



***GeM Bid Technical Specification for Manufacturing, Assembly, Testing and Supply
of Vacuum Capacitor Assembly***

Technical Specification

For

**Manufacturing, Assembly, Testing and Supply of
Capacitor Assembly**

Dispatch Site:

DNB Lab, ITER-India, Institute for Plasma Research

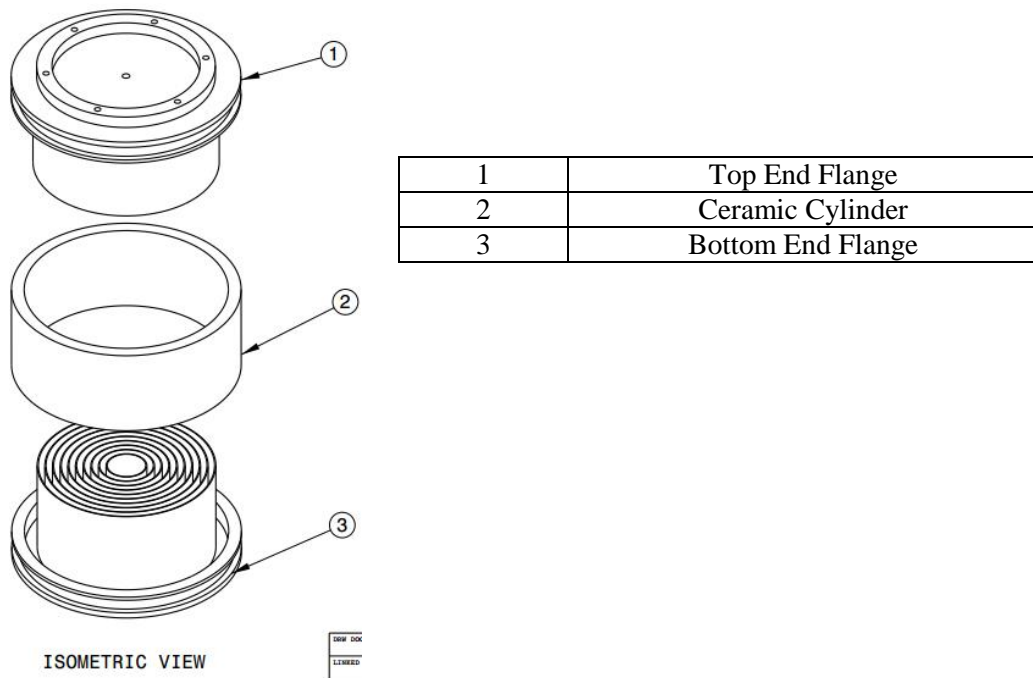
Nr. Indira Bridge, Bhat, Gandhinagar.

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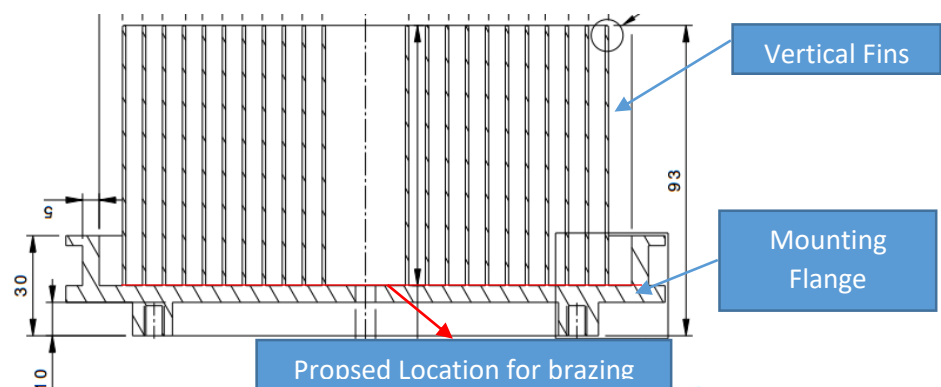
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1. MANUFACTURING REQUIREMENTS:

