400, 50JN470, 50JN600, 50JN700, 50JN800, 50JN1000, 50JN1300	0.50 (0.0197)		
		65JN800, 65JN1000, 65JN1300, 65JN1600	0.65 (0.0256)		
	JNE CORE	35JNE230, 35JNE250, 35JNE300, 35JNE440	0.35 (0.0138)	from 50 mm (2 in.) to 1,250 mm (49.21 in.)	
		50JNE300, 50JNE350, 50JNE470	0.50 (0.0197)		
	JNEH CORE	20JNEH1200	0.20 (0.0080)	from 50 mm (2 in.) to 1,160 mm (45.67 in.)	
		20JNEH1500			
	JNA CORE	50JNA300, 50JNA350, 50JNA500	0.50 (0.0197)	from 50 mm (2 in.) to 1,250 mm (49.21 in.)	

Tolerances in Dimension and Shape of Slit coils

Tolerances in dimension and shape conform to JIS C 2553

Width mm	Thickness mm	Tolerance				
		Thickness %	Deviation of thickness in transverse direction mm	Width mm	Camber in any 2 meters (Slit Products) mm	Shear Burr mm
150 or under	0.20	±10	0.02 or under	+0.3 0	1.0 or under	0.035 or under
	0.35	±10	0.02 or under			
	0.50	±8	0.03 or under			
	0.65	±8	0.03 or under			
Over 150 to 400	0.20	±10	0.02 or under	+0.5 0		
	0.35	±10	0.02 or under			
	0.50	±8	0.03 or under			
	0.65	±8	0.03 or under			
Over 400 to 750	0.20	±10	0.02 or under	+1.5 0		
	0.35	±10	0.02 or under			
	0.50	±8	0.03 or under			
	0.65	±8	0.04 or under			
Over 750	0.20	±10	0.03 or under	+1.5 0		
	0.35	±10	0.03 or under			
	0.50	±8	0.04 or under			
	0.65	±8	0.04 or under			

Note : Stipulation of camber shall be applied only for the steel strips (width 75mm over)

Stress-Relief Annealing

Magnetic properties of electrical steel sheets are deteriorated by a mechanical strain caused by shearing, punching, bend-forming.
Stress-relief annealing is performed to remove such strain and to restore the inherent good magnetic properties.
Stress-relief annealing may vary according to the degree of fabrication and the type of annealing equipment.

The following points call for attention:

Heating and cooling rates

Magnetic properties are not affected by heating or cooling rates as performed on an ordinary industrials scale. However, care must be taken so that no strain will remain in the material.

Annealing temperature and holding time

a. Grain-oriented Electrical steel sheets

Optimum annealing temperature range is 780 - 820 ˚C. (1436 ˚F - 1508 ˚F)
Material must be maintained until heated up uniformly within this temperature range. Holding time varies depending upon the shape of core, the number of coils charged and the type of furnace.

b. Non-oriented Electrical steel sheets

Optimum temperature of the stress-relief annealing, when required, is 720-750˚C.(1328˚F - 1382˚F)

Prevention of carburization and oxidation

Since carburization and an excessive oxidation will cause the deterioration of magnetic properties of the steel, the atmospheric gas must be carefully controlled and the gas must also have a low dew point.
For the prevention of the carbuization during annealing, organic compounds such as oil and grease remained on the coil surface during the fabrication must also be removed completely in advance. The use of material of low carbon content is recommended for the base and cover of the annealing furnace.

Surface Insulation

JFE Steel offers the following types of coatings for surface insulation.The customers can select one that best meets their requirements for interlamination resistance, punchability, heat resistance, Freon resistance and other properties.

A, N Coating

As to A, N coating, an organic resin is added to inorganic coating.
It has excellent punchability, corrosion resistivity and Freon resistance, with exceedingly high interlamination resistance shown in the case of the higher grades. Suited to large rotors, especially to motors for electric household appliances where good punchability is required.
A and N Coating has no equivalent in the AISI standards.

D Coating

This phosphate-based inorganic coating has been extensively used since its development in 1959, as it has such excellent characteristics as interlamination resistance, adhesion, heat resistance, lamination factor required for coating.
The interlamination resistance becomes better as the grade becomes higher.D-coating is equivalent to AISI Core Plate C4.

