



ITER-India
(Institute For Plasma Research)



Title	Tender No. I-I/ET-TPT/WORKS/22002/22-23 dated 20-07-2022 for “Manufacturing, Inspection, Testing and Supply of Prototype Electron Beam (EB) Welded transitions for Plasma Grid from the Free Issue Material (FIM) provided by Purchaser”
Sub Title	PART-A (II): Scope of Supply, Work and Technical Specifications

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1 Subject of this technical specifications

ITER-INDIA aims to get manufactured, tested and supplied the “prototype EB welded transitions for Plasma Grid”. Technical specifications of the same are given in this document in detail.

2 Scope of supply

2.1 Hardware

Present technical specifications cover the manufacturing, fabrication, testing and supply of “prototype EB welded transitions for Plasma Grid” as per figure 1 and drawing number 04-00 which is in the scope of supply of the supplier.

2.2 Documentation

Along with the hardware as given in section 2.1, following documents are the part of supply.

- Manufacturing drawings
- WPS, PQR and weld plan
- Inspection reports (dimensional inspection, visual inspection, Production Proof Samples (PPS) qualification tests, Pressure test, He leak test, RT test),
- Release note after completion of all manufacturing activities
- Transportation and delivery documentation

3 Scope of work

The scope of work includes but not limited to the following activities.

- Preparation of manufacturing drawings and submit the same to ITER-INDIA for approval.
- Welding qualification as per ASME/EN
- Necessary tools/fixtures and start & stop block for EB welding shall be designed, manufactured and used by manufacturer as per requirement
- Manufacturing and qualification of the PPS (drawing # 02-00) as per section 5
- Manufacturing of the prototype EB welded transitions for Plasma Grid (drawing # 04-00) as per technical specifications
- Intermediate testing and inspection
- Perform factory acceptance test.
- Cleaning and packaging of all the items
- Transport & Safe delivery of components at ITER-India Lab, IPR , Bhat, Gandhinagar.

All above activities shall be performed as per the details provided in these technical specifications.

Note: Raw material for PG grid assembly, PPS and weld qualification will be provided by ITER-India as Free Issue Material (FIM), as per section 1.6 of Part-A(III). Supplier shall machine the material as per requirements of manufacturing/sample testing and then perform subsequent operations for the completion of the work as detailed in this document.

4 Technical details of the work

Overall dimensions of the prototype EB welded transitions for Plasma Grid are shown in figure1. For detailed dimensions, please refer corresponding drawings.