Fixed capacitor assembly consists of basically three major components as shown below in exploded view:

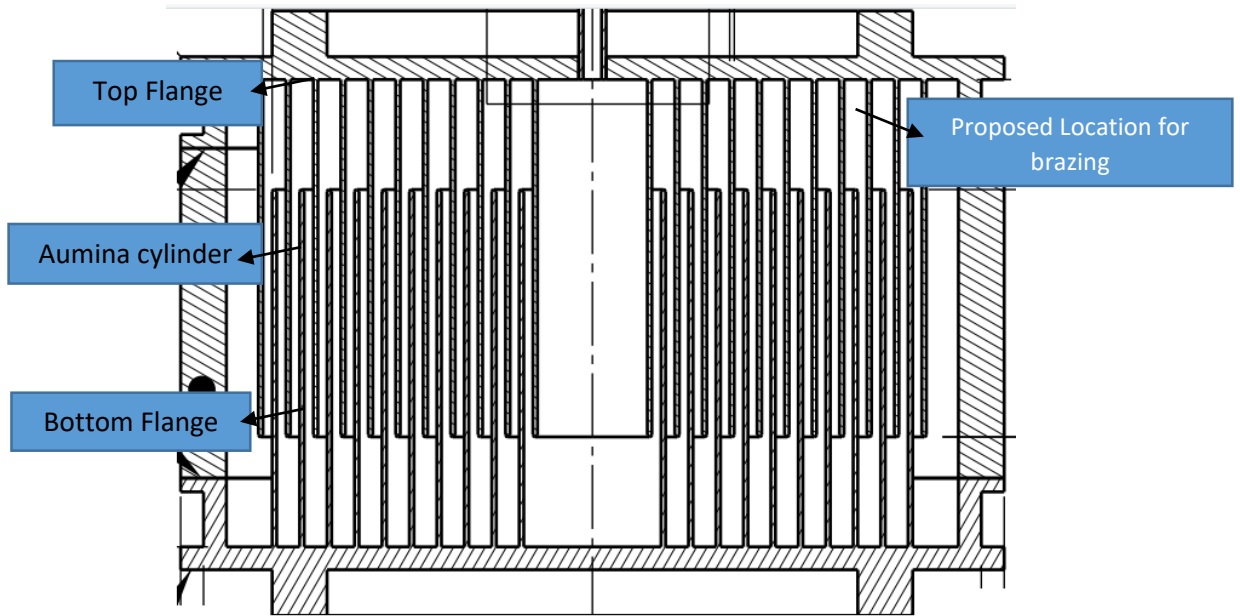


- a. Top/Bottom End Flange Assy: Top/Bottom end flanges are made of OFHC copper. It is envisaged that fabrication of flanges can be done in either of two ways:
- a.1. By machining single copper mono- block to generate the desired profile(Fins). No joining is required.
- OR
- a.2. By fabricating the vertical fins and the mounting plate as separate components and later on joining them by vacuum brazing technique using copper –silver eutectic alloy.



It is desirable to achieve the linear tolerances (dimensional) within 50 microns and geometrical tolerances (flatness, straightness, concentricity, circularity, perpendicularity) within 100 microns. Tolerances shall be measured on as received components after completion of all machining/fabrication activities as per approved drawings. Surface roughness shall be in range of R_a 6.3 – 1.6.

- b. Ceramic Cylinder: Ceramic cylinder can be purchased as brought out item by vendor with $\geq 99.5\%$ purity. Pure alumina is requested, with Al_2O_3 content $\geq 99.5\%$ purity in accordance to class C799 defined in IEC 60672-3.
- c. Capacitor assembly: Final capacitor assembly can be done by vacuum brazing of alumina with copper made end flanges.



2. SCOPE OF WORK

- Manufacturing, Assembly, Testing and Supply of Capacitor Assembly as per General Technical Requirements in Sr.3
- Procurement of raw material for the complete capacitor assembly.
- Supply of complete assembly at the purchaser's site.