J Coating

An organic resin is also partially added to inorganic coating.
In comparison with A,N coating, it has excellent heat-resistancy due to the improvement of an organic resin itself.
J coating has no equivalent in the AISI standards.

Unless otherwise specified, A Coating will be applied and at the end of grade designation, type of surface insulation is indicated.
Ex : 50JN600*A — means 50JN600 appiled with A coating.

The Characteristics of Insulating Coatings for JFE N-CORE(0.5mm thick)

Items			A, N (thin)	J (thin)	A, N (thick)	D	Notice
(1) Applied grades			JN, JNE, JNEH, JNA	JN, JNA	JN, JNE, JNEH, JNA	JN, JNE, JNA	
(2) Comparable to AISI Core-Plate			—	—	—	C-4	
(3) Composition			Inorganic with some organic materials	Inorganic with some organic materials	Inorganic with some organic materials	Inorganic (Phosphate)	
(4) Tickness of coating (μm per side)			0.2 - 0.5	0.2 - 0.5	0.6 - 1.4 *	0.3 - 0.8 *	*The higher grade,the higher value.
(5) Lamination factor (%)			98.5	98.5	98.0	98.0 - 98.5	Pressure : 1N/mm^2 (JIS C 2550)
(6) Adhesion (mmϕ)			10	10	10	20	Minumum mandrel diameter without flaking
(7) Interlaminar resistance (Ω-cm^2/sheet)	Before annealing		1 - 10	1 - 10	10 - 80	1 - 30	JIS C 2550, Pressure : 2N/mm^2, Electrode:1cm^2 × 10 pieces, Voltage : 0.5V D.C. Annealing condition : 750℃×2hrs. in DX rich gas
	After annealing		< 1 - 5	< 1 - 5	< 1 - 20	< 1 - 5	
(8) Resistance to rust, Appearance change			not recognized	not recognized	not recognized	not recognized	Humidity cabinet test at 49℃ (relative humidity ≥ 98%) for 50 hrs.
(9) Resistance to freon	Appearance change		〃	〃	〃	〃	Freon : Lubricating oil = 9:1 at 80℃ for 10 days
	Weight change		〃	〃	〃	〃	
(10) Resistance to insulating oil	Appearance change		〃	〃	〃	〃	at 120℃ for 72 hrs. (oil : JIS C 2320)
	Weight change		〃	〃	〃	〃	
(11) Punchability Number of punchings at which burr height reaches 50μm. (×10^3)	Steel die	50JN350	—	—	500	30	Material of die:Tool steel Shape of punch:15mm dia. Clearance : 5% of sheet thickness Punching oil:Applied
		50JN470	—	—	600	40	
		50JN800	1000	1000	1500	80	
	Carbide die	50JN800	3000	3000	3000	1100	Material of die : WC-Co (JIS B 4104 V2)
(12) Weldability Max.welding speed without blowholes(cm/min)			60	60	30	120	Current : 120A, Ar gas flow:6l/min., Electrode : Th-W 2.6mmϕ, Gap between material andelectrode : 15mm, Clamping pressure : 100kg/cm^2, Weld groove : Provided
(13) Heat resistance Flaking after annealing			not recognized	not recognized	not recognized	not recognized	Annealing condition: 750℃ × 2hrs. in DX rich gas

Note : These above values are those obtained under the certain limited conditions in our laboratory.

