



## PRODUCT STANDARD HYDROGENERATOR

HG 10067 (REV  
00)  
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Date : 13.07.05

### MAGNETIC STEEL SHEET – COLD ROLLED GR. 250

#### 1.0 GENERAL :

This specification governs the quality requirements of high permeability magnetic steel sheet cold rolled, having a minimum 0.2% Proof Stress value of 250 N/mm<sup>2</sup>.

#### 2.0 APPLICATION :

Pole Lamination of Hydrogenerators.

#### 3.0 CONDITION OF DELIVERY:

Cold Rolled with trimmed edges in straight lengths (sheet form) in the ordered thickness & size as specified on BHEL order.

Material shall be supplied coated with Class 'F' insulation and with thickness of 1 to 2 micron per side and shall not contain any welds. The sheets shall be stacked so that their edges are superimposed in a regular manner.

#### 4.0 DIMENSIONS AND TOLERANCES :

##### 4.1 Sizes :

Magnetic steel sheet shall be supplied to the dimensions specified on BHEL order.

The thickness shall preferably be selected from the following standard sizes, 0.8, 1.0 mm. Sheets shall be supplied in straight lengths & shall be flat & edges cleanly sheared & truly squared. Sheets should be free from oil.

#### HYDRO-GENERATOR ENGINEERING DIVISION BHARAT HEAVY ELECTRICALS LTD. BHOPAL

PREPARED  
GRP/BKS

APPROVED  
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DATE  
13/07/2005



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4.2 Tolerances :

4.2.1 Thickness :

4.2.1.1 Nominal thickness

Nominal Thickness (mm) Permitted thickness tolerances for widths (mm)

Above	Upto	Upto 1250
0.8	1.0	+ / - 0 . 05

4.2.2 Width (Trimmed Edges)

Width (mm) Permitted Width tolerances (mm)

From	Upto	Plus	Minus
-	1250	+ 7	0
1250	2000	+ 10	0

4.2.3 Length :

Length (mm) Permitted Length tolerances (mm)

	Plus	Minus
Upto 2000	15	0
Above 2000	0.75% of length	0

4.2.4 Flatness :

The maximum distance between the lower face of the sheet and the flat horizontal surface shall not exceed the values given below:

Length (mm)	Maximum distance for nominal thickness
Less than 1250	8
1250 & above	10



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#### 4.2.5 Edge Camber :

The gap which characterizes the edge camber shall not exceed  $0.4\% \times$  Length of the sheet for material supplied with trimmed edges and above 150 mm width.

#### **5.0 FREEDOM FROM DEFECTS :**

The surface of the material, before application of insulation, shall be smooth and clean, free from grease, rust, loose scale and other surface defects such as burrs, cutting distortions, dents, waviness, scratches, blisters, cracks, pitting, cracked edges etc.

Insulation shall be tightly adherent to sheet & of homogeneous texture & uniform thickness. Insulation thickness shall not be less than 1.0 micron at any point on the sheet.

#### **6.0 TEST SAMPLES:**

One bend test and one hardness test shall be carried out from each lot of 5,000 kg. of material or part thereof, per melt per consignment.

Where material of more than one thickness are rolled from the same melt, one additional bend test shall be made for each thickness.

Test pieces shall be cut so that the axis of the bend is parallel to the direction of rolling, ie, bending shall be in perpendicular direction of rolling.

#### **7.0 PROPERTIES :**

The material, when tested as detailed in BS EN 10265 at a temperature of  $27 \pm 2$  deg C shall show the following properties :



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**7.1 Mechanical :**

Tensile strength	:	350 – 450 N/mm <sup>2</sup> minimum
0.2% Proof Stress	:	250 N/mm <sup>2</sup> minimum
Elongation on 80 mm	:	22 percent minimum
Gauge Length		

**7.2 Magnetic**

The material when tested on a Epstein frame at an AC magnetic field in amperes / metre shall show the following minimum corresponding value of magnetic flux density in Tesla.

Magnetic Field Strength A/m	Magnetic Flux Density Tesla (Minimum)
5000	1.6 For information
15000	1.8 Guaranteed

**8.0 TEST CERTIFICATE :**

Three copies of Test Certificate shall be supplied unless otherwise agreed to.

In addition, the supplier shall ensure to enclose one copy of the Test Certificate along with their dispatch documents, to facilitate quick clearance of the material.

The test certificate shall bear the following information :



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Material grade, BHEL Order No, Supplier's Name/Grade/Identification No., Size & Weight, Packet/Bundle No, Test Results of – a) Dimensions & Tolerances, b) Mechanical & c) Electromagnetic properties viz: Magnetic Flux Density in Tesla – Guaranteed at 15,000 A/m and For Information at 5000 A/m and B.H. Curve from 0 to 15000 A/M.

**9.0 PACKING AND MARKING :**

**9.1 Packing :**

Magnetic steel sheets shall be supplied in bundles. The packing shall be sea-worthy and shall protect the material from damage in transit.

Each sheet shall be marked with supplier's grade / references. These markings shall be along the rolling direction.

Note:

a)Water proof paper lining shall be preferably Volatile Corrosion Inhibitor (V.C.I.) Coated Paper with an additional polythene (100 micron) enveloped.

b)Approximate weight of each bundle shall be 2 to 3 metric tones. Bundle weighing 2 metric tones is however preferred.

c)The packing shall ensure that there is no seepage of moisture and the sheets reach BHEL in completely rust free condition. It shall be strong enough to withstand handling at the docks, at sea and on the road.

**9.2 Marking**

A metal label / tag shall be securely attached with each bundle, outside its wrapping and shall be legibly marked with the following information:

BHEL Order No, Supplier's Name / Grade / Identification No, size & Weight, Melt No, Packet / Bundle No.