

Grain Oriented Electrical Steels

Introduction

ArcelorMittal Frýdek-Místek is the part of the world's largest steel group company ArcelorMittal. The company is a significant producer of cold rolled steels. The production of the grain oriented electrical steel (GOES) has a long tradition in our company. At present time only few producers all over the world are able to produce GOES.

Thanks to the continuous investments in new facilities, technologies and development, the yearly production of GOES has increased nearly to 47 kt. Major investments were launched in years 2008 and 2009. These actions result in continuing quality improvement and wider range of GOES assortment.

Applications

The main application of GOES consists in the core of power, distribution and other types of transformers. This steel is also used in power reactors, hydro- and turbogeneratores for electrical energy generation. The use of GOES in this equipment improves its efficiency, contributing to the reduction of energy losses in the electrical system.





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GOES are supplied according to Standard EN CSN 10107:2006

Magnetic Properties and Stacking Factor

Steel Grade	Nominal thickness (mm)	Maximum specific total loss / max W / kg at 50 Hz and at		Minimum magnetic polarization (T) for H = 800 A/m	Minimum Stacking Factor
		1,5 T	1,7 T		
M110-23S	0,23	0,73	1,10	1,78	0,945
M120-23S	0,23	0,77	1,20	1,78	0,945
M127-23S	0,23	0,80	1,27	1,75	0,945
M120-27S	0,27	0,80	1,20	1,78	0,950
M130-27S	0,27	0,85	1,30	1,78	0,950
M140-27S	0,27	0,89	1,40	1,75	0,950
M130-30S	0,30	0,85	1,30	1,78	0,955
M140-30S	0,30	0,92	1,40	1,78	0,955
M150-30S	0,30	0,97	1,50	1,75	0,955
M140-35S	0,35	1,00	1,40	1,78	0,960
M150-35S	0,35	1,05	1,50	1,78	0,960
M165-35S	0,35	1,11	1,65	1,75	0,960

Note: Lower thickness based on an individual agreement only.

Typical Magnetic Properties of GOES produced in ArcelorMittal Frýdek-Místek

Grade	P 1,5 T at 50 Hz (W/kg)	P 1,7 T at 50 Hz (W/kg)	J800 (T)
M110-23S	0,72	1,05	1,87
M120-23S	0,75	1,14	1,86
M127-23S	0,78	1,21	1,85
M120-27S	0,78	1,14	1,87
M130-27S	0,82	1,21	1,86
M140-27S	0,87	1,29	1,85
M130-30S	0,83	1,18	1,87
M140-30S	0,88	1,26	1,86
M150-30S	0,93	1,32	1,84
M140-35S	0,96	1,32	1,86
M150-35S	1,02	1,42	1,85
M165-35S	1,07	1,53	1,83

Note: Typical values are for indicative purposes only.

Standard Sizes

Grade	Thickness (mm)	Available Range (mm)	Width		Inside Coil Diameter (mm)
			Standard (mm)		
M110-23S	0,23	50 - 950	950		508
M120-23S	0,23	50 - 950	950		508
M127-23S	0,23	50 - 950	950		508
M120-27S	0,27	50 - 950	950		508
M130-27S	0,27	50 - 950	950		508
M140-27S	0,27	50 - 950	950		508
M130-30S	0,30	50 - 950	950		508
M140-30S	0,30	50 - 950	950		508
M150-30S	0,30	50 - 950	950		508
M140-35S	0,35	50 - 950	950		508
M150-35S	0,35	50 - 950	950		508
M165-35S	0,35	50 - 950	950		508

Note: Width 20 - 49 mm based on an individual agreement only.

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Insulating coating

Both sides of GOES strip are coated with C2 insulation which is covered with C5 phosphate insulating coating.

Total thickness of these coatings is within the range of 1 – 4 micron/side.

Typical resistance of insulating coating is min. 10 Ωcm^2 measured by Franklin test according to EN 10282:2001; method A.

Insulating coating does not affect and is unaffected by transformer oil.