Substances of Environmental Concern Data

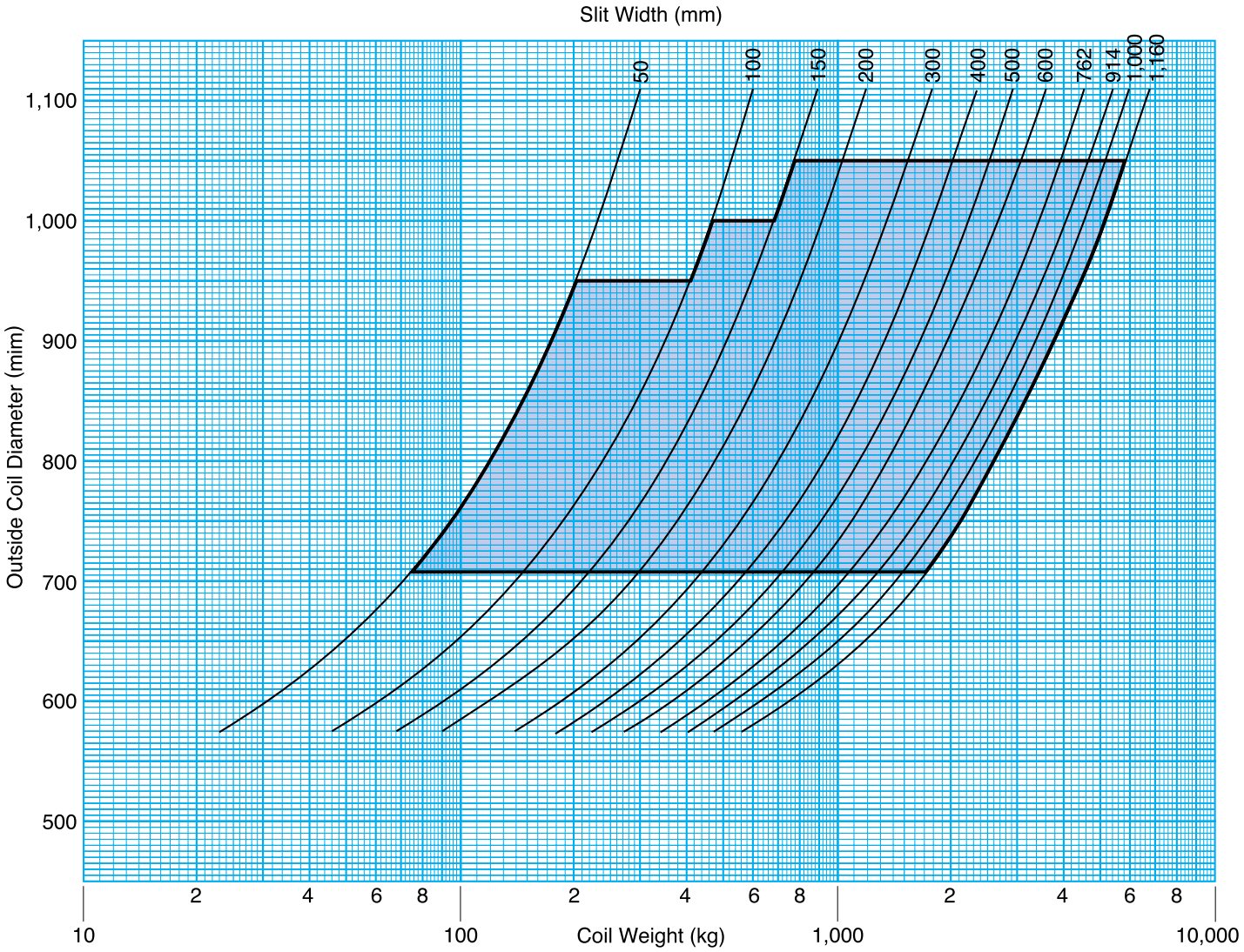
In JFE's Electrical Steel Sheet products, substances of environmental concern listed below are not detected in the results of analyses conducted by following methods.

Analytical method

Substance	Preparation	Analytical method	Minimum limit of determination
Hg	Wet digestion	Atomic absorption spctrometric method after reduction-generation as Mercury gas	1 ppm
Cd	Wet digestion (dissolved completely)	Atomic absorption spectrometric method	10 ppm
Pb			10 ppm
Cr^{6+}	Extraction in boiling water	Diphenylcarbazide spectrophotometric method	0.01 $\mu g/cm^2$

Note : 1. Insulation coating contains Cr^{3+}.
Please pay attention when heating in the oxidizing atmosphere or using in the high temperature conditions.
2. Chemical substances such as PBB and PBDE are neither intentionally added nor used in our production processes.