3. TECHNICAL REQUIREMENTS

1. Review of engineering drawing provided with tender document and check the design for vacuum integrity and suggest changes if any.
2. Complete capacitor assembly shall be as per Manufacturing Requirements in Sr.1.
3. Any change in engineering design would be implemented as per approval from ITER-INDIA/IPR.
4. Preparation of manufacturing/fabrication drawings (including tolerances), Manufacturing and Inspection Plan (MIP). *Vendor shall submit all the drawings, manufacturing, and inspection plan to ITER-INDIA/IPR for approval with proper documentation.*
5. Procurement of all the materials required for manufacturing including materials required for all qualifications, tests, tools, jigs & fixtures shall be in the scope of supplier.
6. Manufacturing of capacitor assembly per the final approved drawings and approved MIP.
7. Manufacturing tools, jigs & fixtures and tooling required for all manufacturing activities, handling, surface treatment, assembly, inspection, testing, and packing shall be in the scope of supplier.
8. Inspection and testing at various stages before / after / during manufacturing as asked by the various sections and annexures of this specification and drawing as per approved MIP.

9. Completion of all factory acceptance tests shall be in the scope of supplier (may be witnessed by the purchaser).
10. Items (approved as per FAT) shall be dispatched only after issuance dispatch clearance note from the Purchase section.

4. LIST OF DRAWINGS:

| Sl. No. | Description | Drawing No. |
|---------|-----------------------------|-------------|
| 1 | Bottom End Flange | CP-00-01 |
| 2 | Top End Flange | CP-00-03 |
| 3 | Ceramic Cylinder | CP-00-02 |
| 4 | Fixed Capacitor Assembly-1 | CP-01-01 |
| 5 | Fixed Capacitor Assembly -2 | CP-01-02 |

5. LIST OF DELIVERABLES:

5.1. List of Components to be delivered at ITER-INDIA/IPR:

- a. Capacitor assembly -01 no. (As per approved manufacturing drawing)

5.2. List of documents to be submitted by supplier:

| Sr.No. | Description |
|---|--|
| A. Before start of manufacturing process: | |
| 1. | <ol style="list-style-type: none"> 1. Deviation list (if any) in the engineering drawings. 2. Initial follow-up documents (Manufacturing & Inspection Plan) including Purchaser hold points. 3. Material documentation (incl. Procurement specification, material certificates, test and examination results (if any)). 4. Manufacturing drawings and components part list. 5. Brazing procedures. 6. Non Conformance Report (NCR)/Deviation Request (DR)(If applicable) |
| B. Documents to be supplied before final acceptance: | |
| 2. | <ol style="list-style-type: none"> 1. Inspection reports (dimensional checking, visual inspection, results of leak tests performed (including size and location of leaks found), NDE(if applicable). |

6. MATERIAL SPECIFICATION:

- a. Pure alumina is requested, with Al_2O_3 content ≥ 99.5 % purity in accordance to class C799 defined in IEC 60672-3.
- b. Oxygen free High Conductivity Copper(OFHC)
EN 10204 3.1 certification as per ASTM B 152 (Cu UNS no. C10100/C102100/C103100)

7. BRAZING REQUIREMENTS:

- a. Brazing shall be carried out in a vacuum atmosphere.
- b. Brazing filler materials must be Cu-Silver eutectic alloy like BvAg8 for Cu-Cu joints. For ceramic to copper brazing, either metallization of ceramic can be used followed by Nickel plating or active metal brazing can be used. Detailed brazing procedures shall be submitted to ITER-INDIA/IPR for approval before start of manufacturing.
- c. Deviation (Alternate proposal) in proposed braze filler material and procedures can be mutually agreed and shall be allowed only after approval from ITER-India/IPR.
- d. *Leak testing of braze joints:* All vacuum sealing braze joints shall be 100% leak tested. Acceptance criteria for local leak tightness (by vacuum method) is less than 5×10^{-9} mbar-lit/sec. Acceptance criteria for global leak tightness (by vacuum- hood method) is less than 5×10^{-8} mbar-lit/sec.
- e. The use of LPT shall be prohibited on braze joints.