Strip width tolerances

Nominal width (mm)	Width tolerances (mm)
$l \leq 150$	0 / - 0,2
$150 \leq l \leq 400$	0 / - 0,3
$400 \leq l \leq 750$	0 / - 0,5
$l > 750$	0 / - 0,6

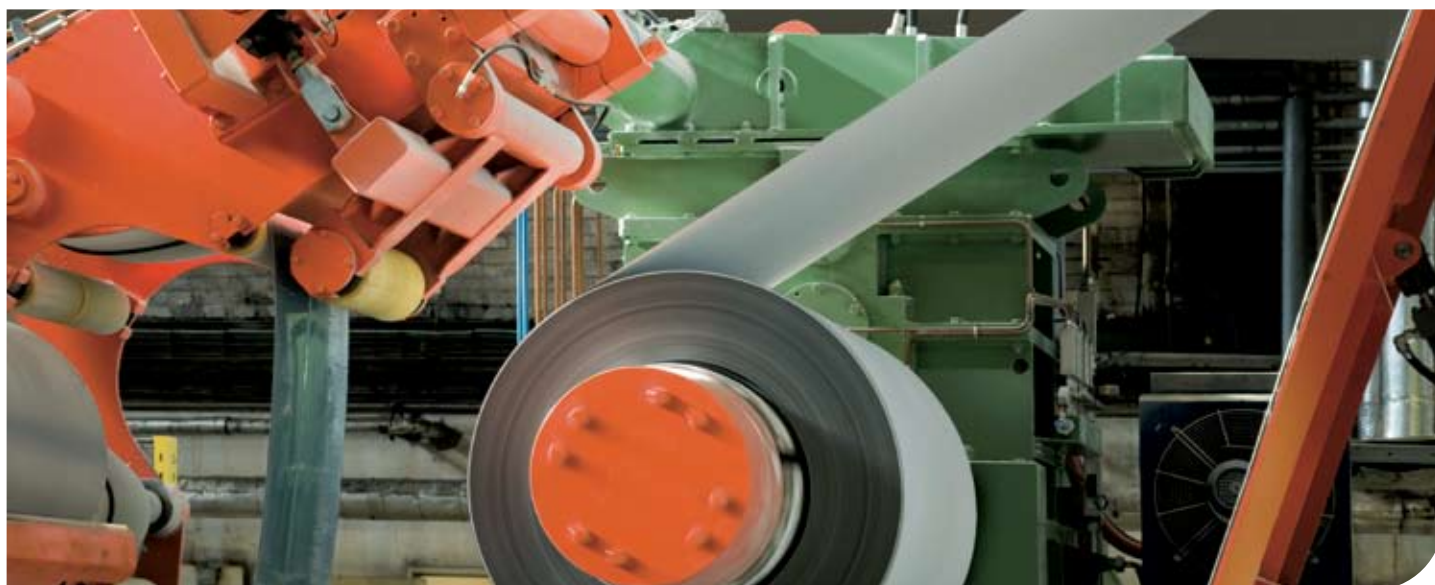
Note: When agreed in order all tolerances can be plus values.

Thickness and its tolerances

The nominal thicknesses of the material are 0,23 mm; 0,27 mm; 0,30 mm and 0,35 mm.

At any point, the allowable tolerance on the nominal thickness within the same acceptance unit shall not exceed $\pm 0,030$ mm (for the nominal thicknesses of the material 0,27 mm; 0,30 mm and 0,35 mm) and $\pm 0,025$ mm (for the nominal thickness of the material 0,23 mm).

The additional thickness due to welds with respect to the measured thickness of the steel sheet of strip shall not exceed 0,050 mm.



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Packaging GOES

Continental I.	Wrapped in antirust paper with inhibitor
	Wrapped in antirust stretch foil
	Cardboard cap
	Metal cap
	Steel ribbon
	Wooden pallet

Continental II.	Wrapped in antirust paper with inhibitor
	Wrapped in metal packaging
	Inner packing metal sheet
	Coil edge protection
	Steel ribbon
	Wooden pallet

Overseas I.	Metal Cap
	Bottom cardboard
	Wrapper in antirust paper with inhibitor
	Wrapped in antirust stretch foil
	Wrapped in metal packaging
	Steel ribbon
	Wooden pallet

Overseas II.	Metal Cap
	Bottom cardboard
	Wrapper in antirust paper with inhibitor
	Wrapper in antirust stretch foil with inhibitor
	Wrapped in plastic (PVC) packaging
	Steel ribbon
	Wooden pallet

