Sub: Development, Fabrication of magnetic assembly and jigs along with room temperature cure epoxy

Dear Sir/Madam,

1. Quotations are invited for development, fabrication of magnetic assembly and jigs along with room temperature cure epoxy as per the technical specification document No: EmA&ID/HABA/TM/01 dated 04/11/2020.

2. Bidder shall quote for fabrication of jigs for assembly of T-R configuration permanent magnets on circular disc. These magnets shall be fixed by three part room temperature cure epoxies.

3. Taxes and Excise Duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.

4. The quotation must reach The Head, Electromagnetic Applications & Instrumentation Division by 13th Nov, 2020 and must be sent in a sealed envelope super scribed with the reference number & the due date given above.

5. The quotations shall be sent only through registered post/speed post through Indian postal services.

6. The address on the envelop should read:

   The Head,
   Electromagnetic Applications & Instrumentation Division,
   BARC, Trombay,
   Mumbai - 400 085.

   (Kind Attn: Shri. Udai Giri Pratap Singh Sachan, SO/D)

7. The assembly shall be carried in the presence of our engineer. The assembled array along with jigs and glues shall not be dispatched prior to approval by our engineer at bidder's premises. Necessary inspection facilities shall be provided to our engineer during fabrication at bidder’s premises.

8. The bidder shall deliver the finished components after approval by our engineer within 4 weeks from the date of firm work order issued to the bidder. The finished components shall be delivered by the bidder at Accelerator Control Division, BARC, Trombay, Mumbai - 400 085.

9. Head, Electromagnetic Applications Section reserves the rights to accept/reject any or all quotations without assigning any reason.

10. Delivery charges if any must be clearly mentioned in the offer. Quotation must also indicate the validity of offer. Quotation must also indicate the VAT no and PAN no of the party.

11. The quotation has to be signed by authorized person with company seal.

12. Payment will be made by cheque only after satisfactory completion of work on production of bill, delivery challan and advance stamped receipt. It may be noted that IT @ 2% and surcharge on tax at 15% shall be deducted from your bills.

13. Job should be guaranteed against material and manufacturing defects for 1 year from the date of supply.

Encl.: Technical Specification Sheet no:- EmA&ID/HABA/TM/01 dated 04/11/2020

(Udai Giri Pratap Singh Sachan)
Indenting Officer
Development, Fabrication of magnetic assembly and jigs along with room temperature cure epoxy

1.0 **SCOPE**

This specification specifies the requirements for development, fabrication of magnetic assembly and jigs along with room temperature cure epoxy as per specifications mentioned in this document. Fabrication shall be carried out strictly as per specifications as detailed in this document.

Supplier shall arrange required raw material/ facilities for manufacturing and testing. Supplier shall be qualified on the basis of technical evaluation. (Refer Para 9.0). The brief description of contents of this tender specification document is as described below.

Para 2.0 gives intended application and operating service conditions.
Para 3.0 gives the details of deliverables.
Para 4.0 gives the general description details.
Para 5.0 gives engineering requirements.
Para 6.0 gives the requirement of raw material procurement.
Para 7.0 gives the inspection and testing.
Para 8.0 gives the requirements of packaging and safe delivery.
Para 9.0 gives the requirements of supplier qualifications.
Para 10.0 gives the requirements of price and delivery schedule.

2.0 **INTENDED APPLICATION AND OPERATING SERVICE CONDITIONS**

The special configuration circular magnetic array assembly is used to increase the magnetic flux density on the top side of the magnetic disc whereas magnetic flux density is reduced on the bottom. During assembly of these array large attractive and repulsive forces are felt which makes the assembly a challenging job.

3.0 **DETAILS OF DELIVERABLES**

The scope of supply is tabulated in table below

<table>
<thead>
<tr>
<th>S.No</th>
<th>Component</th>
<th>Nos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Development, Fabrication of magnetic assembly and jigs along with room temperature cure epoxy NdFeB rare earth TR magnets-36 Nos</td>
<td>01 Set</td>
</tr>
</tbody>
</table>

4.0 **GENERAL DESCRIPTION**

4.1 The assembly of circular Halbach array requires suitable jigs. The array shall be comprising of 36 rare earth magnets placed side by side. The magnets shall be sitting on the base plate with the help of special purpose cyanoacrylate glues. The magnets shall be nickel coated only.

4.2 Jig-1 shall be fixed first on the base plate with the help of M4 nuts on 16 points. The base plate shall be sandblasted and cleaned with acetone before fixing with Jig-1. Alternate magnets (same polarity) shall be stick first. The glue shall be left for 48 hours to cure.
4.3 The magnets grade shall be equivalent or better than N50H. The direction of magnetization shall be parallel to the trapezoid parallel faces.