8. INSPECTION AND TESTING

The following test and inspection procedure shall apply to components during manufacturing and to finished components of capacitor assembly:

| Test Description | Components | Acceptance Criteria/Reference Document |
|--|--|---|
| Visual Inspection | Top End Flange, Bottom End Flange, Ceramic cylinder. | Free from all kinds of surface defects. |
| Dimensional Inspection- Using coordinate measuring machine (CMM)/ Faro Arm/any 3d profile measuring techniques /Conventional tools like dial gauge and vernier. | Top End Flange, Bottom End Flange, Ceramic cylinder. | Approved manufacturing |
| Geometrical Tolerances- Flatness & Positional accuracy USING coordinate measuring machine (CMM)/ coordinate measuring machine (CMM)/ Faro Arm/any 3d profile measuring techniques | Top End Flange, Bottom End Flange, Ceramic cylinder. | Approved manufacturing |
| Surface Roughness- By Stylus probe method | Top End Flange, Bottom End Flange, and Ceramic cylinder. | Approved manufacturing |
| MSLD –Leak testing shall be performed at room temperature. Leak testing must be performed by following two methods: 1. <u>Local Leak testing</u> (Vacuum method): Capacitor assembly must be evacuated below 10^{-3} mbar | Capacitor assembly | Leak Rate of less than or equal to : a. 5×10^{-9} mbar-lit/sec for Local leak rate. b. 5×10^{-8} mbar-lit/sec for integrated leak rate. |

| | | |
|--|---------------|--|
| <p>using MSLD. After background is stabilised at less than 5×10^{-9} mbar-lit/sec, helium should be sprayed near all the brazing joints and vacuum sealing area.</p> <p>2. <u>Integrated leak test(Hood Method):</u></p> <p>The Capacitor assembly should be covered with a plastic and it is evacuated using a vacuum pumping system to a pressure less than $\sim 10^{-5}$ mbar. A leak detector is connected to the capacitor assembly and is calibrated w.r.t a standard leak before starting the measurement of integral leak test. For the integral leak test, the space between the evacuated assembly and plastic cover must be filled with helium tracer gas at least 60% by volume. As helium enters through leak present in evacuated assembly, it gets detected by helium gas leak detector. The detector indicates the total / global leak rate.</p> | | |
| NDE –Examination – | As applicable | 100% as per ASME sec VIII, Div. I, UW52. |

| | | |
|-----------------|--|---|
| Isolation Test. | 5kV DC from Meggar to be applied between Top and Bottom Flange/End of the complete capacitor assembly with no vacuum inside the capacitor. | Acceptance value shall be $\geq 10 \text{ G}\Omega$ (Giga Ohms) |
|-----------------|--|---|

9. FINAL ACCEPTANCE TESTING (FAT)

9.1. Factory Acceptance Test:

The Supplier is responsible for checking that all items conform to the technical requirements as set out in the technical specifications. The Supplier shall ensure that the items are in line with requirements. The Supplier shall make all components and parts available for Factory Acceptance Tests at the Supplier's site for ITER-INDIA/IPR.

Factory Acceptance Test aims and criteria are to check:

- Compliance with the Technical Requirements specified in this Technical Specification and drawings.

For final FAT following test shall be done.

1. Visual Inspection
2. Dimensional tests
3. He leak rate tests

Acceptance of the tests results and certificates does not relieve the Supplier of the responsibility for compliance with all the contractual requirements. If any of the Factory Acceptance Tests prescribed in the present specification reveals a defect or a fault of the components, the Supplier shall perform a timely and effective repair or shall guarantee the replacement the faulty deliverable free of charge, managing the repair or replacement by means of a proper non conformity management procedure.

9.2. Site Acceptance test (SAT):

After delivery of item(s) at purchase site, purchaser will inspect every component and check the physical state and condition of the packing for possible damage during transportation (vendor may witness SAT at it's own discretion).

