



Government of India
Bhabha Atomic Research Centre
Accelerator Control Division
Electromagnetic Applications Section



Tender No. : ACnD/EMAS/JI/2018/645

Date : 11.10.2018

Sub: Fabrication, Assembly, and testing of cryogen free cold bore cryostat for superconducting SSR2 focusing lenses as per TSP/08

Dear Sir/Madam,

1. Quotations are invited for the *execution of subject work*.
2. Taxes and Excise Duties shall be quoted separately. Form AF / H whichever is applicable shall be provided, if required.
3. The suppliers are shall submit the cost for Design, fabrication, assembly and testing. All necessary tools, instruments have to be arranged by the supplier.
4. The quotation must reach the undersigned on or before **05th Nov, 2018** and must be sent in a sealed envelope super-scribed with the **reference number & the due date** given above.
5. The quotations must reach us on or before the aforesaid date by India post (by speed post or ordinary post) only.
6. The address on the envelop should read:

**The Head,
Electromagnetic Applications Section,
Accelerator Control Division,
RCnD Bldg., North Site,
B.A.R.C, Trombay,
Mumbai - 400 085.
(Attn: Shri. Janvin Itteera)**

7. The Purchaser representative shall approve the design of the assembly sequence, and fabrication procedure, thermal testingscheme consequent to which the supplier shall commence the fabrication of the jigs and fixtures.
8. The testing of the magnet shall be conducted in the presence of the Purchaser representatives only, further details are laid down in the enclosed specification sheet.
9. The bidder is expected to deliver the finished components after the approval by our engineer within 08 months from the date of receipt of Free issue material and firm work order.
10. All the raw materials used shall have the manufacturer's QC/QA certificates for ensuring the authenticity of the components. Further details are mentioned in the enclosed specification sheet.
11. The finished components with the test certificates as mentioned in the enclosures shall be delivered by the manufacturer after the award of the contract at Accelerator Control Division(ACnD), BARC, Trombay, Mumbai - 400 085.
12. Head, Electromagnetic Applications Section, ACnD reserves the right to accept / reject any or all quotations without assigning any reason.
13. Delivery, packing & forwarding charges, if any, must be clearly mentioned in the offer.
14. Drawings / Sketches (if any) must be returned along with the offer
15. Quotation must indicate the VAT no / PAN no of the vendor & validity of offer. Minimum validity of 60 days is preferred.
16. The quotation has to be duly signed by *authorized person with company seal*. *Unsigned offers shall be treated as invalid*.
17. The supplier has to submit insurance for the Free issue material offered by the purchaser as per para 3.0 of the enclosed technical specification sheet.
18. For any technical clarifications, Please contact us vide email: janvin@barc.gov.in; Tel: +912225591849
19. The above item is solely meant for R&D purpose, hence, necessary GST exemption certificate(@5%) shall be provided

Encl.: TSP/08

(SD/-)
**Head, Electromagnetic Applications Section
B.A.R.C**
For & on Behalf of the President of India
(The Purchaser)

Specification no.	Revision no.	Date of Issue
TSP/08	0	04th Oct, 2018

Fabrication, assembly and testing of cryogen free cold bore cryostat with superconducting SSR2 focusing lenses

1.0 Scope:

The tender is invited for the “Fabrication, assembly and testing of cryogen free cold bore cryostat for superconducting SSR2 focusing lenses” as per the following technical specification.

2.0 Scope of work:

2.1) Supplier shall procure the raw material mentioned in the enclosed drawings except those indicated as FIM in para 3.0.

2.2) Supplier shall fabricate the requisite jigs and fixtures as per the drawings enclosed herewith and also design and develop additional jigs as deemed necessary to safely insert the magnets cryostats.

2.3) Supplier shall submit the manufacturing drawings for purchaser approval

2.4) Supplier shall assemble the material supplied under FIM and test thier performance

2.5) Supplier shall do electro-polishing of the inner surface for better vacuum performance.

2.6) Supplier shall test the cryostat as per the acceptance criterion prior to its shipment.

2.7) Supplier shall only use De-ionised water(7.0<pH<7.5) with TDS < 50ppm for chiller of the cryocooler

2.8) Supplier shall use SS316 screws for fastening purpose.

2.9) Supplier is advised to fabricate a dummy bobbin from OFHC UNS C10100 for validating the the thermal performance of the system

2.10) Detailed engineering drawings of the the cold head, magnet, current leads shall be given to the supplier only after the award of the contract.

3.0 FREE ISSUE MATERIAL

3.1) The list of free issue material offered by the purchaser for the satisfactory of the proposed work is as under:

S No.	Description	Qty	Cost in Rupees
1	Two stage 4K cryocooler with its cold head, compressor and chiller	01 set	Rs. 45,00,000/-
2	HTS Current leads, 30cm long	04 set	Rs. 20,00,000/-
3	Turbo-molecular pump with measuring gauge 80l/s (TMP)	01 set	Rs. 25,00,000/-
4	SSR2 magnet of OFHC bobbin	01 No	Rs. 25,00,000/-
5	Temperature sensors	04 Nos	Rs. 20,00,000/-
6	Magnet power supply	01 No	Rs. 25,00,000/-

Table-1.0

The supplier has to submit insurance for the aforesaid FIM on the behalf of President of India acting Head, ACnD

