

ANNEXURE TO TENDER NO. DPS/MRPU/1/2/2829

TECHNICAL SPECIFICATION FOR MANUFACTURE AND SUPPLY OF CFMM TEST SETUP

1. INTRODUCTION

It is planned to carry out performance testing of modified Core Flow Monitoring Mechanism (CFMM) in Hall-IV, IGCAR. The material for construction is SS 304L. Test setup fabrication drawing is attached herewith. Manufacturer has to fabricate the test setup as per the attached drawing and supply it to Engg. Hall-IV of FRTG at Indira Gandhi Centre for Atomic Research, Kalpakkam.

2. PROCESS CONDITIONS

The operating process conditions for testing are:

Fluid	:	Water
Temperature	:	80° C
Quality of water	:	Raw water or de-mineralized water
Maximum Pressure	:	1 bar (g)

3. SCOPES OF THE WORK

The scopes of the work are listed as follows:

- a) Study of design drawings, preparation of components fabrication drawings, QAP and stage wise inspection plan.
- b) Preparation of different manufacturing procedures and qualification of manufacturing process
- c) Procurement of materials, fabrication of parts as per detailed drawings and assembly. No free issue material will be provided by purchaser.
- d) Fabrication of test setup as per approved fabrication drawings.
- e) Minor modifications as suggested by the purchaser during manufacturing shall be carried out at no additional cost.
- f) Inspection, testing, transportation and safe delivery of the item at site with guarantee of the components.
- g) Chemical cleaning including degreasing, pickling and passivation are to be carried out after fabrication of all the components.
- h) Design, procurement of materials and manufacture of jigs and fixtures and tooling required for the manufacture, handling and inspection at shop.
- i) Design, procurement of materials, manufacture and supply of handling and transportation structure.

4. APPLICABLE STANDARDS AND DRAWINGS

The applicable standards are as follows:

ASME Section VIII Div. I	:	Fabrication of the model
ASME Section II Part A&C	:	Materials, welding rod and filler rod properties
ASME Section IX	:	Specifications for welding procedure and performance qualification.

ASTM E- 165	:	Method for liquid penetrant inspection.
ASTM A 276	:	Specification for Stainless Steel Bars and Shapes.
ASTM A-380	:	Surface treatment
ASTM A 240	:	Standard Specification for Stainless Steel plates
ANSI/ASME B16.21	:	Non-metallic Flat Gaskets for Pipe Flanges
ANSI/ASME B16.25	:	Butt welding Ends
SA-193/SA-193M	:	Specification for Stainless Steel Bolts
SA-194/SA-194M	:	Specification for Stainless Steel Nuts for Bolts
ASTM F 436 -11	:	Standard Specification for Hardened Steel washer

Model shall be fabricated as per the following drawings:

ETHD/HES/99204/DD/3122	:	CFMM Test Setup details
CDS/PFBR/31450/DD/1507	:	SA Head
CDS/PFBR/31450/DD/1508	:	Adaptor

The test setup shall be fabricated within the tolerances specified for each component as per the drawing. Wherever tolerances are not mentioned; the same shall be followed as per the standards and good manufacturing practices. The manufacturer shall submit detailed fabrication drawings for approval and list of deviations, if any, to the purchaser before commencement of manufacture. The details provided in attached drawing are providing necessary information for the manufacturer for the preparation of any shop/manufacturing drawings. General tolerances shall be specified as per IS: 2102, Part-1, Class m & IS: 2102, Part-2, Class K. The general and/or specific tolerances should be clearly indicated on the fabrication drawings. The manufacturer can scrutinize the drawings and bring out in writing missing information/discrepancy/mismatch, etc, if any, to the notice of the purchaser at the time of submission of the tender. If not done, then the successful bidder will be fully responsible for any difficulties/problems faced during the manufacture, assembly and testing of the component and shall bear the cost of any repair/rework carried out to solve the problems. Minor modifications, if any, as suggested by the purchaser shall be carried out at the time of fabrication without extra charges. Fabrication of the test setup as per ASME Section VIII Div.I and relevant ASTM & Indian Standards.

5. MATERIAL SUPPLY AND IDENTIFICATION

There is no free issue material from the purchaser.

- a) All material should have linkage test certificate
- b) IGCAR will confirm the submitted test certificate
- c) All plates, tubes and rounds etc., to be used for manufacturing shall be inspected and properly identified by the supplier and approval has to be obtained by the purchaser before commencement of fabrication.
- d) Relevant test certificates like chemical composition, tensile strength and heat treatment shall be produced by the supplier to identify the material.
- e) Any deviation from the material specifications shall be intimated to the purchaser for his prior approval.

6. FABRICATION REQUIREMENTS (Refer drawings mentioned in section 4)

6.1 The test setup assembly consist five major parts viz., SA head, adaptor, Tube Assembly, Sensor rod and Outer pipe. All parts are joined using flanged connections as shown in the attached drawing.