4.4 The above procedure shall be repeated for the next set of magnets. The magnets shall again be left for 48 hours for curing. All the curing process shall be carried out at room temperature only.

4.5 After curing of second set of magnets jig-1 shall be removed from the base plate. Glue strength shall be checked. The top plate shall be fixed on the base plate with the help of M-4 nuts.

4.6 Suitable jigs for the above conceptual design shall be fabricated for inserting the remaining magnets.

4.7 The bottom surface of the magnet shall be made rough with the help of sand paper. The complete assembly shall be cured for 48 hours at the room temperature.

Table 1.0:

<table>
<thead>
<tr>
<th>NdFeB Magnet Characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material: NdFeB</td>
</tr>
<tr>
<td>Grade: N50H or equivalent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residual Induction (B_r)</td>
<td>1.315 ± 0.1 Tesla</td>
</tr>
<tr>
<td>2</td>
<td>Coercive Force (H_c)</td>
<td>13 ± 0.2 KOe</td>
</tr>
<tr>
<td>3</td>
<td>Energy ((BH)_{\text{max}})</td>
<td>≥ 49 MGOe</td>
</tr>
<tr>
<td>4</td>
<td>Intrinsic Coercive Force (H_{cj})</td>
<td>≥ 16 KOe</td>
</tr>
<tr>
<td>5</td>
<td>Maximum operating temperature</td>
<td>120 °C</td>
</tr>
<tr>
<td>6</td>
<td>Temperature coefficients of reversible change in (B_r)</td>
<td>≤ -0.12 %/°C</td>
</tr>
</tbody>
</table>

Geometrical Characteristics of Rectangular Magnet after Ni plating:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shorter Dimension of Parallel faces</td>
<td>35 (-0.1)mm</td>
</tr>
<tr>
<td>2</td>
<td>Longer Dimension of Parallel faces</td>
<td>62(-0.1)mm</td>
</tr>
<tr>
<td>3</td>
<td>Distance between parallel faces</td>
<td>60(-0.1)mm</td>
</tr>
<tr>
<td>4</td>
<td>Height</td>
<td>45 (-0.1)mm</td>
</tr>
<tr>
<td>5</td>
<td>Quantity</td>
<td>32</td>
</tr>
</tbody>
</table>

Magnetized along parallel faces 35mm & 60 mm

5.0 ENGINEERING REQUIREMENTS APPROACH

5.1 The cable groups shall be drawn separately and proper care shall be taken while drawing the wires.
5.1.1 Suitable precaution shall be taken while pasting the magnets. The glue setting time is only 5 mins.

5.2 Cleanliness

5.2.1 All the surfaces on which glue has to be applied shall be sandblasted and thoroughly cleaned with the help of acetone.

6.0 RAW MATERIAL PROCUREMENT

The following materials shall be used:

6.1 Only SS-304 L material for the base plate, top plate

6.2 Aluminum T-6061 for the Jig-1 & Jig-2

6.3 NdFeB Grade (N-50H) size(60×30×45 mm) for magnets

7.0 INSPECTION AND TESTING

7.1 After assembly of the array the integrity of the magnet with the base plate shall be inspected.

7.2 The jigs shall be fabricated as per the tolerances given in the drawings.

8.0 REQUIREMENT OF PACKAGING AND SAFE DELIVERY

8.1 The finish component jigs, top plate, base plate & remaining cyanoacrylate glue shall be packed carefully before dispatch. Utmost care shall be taken during cable handling.

8.2 Protective covers: Supplier shall make necessary arrangements for all components using a suitable PVC cover or moulded thermocol. Connectors shall be provided extra cushioning during transportation.

9.0 REQUIREMENTS OF SUPPLIER QUALIFICATIONS

9.1 Infrastructure: The supplier must give the details of infrastructure suitable for this job such as Manufacturing Machines; EDM wire cut, EB welding machine, Assembly room and other tools & tackles, Inspection facilities etc.

9.2 Past experience: The supplier must give their past three year turnover and job executed by them with reference, volume of work and completion schedule, present commitments and anticipated commitments inside and outside India.

10.0 REQUIREMENTS OF PRICE AND DELIVERY SCHEDULE

10.1 The delivery of shielded conductor cables after fabrication and testing is expected within 1 month from the date of placement of firm work order.

10.2 The supplier shall provide overall cost with delivery schedule.

Udai Giri