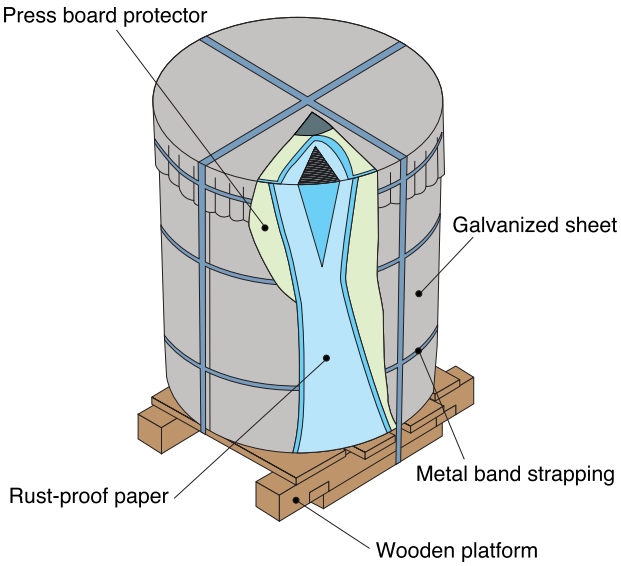
Relations among Coil Weight, Outside Coil Diameter and Slit Width



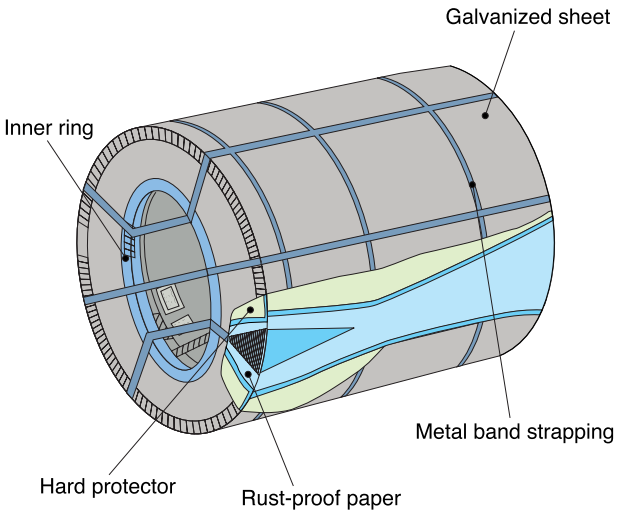
Note : 1. Inside Coil Diameter 508mm (20 in.)
2. This chart is for JFE G-CORE. In appling to JFE N-CORE, the curves are a little different from this.
3. The shadowed portion shows the general available dimensions.
Please contact to us if there is any request about the other available sizes.