4.0 DELIVERABLES

The deliverables included in this tender are as follows:-

For the FIM supplied by the purchaser, the items highlighted under table-1.0 are to be delivered:

S No	Description	Quantity
01	Cryogen Free superconducting magnet with cold bore	01 Set

Table-2.0

5.0 LIST OF DOCUMENTS

Following documents (under table 2.0) are to be furnished under this contract

Sr. no	Description	Quantity
1	Geometrical inspection report	01 Set
2	Material test reports	01 Set
3	The Quality Control Records	01 Set

Table-3.0

5.0 RECOMMENDED FABRICATION AND ASSEMBLY TECHNIQUES

5.1) Material used for the cryostat shall be made from SS304L/SS316L

5.2) Welding for joining stainless steel shall be performed as per paragraph 4.2 of Div. 2 Section VIII ASME Boiler Pressure vessel code (BPVC). Qualification of the welded joints shall be as per Section IX, ASME Boiler Pressure vessel code (BPVC).

5.3) The outer cryostat vacuum chamber must be separated by gate valve of reputed make such as swage lock or Pffiefer

5.4) All the surface exposed to 300K or 45K must be protected from direct radiation by means of reflective superinsulation

5.5) All the thermal straps must be made from OFHC copper for high thermal conductivity

5.6) All the thermal joints must be connected after applying thermal grease of cryogenic grade

6.0 PERFORMANCE OF THE CONTRACT

6.1 Fabrication and Delivery Schedule

The bidder shall complete the job within preferably within 08 months starting from the date of Receipt of Free issue material to the successful bidder. The supplier is expected to maintain and preserve the integrity of the coil This may involve the revision in the practices governing the assembly, testing and requisite jigs fixtures after consulting with the purchaser. All the changes called for, shall be intimated vide Engineering/Design change notice(ECN/DCN) duly approved. A copy of the DCN/ECN may be forwarded to the purchaser for information and records. The purchaser shall incorporate the remarks of the aforesaid notices at applicable test documents and release the revisions of the same to the contractor. This is essential to ensure the quality of the delivered goods.

6.2 Document to be furnished prior to the start of winding

After the successful award of the contract, supplier shall first deliver the manufacturing file(MF) containing the factory drawing of the magnet

The manufacturing file shall contain the following information:

- a) Engineering Details of jigs and fixtures to be used
- b) The schematic representation of the assembly procedures
- c) Details of insulating material proposed to be indicating the make and class
- d) The fabrication drawing of the winding indicating the adjustment allowed in para 3.0

A review meeting will be scheduled within two weeks after its receipt. This document shall be approved by the purchaser, although the review and the approval process shall not relieve the contractor from his responsibility to produce the magnet according to the requirements as set out in this technical specification.

6.2.3 Quality Control Records

The QCR shall contain:

- The material certificates, in particular varnish, epoxy any other material intended to be used.
- All the documentation requested in the para 6.0. All these documents shall be endorsed by the purchaser for approval during successive stages of the production, or for provisional acceptance before authorization for shipment can be granted. The baseline format of the QCR shall be specified in the MF. If any format is changed during the period of this contract, it shall through mutual agreement between purchaser and the contractor, the related templates in the MF shall be revised as well.

6.3) Warranty:

6.3.1) All items covered under this contract shall have a warranty of 12 Months

7.0) Acceptance Criterion

The assembled magnet shall undergo the following rigorous acceptance criterion prior to its dispatch.

1. Vacuum leak tightness: All welds are leak tight with a minimum sensitivity of 10^{-9} atm-cc/s
2. Vacuum level with purchaser supplier supplied pump: better than 10^{-4} mBar
3. Thermal trials: After cool down, stabilised base values must be
 - A) First stage of the cryocooler: lower than 45K
 - B) Second stage of the cryo-cooler: lower than 3.5K
 - C) magnet temperature: lower than 4.2K

Please note that cool down must be carried out only after after disconnecting the TMP with gate valve closed.

4. After base temperature have attained satisfactory values, system must be operating for atleast 20 Hours uninterrupted. Supplier to log the temperature values during the aforesaid cycle.

All the above measurements must be documented and logged for reproducibility at purchaser location. The log files must be transferred to the purchaser for validation and future diagnostics.

8.0 GENERAL DESCRIPTION:

8.1 Supplier shall submit the offer the fabrication, assembly and testing with material that shall be supplied as free issue material from the purchaser. Entire testing of the system shall be done at the vendor site.

8.2 Overall cost will be compared and include packaging, forwarding and safe delivery to purchaser site.

8.2.1) The assembled cryostat with magnet shall be safely transferred to purchaser after ensuring adequate care to the cold head.

8.3 Suppliers shall give complete details of their product, facilities, winding machine details, list of users and compliance certificates from users for technical evaluation. Quotations submitted with incomplete details are viable for rejection.

8.4 Vendors with test facilities for qualification of geometrical inspection, electropolishing, CNC machining, and basic metrology equipment's for dimensional checks will be given preference.

In case vendor plans of sub-contracting the job, same shall be clearly brought out in quotations. The sub-contracting can only be carried out only after prior permission of the purchaser. Under any circumstances, the responsibility for the satisfactory completion of job lies solely the supplier. Vendors shall document the details of qualification checks performed on the fabricated parts by self or in collaboration with other laboratories.