Acceptance Test at site includes

- Checks of the physical state and condition of the packing for possible damage during transportation (vendor may witness SAT at it's own discretion).
- Successful completion of all the tests as per below, which may or may not be witnessed by vendor's representative:
 1. Visual Inspection
 2. Dimensional tests
 3. Helium leak test

If any of the Site Acceptance Tests prescribed in the present specification reveals a defect due to a fault or damage during transport or unloading, the Supplier shall perform an urgent and effective repair or shall guarantee the replacement of the faulty component at no cost

to the purchaser, managing the repair or replacement by means of a proper non-conformity management procedure.

6.0. Delivery Schedule:

The item(s) mentioned in this tender document should be supplied at purchaser's site on or before **Six** months from the date of release of purchase order.

7. General Terms and Conditions

- a) Bidder shall fill the Annexure A Technical compliance sheet at the time of quote.

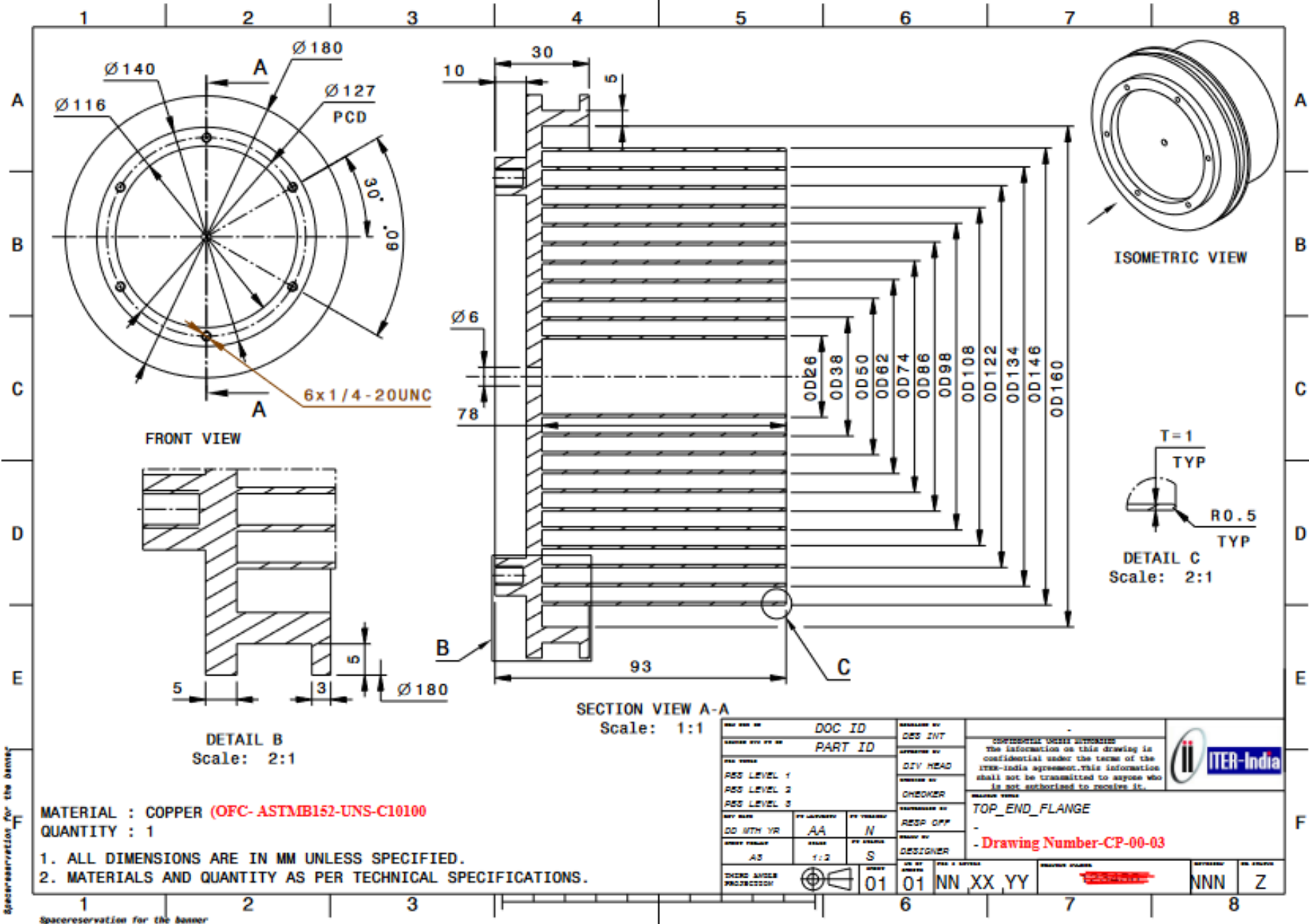
Note: Alternate manufacturing technology / method is acceptable, provided the end requirements of the drawing / configuration / dimensions along with the leak tightness and electrical parameters are met.