Packaging

Coil Vertical Axis Type



Coil Horizonal Axis Eye Hole Type



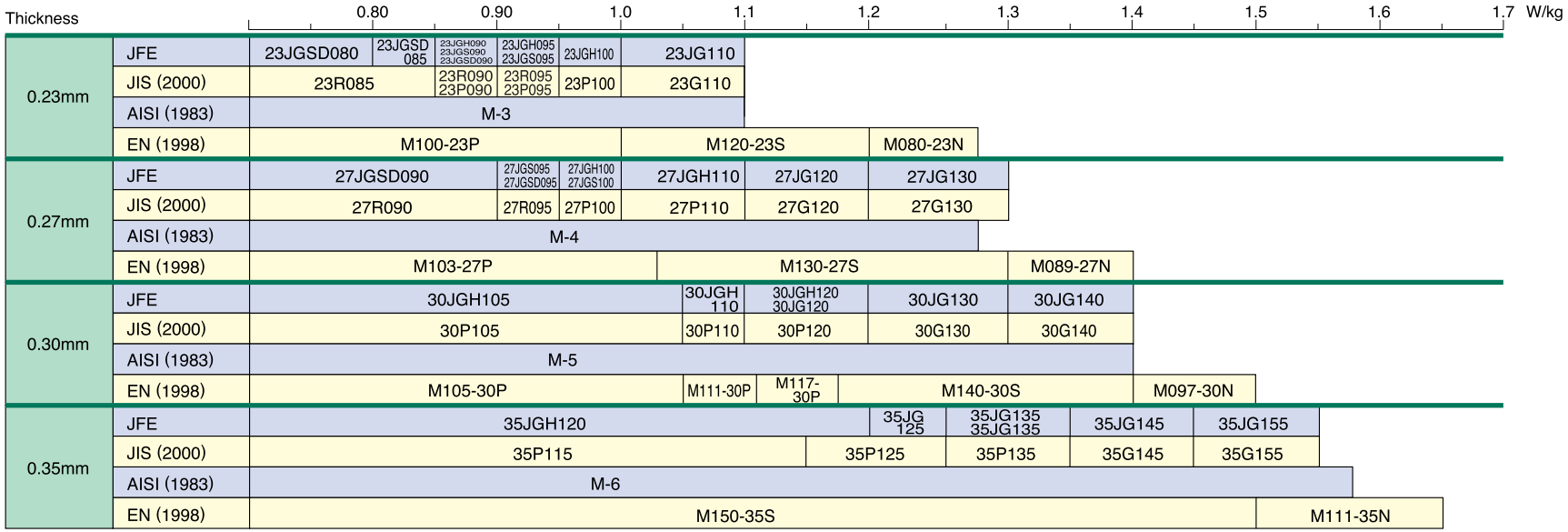
Conversion Factors

Units	Multiply	By	To Obtain
Magnetizing Force	Oersted (Oe)	7.958×10	Ampere per meter (A/m)
	Oersted (Oe)	2.021	Ampere per inch (A/in)
	Ampere per meter (A/m)	1.257×10^{-2}	Oersted (Oe)
	Ampere per meter (A/m)	2.540×10^{-2}	Ampere per inch (A/in)
	Ampere per inch (A/in)	4.947×10^{-1}	Oersted (Oe)
	Ampere per inch (A/in)	3.937×10	Ampere per meter (A/m)
	Ampere per centimeter (A/cm)	10^{2}	Ampere per meter (A/m)
Magnetic Induction	Tesla (T)	10^{4}	Gauss (G)
	Tesla (T)	1	Weber per square meter (Wb/m^2)
	Gauss(G)	10^{-4}	Weber per square meter (Wb/m^2)
	Gauss(G)	6.452	Lines per square inch ($Line/in^2$)
	Weber per square meter (Wb/m^2)	10^{4}	Gauss (G)
	Weber per square meter (Wb/m^2)	1	Tesla (T)
	Weber per square meter (Wb/m^2)	6.452×10^{4}	Lines per square inch ($Line/in^2$)
	Lines per square inch ($Line/in^2$)	1.550×10^{-1}	Gauss (G)
	Lines per square inch ($Line/in^2$)	1.550×10^{-5}	Weber per square meter (Wb/m^2)
Core Loss	Watt per kilogram (W/kg)	4.536×10^{-1}	Watt per pound (W/lb)
	Watt per pound (W/lb)	2.204	Watt per kilogram (W/kg)
Permeability	CGS electro-magnetic unit (emu)	1	Gauss per Oersted (G/Oe)
	CGS electro-magnetic unit (emu)	1.257×10^{-6}	Henry per meter (H/m)
	CGS electro-magnetic unit (emu)	1.257×10^{-6}	Weber per Ampere-meter (Wb/A-m)
	CGS electro-magnetic unit (emu)	3.192×10^{-8}	Weber per Ampere-inch (Wb/A-in)
	CGS electro-magnetic unit (emu)	3.192	Lines per Ampere-inch (Line/A-in)
	Henry per meter (H/m)	7.958×10^{5}	CGS electro-magnetic unit (emu)
	Henry per meter (H/m)	7.958×10^{5}	Gauss per Oersted (G/Oe)
	Henry per meter (H/m)	2.540×10^{-2}	Weber per Ampere-inch (Wb/A-in)
	Henry per meter (H/m)	2.540×10^{6}	Lines per Ampere-inch (Line/A-in)
Length	Meter (m)	3.937×10	Inch (in)
	Inch (in)	2.540×10^{-2}	Meter (m)
	Meter (m)	3.281	Feet (ft)
	Feet (ft)	3.048×10^{-1}	Meter (m)
Weight	Kilogram (kg)	2.204	Pound (lb)
	Pound (lb)	4.536×10^{-1}	Kilogram (kg)

