ELECTRICAL STEEL

WHAT IS ELECTRICAL STEEL?

Electrical steels are a type of steel with high %Si content and the most important feature is their low magnetic loss compared to standard steels.

Main scope of electrical steel is to create best conductivity of magnetic field which assures the minimum loss in energy transformation. They are generally produced in cold rolled strips less than 1 mm thickness.

Electrical steels are divided into NGO (Non Grain Oriented) and GO (Grain Oriented) grades according to the magnetic behavior. Only fully processed NGO grades are produced in Erdemir Romania plant.

NGO grades are produced according to EN 10106 standard and have Si content ranging between 0.6-3.0%. Grains are oriented independently from the rolling direction and the magnetic property of the material remains same in all directions. 0.35 - 0.50 - 0.65 and 1.00 mm thicknesses are available.

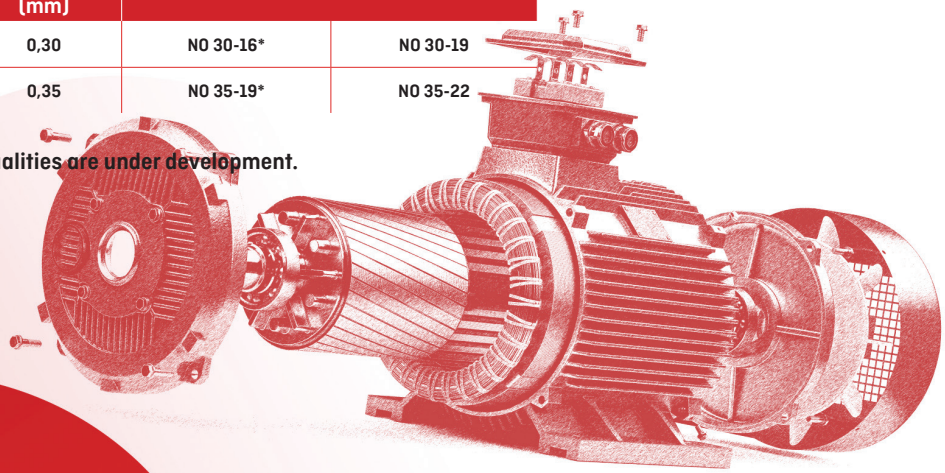
NO Grades are special type of NGO electrical steels with improved properties at medium frequencies specially dedicated to e-mobility.

All specified grades are available in high permeability (HP) versions.

Thickness (mm)	NGO Grades													
0,35	M210*	M235*	M250*	M270	M300	M330								
0,50	M230*	M250*	M270	M290	M310	M330	M350	M400	M470	M530	M600	M700	M800	M940
0,65	M310*	M330	M350	M400	M470	M530	M600	M700	M800	M1000				
1,00	M600	M700	M800	M1000	M1300									

Thickness (mm)	NGO Grades	
0,30	NO 30-16*	NO 30-19
0,35	NO 35-19*	NO 35-22

*Qualities are under development.



PRODUCTION LIMITS

Electrical steels can be produced as slitted or trimmed edge (SL), mill edge (ME), cut-to-length (CL) products within the following production limits.

	SL		ME		CL			
	Width (mm)				Width (mm)		Length (mm)	
Thickness (mm)	min	max	min	max	min	max	min	max
0,35	20	1320	1000	1320	600	1320	600	3000
0,50								
0,65								
1,00								

DIMENSIONAL TOLERANCES

Dimensional tolerances in electrical steels are applied according to EN 10106 standard.

Thickness Tolerance: ± 8% of thickness for 0.35 and 0.50 mm, ± 6% of thickness for 0.65 and 1.00 mm. The thickness difference across the width is max. 0.02 mm for thicknesses of 0.50 mm and below and max. 0.03 mm for thicknesses of 0.65 mm and above. Measurements are made min. 30 mm from the edge and are only applicable for widths over 150 mm.

Thickness (mm)	0,35	0,50	0,65	1,00
Change in thickness along the coil in the rolling direction	± % 8	± % 8	± % 6	± % 6
Change in thickness along the width	0,020	0,020	0,030	0,030

Width tolerance: It is -0/+20 mm for products without edge cuts. For products with cut or slitted edges, the table below is valid and can be applied in + or - direction.

Strip Width (mm)	≤ 150	151 - 300	301 - 600	601 - 1000	1001 - 1250
Tolerance (mm)	+0,2	+0,3	+0,5	+1	+1,5

Length tolerance: 0.5% of the sheet length, maximum 6 mm.

COATING TYPES

After annealing, materials can be coated with different types of coatings for isolation purposes.

Coating Classification According to ASTM	Isolation Type	Color	Coating Thickness per side (µ - microns)	Electric Resistance (Ω x cm2 / lamination)	Temperature Resistance in Air (Permanently)	Weldability	Punchability
C-0	Uncoated	-	-	-	-	-	-
C-3	Organic	Yellow-Green	0.5 - 1.5	>5	180 °C	Good	Very good
			2.5 - 4.5	>20		Not recommended	
			3.0 - 5.0	>50		Not recommended	
C-5	Inorganic with Organic Component	Yellow-Green	0.5 -2.0	>5	180 °C	Good	Very good
		Gray	1.0 - 2.0	>10	210 °C	Good	Very good
		Trans-parent	0.5 - 1.0	>3	210 °C	Very good	Very good
		Gray	0.5 - 1.5	>5	210 °C	Very good	Very good
		Gray	1.5 - 5.0	>20	270 °C	Very good	Good
C-6	Organic w/ Component Pigmented	Gray	3.0 - 7.0	>80	180 °C	Not recommended	Good
Backlack	Organic	Trans-parent	3.0 - 6.0	>50	180 °C	Not recommended	Good

We have capability of applying double coating.