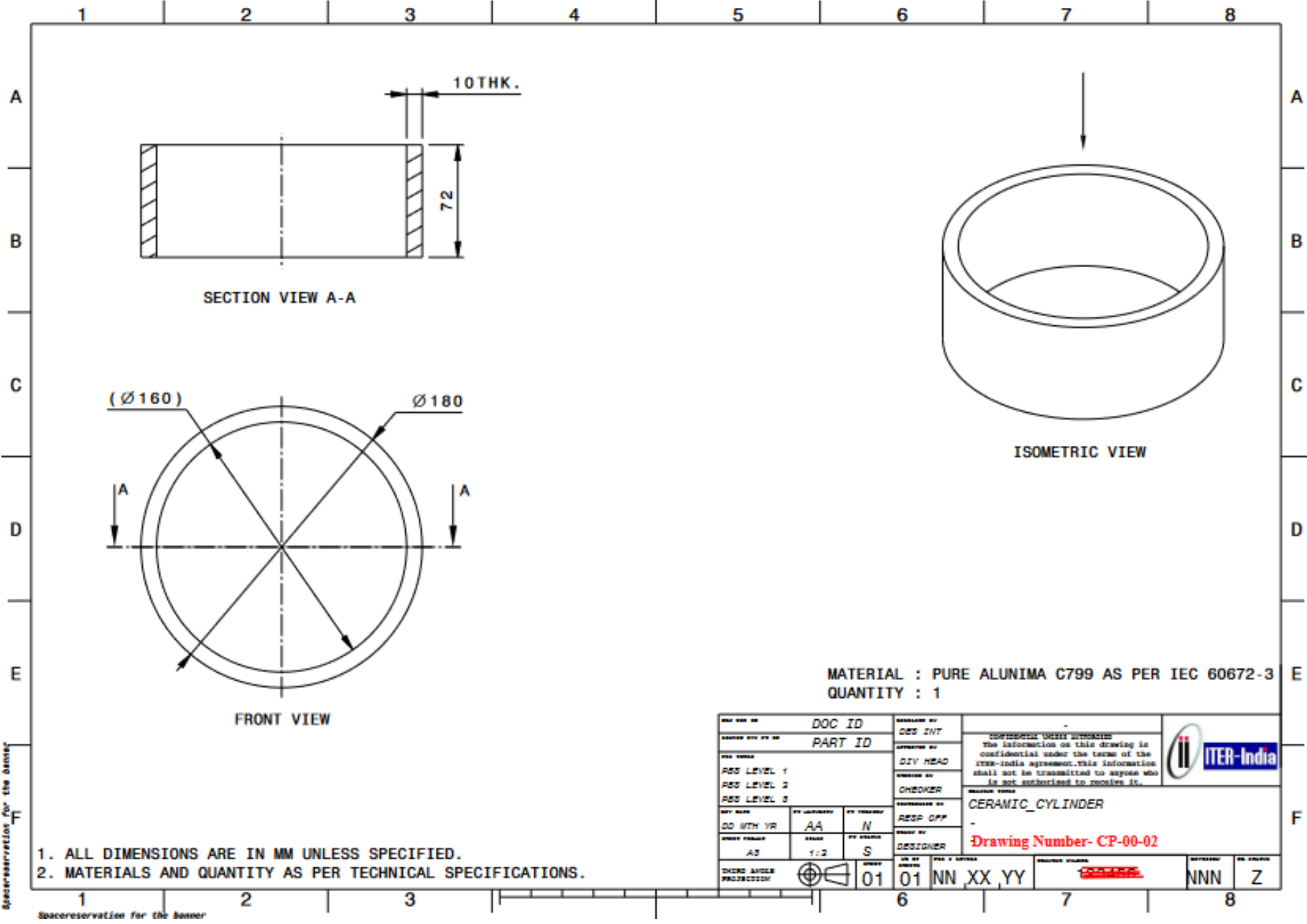
Annexure A
Technical Compliance Sheet



| Description | Response from M/s |
|---|-------------------|
| I have completely read, understood and accept the Technical Requirement mentioned from Sr.1 to Sr.11. (Yes/No)? | |
| I have received and completely understood the drawings supplied ITER-India/IPR. (Yes/No)? | |