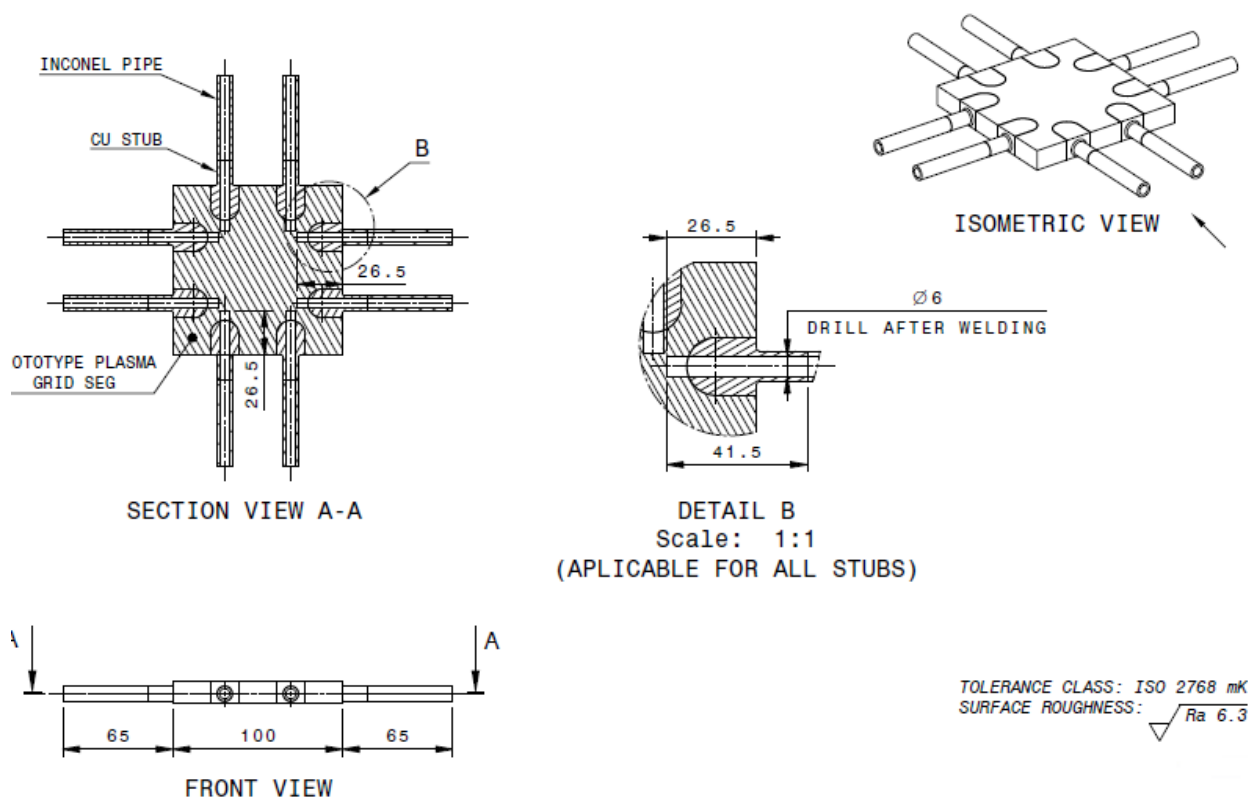


Figure 1 Prototype EB welded transitions for Plasma Grid (drawing # 04-00)

4.1 Proposed Assembly sequence

1. Cu stubs (drawing # 00-02) shall be machined from Cu plate

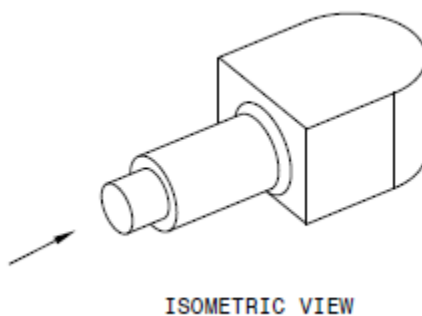


Figure 2 Cu stub after machining

2. Inconel pipes (drawing # 00-01) of required length as per drawing shall be welded with Cu stubs

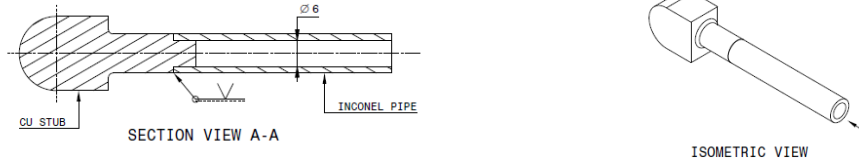


Figure 3 Inconel pipe welded with Cu stub(00-04)

3. Cu plate is machined to produce grooves as per requirements given in drawing # 00-05

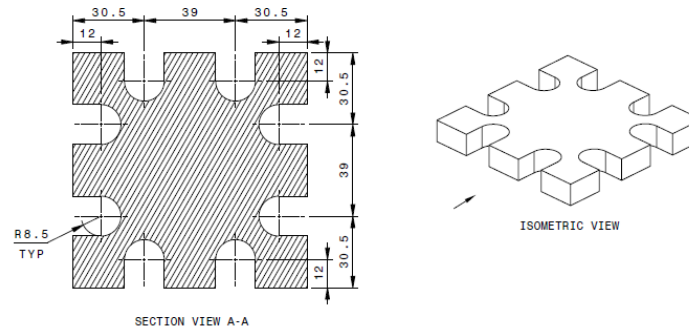


Figure 4 Plasma Grid Segment

4. Welding of Plasma grid segment with the items specified in drawing # 00-04

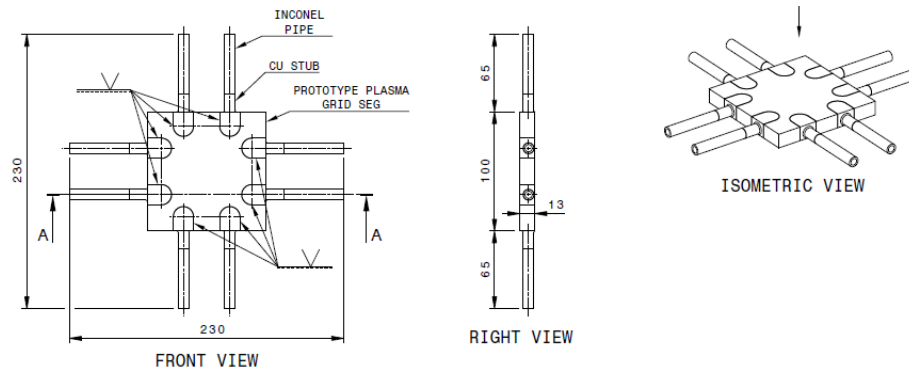


Figure 5 Prototype plasma grid assembly (without drill)