Comparison of specification

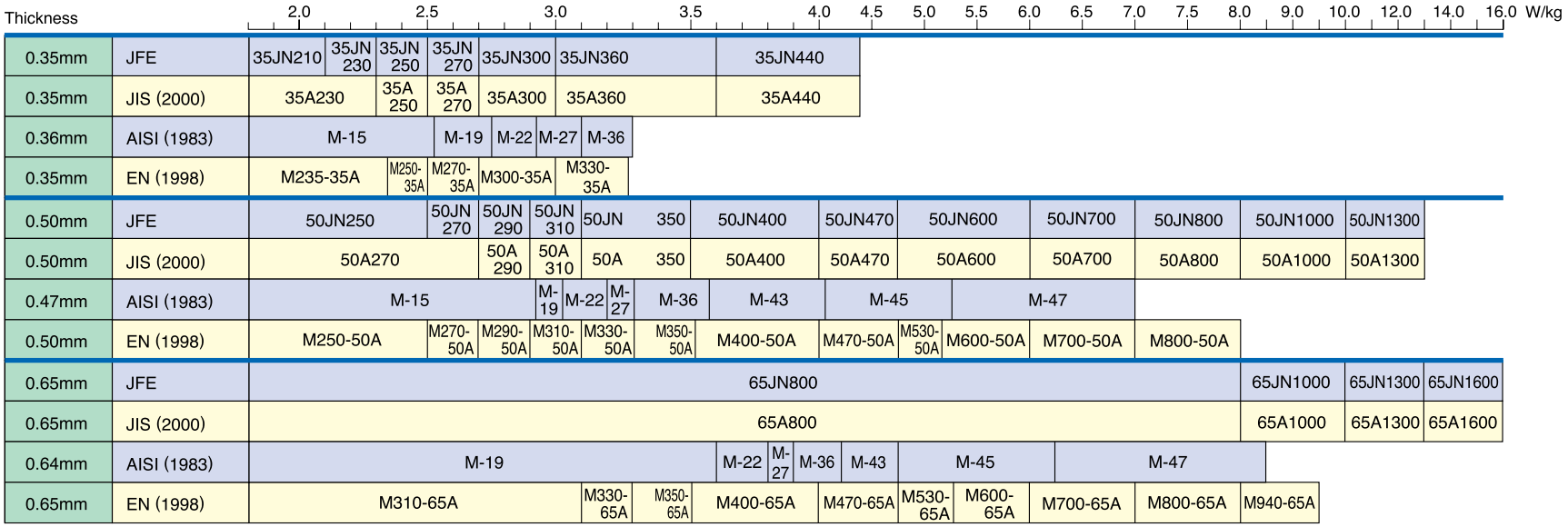
Grain-Oriented

JFE STANDARD
vs JIS,AISI,EN
Core Loss W17/50
(at 1.7T and 50Hz)



Non-Oriented

JFE STANDARD
vs JIS,AISI,EN
Core Loss W15/50
(at 1.5T and 50Hz)



• For further information, please contact our nearest office or send your inquiries directly to:

Electrical Steel Sec. Electrical Appliance Steel Sales Dept. Phone 03(3597)4101 Fax 03(3597)4779
Electrical Steel Business Planning Dept. Phone 03(3597)3480 Fax 03(3597)3494

Cat.No.F1E-001-04

JFE

JFE Steel Corporation

http://www.jfe-steel.co.jp/en/

TOKYO HEAD OFFICE Hibiya Kokusai Building, 2-3 Uchisaiwaicho 2-chome, Chiyodaku, Tokyo 100-0011, Japan
Phone : (81)3-3597-3111 Fax : (81)3-3597-4860

NEW YORK OFFICE JFE Steel America, Inc.
600 Third Avenue, 12th Floor, New York, NY 10016, U.S.A.
Phone : (1)212-310-9320 Fax : (1)212-308-9292

HOUSTON OFFICE JFE Steel America, Inc., Houston Office
10777 Westheimer, Suite 230, Houston, TX 77042, U.S.A.
Phone : (1)713-532-0052 Fax : (1)713-532-0062