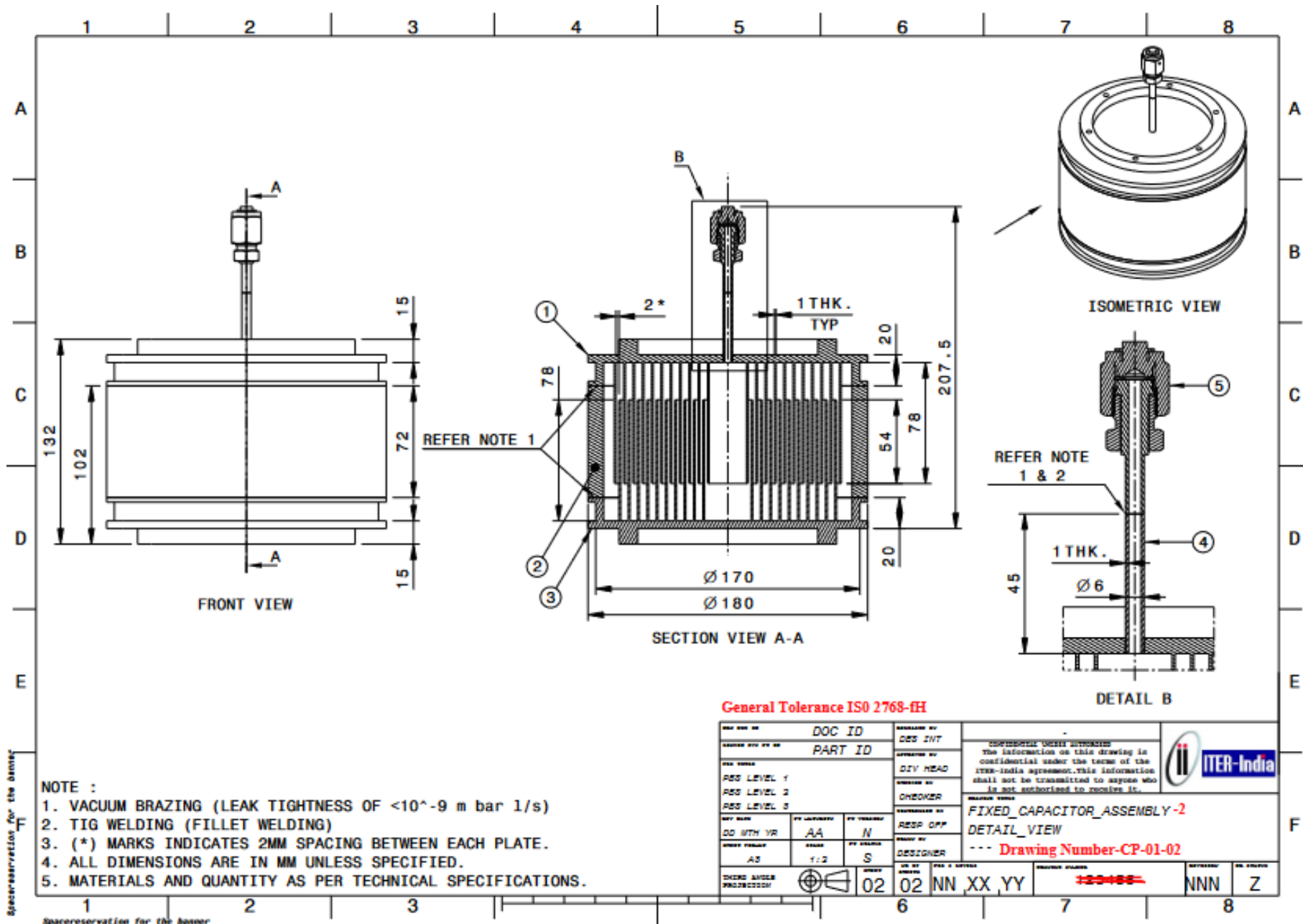
Sign & Stamp of Bidder with Date

Place: _____





| | | | | | |
|------------------------|--|-------------|--|--|--|
| DOC ID | | DES INT | | <div>CONFIDENTIAL UNDER IITER-INDIA</div> <div>The information on this drawing is confidential under the terms of the IITER-India agreement. This information shall not be transmitted to anyone who is not authorized to receive it.</div> <div></div> | |
| PART ID | | DIV HEAD | | | |
| DES LEVEL 1 | | DESIGNER | | CERAMIC_CYLINDER | |
| DES LEVEL 2 | | CHECKER | | | |
| DES LEVEL 3 | | DESIGNED BY | | Drawing Number- CP-00-02 | |
| DD WITH YR | | RESP OFF | | | |
| DESIGNER | | DESIGNER | | <div>01 NN XX YY</div> <div></div> | |
| THIRD ANGLE PROJECTION | | 01 | | | |
| 6 | | 7 | | 8 | |



Annexure-I Self Declaration (On company letter head) (Along with supporting documents, if any)

Tender No:

Tender Title:

Bidder's Name: _____ (Address and contact details)

Bidder's Offer No. _____ Date: _____

Restrictions on procurement from Bidders from a country or countries, or class of countries under Rule 144(xi) of the General Financial Rules 2017.

We have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries, and solemnly certify that we fulfil all requirements in this regard and are eligible to be considered. We certify that:

- (a) we are not from such a country or, if from such a country, we are registered with the Competent Authority (copy enclosed). and;*
- (a) we shall not subcontract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.*

Penalties for false or misleading declarations:

We hereby confirm that the particulars given above are factually correct and nothing is concealed and also undertake to advise any further changes to the above details. We understand that any wrong or misleading self-declaration by us would be violation of Code of integrity and would attract penalties as mentioned in this tender document, including debarment.

(Signature with date)

(Name and designation) Duly authorized to sign Bid for and on behalf of

(Name & address of the Bidder and Seal of Company)

Annexure-II Self-Certification under preference to Make in India order Certificate

(to be printed in letter head)

In line with Government Public Procurement Order No. P-45021/2/2017-PP (BE-II) dated 04.06.2020 as amended from time to time and as applicable on the date of submission of tender/enquiry, we hereby certify that we M/s__are Class I local supplier/ Class II local supplier/Non-Local supplier and quoted item/service against ITER-India Enquiry/Tender No. Dated

..... has/have local content i.e.,__%. Details of location at which local value addition will be made as follows:

We also understand, false declarations will be in breach of the code of integrity under rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151(iii) of the General Financial Rules along with such other actions as may be permissible under law.

Thanking You

Signature with date:

Name:

Design

ation:

Official

Seal