6.2 The Tube assembly is made of three machined parts (part no. 16, 17 & 18) welded together. The fine tolerance in inner diameter of tube assembly shall be achieved with highest degree of workmanship. The integrated concentricity, verticality and positional tolerance of tube assembly shall be achieved within specified tolerance limit. The holes are provided in the bottom part no. 16 of tube assembly shall be perpendicular to the outer conical surface.

6.3 The manufacturing of Tube assembly involves drilling, tapered boring, reaming and honing operations. The manufacturing operations drilling tapered boring and reaming shall be carried out by CNC machining.

6.4 Honing shall be done after fabrication of all three parts of flow guide for very smooth internal profile.

6.5 Sensor rod (Part no. -21), shall be fabricated with CNC machining to achieve high surface finish.

6.6 Part no. 13 &14 (SA head & adaptor) shall be fabricated by CNC machining.

6.7 The 8” inch rubber flexible bellow used in the assembly shall be compressed with human hand applied load.

6.8 Examine bolt & nut threads and washer faces of nuts for damage such as rust, corrosion, and burrs; replace/correct any damaged components.

7. WELDING REQUIREMENTS

Welding for all the model components shall satisfy following requirements:

7.1 Cutting precautions

Stainless steel shall be prepared by machining, grinding by mechanical processes or plasma arc cutting. Chipping, filing, cutting with hacksaws or wire brushing using carbon steel brushes is not permitted on stainless steel. Burrs and other objectionable defects shall be removed by reaming, machining or grinding. All cuts shall be carefully beveled and accurately matched to form a suitable groove for welding and to permit complete penetration of the welds at all points.

7.2 Edge Preparation for welds

Edge preparation for welding shall be carried out by machining or grinding. The surface to be welded shall be free from foreign material such as grease, oil, paint, rust etc. for a distance of at least 50 mm, from the welding edges. Weld details shall be followed as shown for the individual components in the drawings.

7.3 Weld Process and welder requirements

7.3.1 All the welding should be done by qualified welder approved by IGCAR. Root pass welding of stainless steel weld joints shall be done by TIG welding and subsequent passes may be performed by TIG/SMAW. Filler wire ER308L for the base metal of 304L has to be used as per SFA-5.9 ASME Section II part C. Welding electrode E308L for the base metal 304L has to be used SMAW as per SFA-5.4 of ASME Section II Part C. The filler wire used shall be as per the AWS or equivalent Indian Standard Specifications which shall be approved by the purchaser. The supplier shall conduct tests required for qualifying the welding procedure and welders performance as per ASME Section IX. The supplier shall maintain a record of the results obtained in welding procedure and weld performance qualification tests and submit the same for purchaser's approval. Welding tolerances shall be as per the standard codes. Welding of different components should not result in change of dimension as specified in drawing. Stainless steel material shall be segregated from other piping materials during all stages of machining and fabrication to prevent surface contamination with carbon steel leading to localized corrosion.

7.3.2 Stainless steel plates should be properly constrained by means of jigs and fixtures to avoid distortion, prior to continuous welding. Constraints by welding should be avoided up to maximum possible extent.

7.3.3 Temporary tack welds shall not touch the root gap or root face and shall not be part of a final joint weld up. Line-up clamps shall not be removed until the root pass has been completed. Each welding bead shall be thoroughly cleaned of all scale and slag by chipping and/or grinding and wire brushing immediately after completion of the weld and prior to the application of succeeding beads.

7.3.4 The welding area shall be protected at all times against adverse environmental conditions, water spray, mist, drips or wind exceeding 8 kph. Welding shall not proceed when the work is exposed to such conditions. Prefabrication areas for carbon and stainless steel shall be physically separated to prevent contamination of stainless steels. When grinding or welding carbon steel plates and supports protection of any adjacent stainless steel shall be provided. All machined surfaces shall be protected by a suitable paint or compound or by any other method to prevent damage from scaling.

7.4 Butt Weld requirements

All butt joints shall have complete joint penetration and complete fusion for the full length of the weld and shall be free from undercuts, overlaps of abrupt ridges or valleys. Each run of the weld metal shall be thoroughly cleaned. The core wire of the electrode or filler material shall be same as the composition and structure of the metal being welded. After welding has been stopped for any reason, care shall be taken in restarting to ensure proper fusion and penetration between the plates, the weld metal and the previously deposited weld metal, which shall be thoroughly cleaned. The surface of the welds shall be smooth and have gentle transition to the plate surface. All welding shall be carried out using a suitable welding sequence and in such a manner that harmful secondary effects are avoided. Wherever possible, welding shall be carried out in down hand position.