BRISBANE OFFICE JFE Steel Australia Resources Pty Ltd.
Level 19, CPA Centre, 307 Queen St, Brisbane, QLD 4001, Australia
Phone : (61)7-3229-3855 Fax : (61)7-3229-4377

RIO DE JANEIRO OFFICE JFE Steel do Brasil LTDA / JFE Steel Corporation, Rio de Janeiro Office
Praia de Botafogo, 228 Setor B, Salas 508 & 509, Botafogo, CEP 22250-040, Rio de Janeiro-RJ, Brazil
Phone : (55)21-2553-1132 Fax : (55)21-2553-3430

LONDON OFFICE JFE Steel Europe Limited
15th Floor, The Broadgate Tower, 20 Primrose Street, London EC2A 2EW, U.K.
Phone : (44)20-7426-0166 Fax : (44)20-7247-0168

DUBAI OFFICE JFE Steel Corporation, Dubai Office
P.O.Box 261791 LOB19-1208, Jebel Ali Free Zone Dubai, U.A.E.
Phone : (971)4-884-1833 Fax : (971)4-884-1472

NEW DELHI OFFICE JFE Steel India Private Limited
1101, 11th Floor, Unitech's Signature Tower, Tower-A, South City-I, NH-8, Gurgaon, Haryana, 122002, India
Phone : (91)124-426-4981 Fax : (91)124-426-4982

MUMBAI OFFICE JFE Steel India Private Limited Mumbai Office
308, A Wing, 215 Atrium, Andheri - Kurla Road, Andheri (East), Mumbai - 400093, Maharashtra, India
Phone : (91)22-3076-2760 Fax : (91)22-3076-2764

SINGAPORE OFFICE JFE Steel Asia Pte. Ltd.
16 Raffles Quay, No. 15-03, Hong Leong Building, 048581, Singapore
Phone : (65)6220-1174 Fax : (65)6224-8357

BANGKOK OFFICE JFE Steel (Thailand) Ltd.
22nd Floor, Abdulrahim Place 990, Rama Ⅳ Road, Bangkok 10500, Thailand
Phone : (66)2-636-1886 Fax : (66)2-636-1891

VIETNAM OFFICE JFE Steel Vietnam Co., Ltd.
Unit 1401, 14th Floor, Kumho Asiana Plaza, 39 Le Duan Street, Dist 1, HCMC, Vietnam
Phone : (84)8-3825-8576 Fax : (84)8-3825-8562

JAKARTA OFFICE JFE Steel Corporation, Jakarta Office
16th Floor Summitmas Ⅱ, JL Jendral Sudirman Kav. 61-62, Jakarta 12190, Indonesia
Phone : (62)21-522-6405 Fax : (62)21-522-6408

MANILA OFFICE JFE Steel Corporation, Manila Office
23rd Floor 6788 Ayala Avenue, Oledan Square, Makati City, Metro Manila, Philippines
Phone : (63)2-886-7432 Fax : (63)2-886-7315

SEOUL OFFICE JFE Steel Korea Corporation
6th Floor. Geumgang-Tower. 889-13, Daechi-dong, Gangnam-gu, Seoul, 135-570, Korea
Phone : (82)2-3468-4130 Fax : (82)2-3468-4137

BEIJING OFFICE JFE Steel Corporation Beijing
1009 Beijing Fortune Building No.5, Dongsanhuan North Road, Chaoyang District, Beijing, 100004, P.R.China
Phone : (86)10-6590-9051 Fax : (86)10-6590-9056

SHANGHAI OFFICE JFE Consulting (Shanghai) Co., Ltd.
Room 801, Building A, Far East International Plaza, 319 Xianxia Road, Shanghai 200051, P.R.China
Phone : (86)21-6235-1345 Fax : (86)21-6235-1346

GUANGZHOU OFFICE JFE Consulting (Guangzhou) Co., Ltd./ JFE Steel Corporation, Guangzhou Office
Room 3901, Citic Plaza, 233 Tian He North Road, Guangzhou 510613, P.R.China
Phone : (86)20-3891-2467 Fax : (86)20-3891-2469

1303P(0909)5-0.5 SPa