Surface isolation resistance is determined according to EN 60404-11. Requests for surface isolation resistance and desired properties must be specified by the customer before the order and agreed with the manufacturer.

You can get information by sending your questions to **ngosales@erdemir.com.tr**

TECHNICAL SPECIFICATIONS

All specified grades are available in high permeability (HP) versions.

Our grades under development are M210, M235 and M250 in 0.35 mm thickness for NGO products; M230 and M250 in 0.50 mm thickness; M310 in 0.65 mm thickness; and NO30-16 and NO35-19 in NO products.

Grades	Nominal Thickness (mm)	Max. Specific Total Loss at 50 Hz and 1.5 T (W/kg)	Min. Magnetic Polarization (T) in an Alternating Magnetic Field Strength (A/m)			Max. Anisotropy of Loss at 50 Hz and 1.5 T (%)	Min Stacking Factor	Min. Number of Bends	Mechanical Properties *(typical values – informative only)*			
			2.500 A/m	5.000 A/m	10.000 A/m				Yield Strength [Mpa]	Tensile Strength [Mpa]	Elongation [%]	Hardness HV5
M270-35A	0,35	2,7	1,49	1,60	1,70	± 17	0.95	2	420	540	22	200
M300-35A		3,0	1,49	1,60	1,70	± 17	0.95	3	360	480	25	280
M330-35A		3,3	1,49	1,60	1,70	± 17	0.95	3	360	480	25	280
M270-50A	0,50	2,7	1,49	1,60	1,70	± 17	0.97	2	420	540	22	200
M290-50A		2,9	1,49	1,60	1,70	± 17	0.97	2	420	540	22	200
M310-50A		3,1	1,49	1,60	1,70	± 14	0.97	3	360	480	25	180
M330-50A		3,3	1,49	1,60	1,70	± 14	0.97	3	360	480	25	180
M350-50A		3,5	1,50	1,60	1,70	± 12	0.97	5	330	450	28	170
M400-50A		4,0	1l53	1,63	1,73	± 12	0.97	5	290	410	30	150
M470-50A		4,7	1,54	1,64	1,74	± 10	0.97	10	270	400	30	145
M530-50A		5,3	1,56	1,65	1,75	± 10	0.97	10	260	390	31	140
M600-50A		6,0	1,57	1,66	1,76	± 10	0.97	10	260	390	31	140
M700-50A		7,0	1,60	1,69	1,77	± 10	0.97	10	260	390	31	140
M800-50A		8,0	1,60	1,70	1,78	± 10	0.97	10	260	390	31	140
M940-50A		9,4	1,62	1,72	1,81	± 8	0.97	10	260	390	31	140
M350-65A	0,65	3,5	1,49	1,60	1,70	± 14	0.97	2	420	540	22	200
M400-65A		4,0	1,52	1,62	1,72	± 14	0.97	2	360	480	25	180
M470-65A		4,7	1,53	1,63	1,73	± 12	0.97	5	330	450	28	170
M530-65A		5,3	1,54	1,64	1,74	± 12	0.97	5	290	410	30	150
M600-65A		6,0	1,56	1,66	1,76	± 10	0.97	10	270	400	30	145
M700-65A		7,0	1,57	1,67	1,76	± 10	0.97	10	260	390	31	140
M800-65A		8,0	1,60	1,70	1,78	± 10	0.97	10	260	390	31	140
M1000-65A		10,0	1,61	1,71	1,80	± 10	0.97	10	260	390	31	140
M600-100A	1,00	6,0	1,53	1,63	1,72	± 10	0.98	2	360	480	25	180
M700-100A		7,0	1,54	1,64	1,73	± 6	0.98	3	330	450	28	170
M800-100A		8,0	1,56	1,66	1,75	± 6	0.98	5	290	410	30	150
M1000-100A		10,0	1,58	1,68	1,76	± 6	0.98	10	270	400	30	145
M1300-100A		13,0	1,60	1,70	1,78	± 6	0.98	10	270	400	30	145

WHERE TO USE?

Electrical steels are used in the laminations that are stacked to form the stators and rotors of electric motors. NGO products are used in areas such as electric motors, generators, wind energy turbines, white goods and home appliance motors while GO products are used mainly in transformers.

FIELDS OF APPLICATION		NGO GRADES		
		M270-35A/50A	M400-50A	M700A-50A/65A
		M330-35A	M470-65A	M940A-50A
		M350-50A	M600-65A/100A	M1000A-65A
		M400-65A	M1000-100A	M1300-100A
ROTATING MACHINES	Large Size Motors	✓		
	Medium Size Motors	✓		
	Small Size Motors	✓	✓	
	Generators			✓
	Hermetic Motors		✓	✓
	General Purpose AC Electric Motors		✓	✓
	Home Appliance Motors		✓	✓
	Small DC Motors	✓	✓	✓
	Compressor Motors	✓	✓	✓
STATIC MACHINES	Power Transformers	✓		
	Current Transformers	✓		
	Audio Transformers	✓	✓	✓
	Welding Transformers	✓	✓	✓
	Fluorescent Lamp Ballasts	✓	✓	✓
	Measuring Machines. Meters			✓
				✓

SCAN ME

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