8. INSPECTION AND TESTING

- a) A QAP has to be prepared and submitted to the purchaser for approval.
- b) At each stage, inspection/testing of the components shall be carried out by the supplier in the presence of purchaser's representative as per QAP. The equipment tools and manpower required for such inspection shall be provided by the supplier. The supplier shall provide the required facilities and comply with all inspection requirements at various stages of fabrication and assembly.
- c) All dimensions and tolerances as given in the drawings shall be strictly followed.
- d) All test procedures and tests proposed by the supplier shall be submitted to the purchaser for his prior approval.
- e) Dye penetration test for root pass and final pass welding shall be carried out for all the welds as per ASTM E165 standard.
- f) All flanges and OD, ID & straightness will be checked and recorded.
- g) Suitable bore gauges of graduation of least count 0.01 mm with extension length shall be arranged, for measurement of internal diameter at different locations of tube assembly (part no. 16, 17 & 18) at the time of inspection.
- h) The weld fit up for joining parts of tube assembly (Part no. 16, 17 & 18) shall be offered for inspection and approval of purchaser.
- i) Final test setup assembly, completely filled with water at 1 bar (g) pressure has to be kept for minimum 5 hours and there should be no leakage at any place during this period. This test should be carried out at supplier site. If leakage found, it has to be rectified by the supplier at free of cost and repeat the water hold up test.

9. CHEMICAL CLEANING AND TREATMENT

Stainless steel parts shall be passivated as per ASTM A 380. Swabbing may be adopted for local passivation. Carbon steel parts be red oxide coated and enamel painted.

10. ASSEMBLING

After completing the fabrication/machining, all the parts to be assembled at the supplier's site in presence of purchaser. Final assembly will be carried out at purchaser's site by the supplier. Manufacturer should make the detailed assembly plan and get it approved from the purchaser before start of the fabrication.

10.1 Ensure flanges are aligned both axially and rotationally to the design plan within engineering design parameters without use of excessive force.

10.2 Verify that the gasket complies with the dimensional (OD, ID, thickness) and material specifications. Position the gasket to be concentric with the flange ID, taking suitable measures to ensure that it is adequately supported during the positioning process. No portion of the gasket should project into the flow path. Ensure that the gasket will remain in place during the joint assembly process. Do not use tape strips radially across the gasket to hold it in position. Do not use grease.

10.3 Before lubricant is applied to the bolt and nut threads, nuts must run freely by hand past where they will come to rest after tightening. If nuts will not turn freely by hand, check for cause and make necessary corrections/replacements. Lubricant used for the fasteners should be compatible with flange and gasket material.

11. PACKING AND SHIPMENT

- a) Supplier has to provide the support details for transportation of these assemblies and get it approved by the purchaser prior to transport.
- b) Test setup parts or completed assembly (if possible) shall be transported to the purchaser's site.
- c) All components shall be properly packed to prevent any possible damage during transportation. There shall be provision for easy handling.
- d) All threaded parts should be packed so as to avoid any damage during shipment.
- e) It is responsibility of the manufacturer to maintain the dimensional accuracy of the test setups at the time of shipment till final delivery at IGCAR stores, kalpakkam, otherwise items are likely to be rejected.

12. DELIVERY PERIOD

12 weeks from the date of approval of drawings. Drawings shall be submitted for approval by supplier within 2 weeks from the receipt of purchase order.

13. GENERAL REQUIREMENTS

- a) The firm should have good machining and fabrication capabilities to manufacture various components of this model. In case the supplier is willing to outsource the manufacturing of some components to third parties, the probable list of sub-vendors to be provided to the purchaser for evaluation along with the quotation. The supplier has the whole responsibility of the total work/supply and quality. Purchaser has right to cancel the sub-contract in the event of sub standard quality of work.
- b) Only suppliers who have previous experience in mechanical handling, machining/fabrication and assembly to close tolerances of similar machinery / equipments will be considered for award of contract. The onsite technicians should be capable of reading and understanding engineering drawings. The supplier is to provide proof of experience of work of similar nature that they have successfully executed in the past.
- c) Supplier is responsible for any damage during transportation
- d) Any deviation from the specifications shall not be taken up without the approval of purchaser.
- e) Details for the manufacturing procedure and assembly procedure of the model, packing and shipping of these items have to be indicated in the quotation.
- f) All materials including bolts, gaskets are to be procured by the supplier.
- g) Any tool or fixture required during manufacture of the parts or during assembly / inspection of the parts shall be designed and fabricated by the supplier at no additional cost.

14. GUARANTEE

The supplier shall give a guarantee against any defect in materials and workmanship for a period of 12 months from the date of installation and for over 18 months from the date of receiving the fabricated components at site whichever is earlier.

15. ACCEPTANCE CRITERIA

Payment will be done only after inspection & acceptance of item at purchaser site.