5. Drilling in the assembly as per the requirements specified in the drawing#04-00

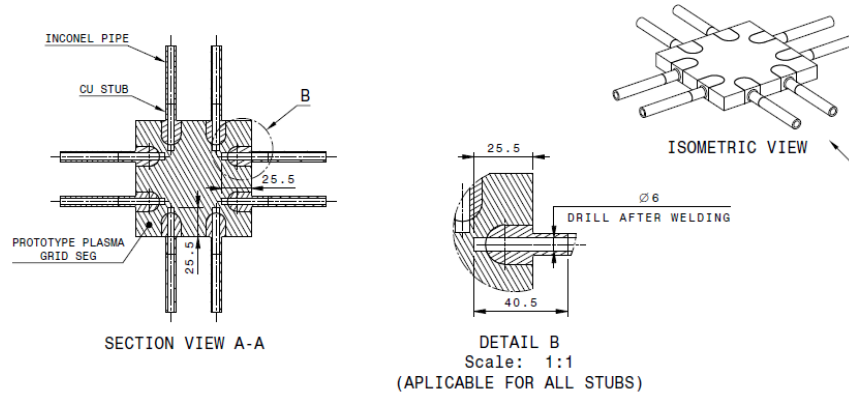


Figure 6 Prototype plasma grid assembly after drilling

Note: Supplier shall assess the assembly sequence from the manufacturability point of view.

5 Production Proof Sample (PPS) and its qualification

Prior to manufacturing of prototype EB welded transitions for Plasma Grid as specified in section 4, supplier shall prepare PPS. The dimensional details of the PPS are provided in figure 2 which is a representative of the production weld.

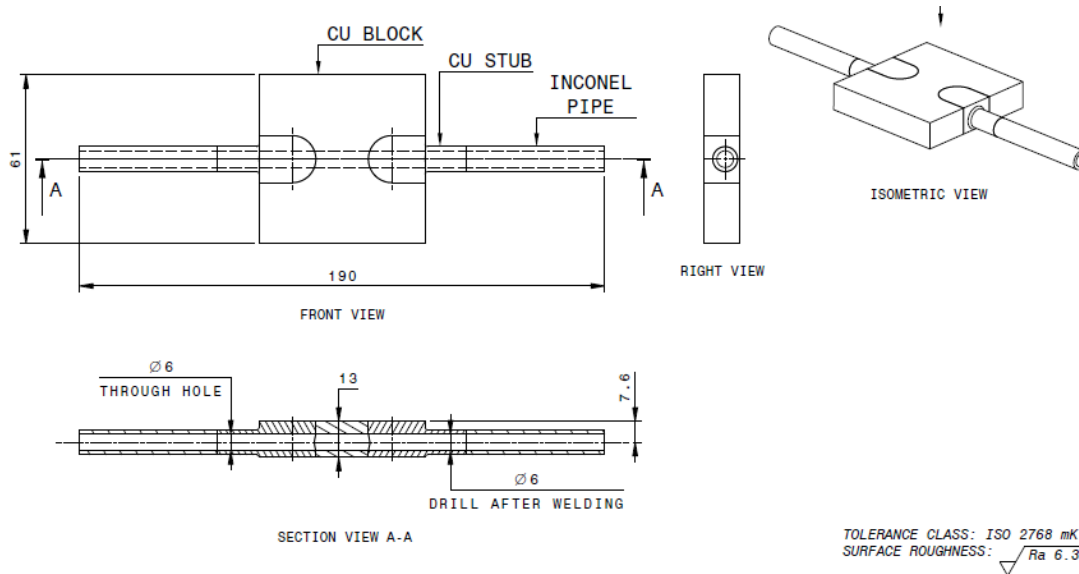



Figure 7 PPS (drawing #02-00)

A PPS must be welded as per qualified WPS and PQR with the machine and weld parameters that would be utilized for the production weld otherwise it would not be representative of the production welding.

PPS's should be tested as per following requirements and steps:

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1. PPS welds shall be 100% volumetrically examined using RT as per section 8.4
2. Pressure test shall be performed on the PPS as per section 9.1.3
3. He Leak test as per 9.1.4
4. Sectioning and macro examination at four places (including one stop/start area).

Photographs of the macros giving the date the PPS was welded, the machine’s identity and identifying the production welds it is covering must be included in the final documentation package.

An I-I representative will normally witness PPS welding and must review all PPS macros. Operations with witness and hold points to facilitate this must be incorporated in the Work Schedule.

Note:

1. All dimensions, unless otherwise specified, are in mm.
2. If discrepancy is found between dimensions provided in the **figures of this specification** and the **drawings**, then in that case dimensions specified in drawings shall only be considered as final approved dimensions.


6 Engineering Drawings

- The details provided in the engineering drawings are comprehensive and provide necessary information to manufacturer for the preparation of manufacturing drawings.
- The ITER-INDIA reserves the right to make minor dimensional changes prior to machining of the components. Such changes shall be considered within the scope of the specified work and shall not be considered extra.
- The Supplier shall scrutinize the drawings and bring out in writing any missing information /discrepancy /mismatch etc. if any to the notice of the purchaser at the time of submission manufacturing drawings. If not done so by Supplier, then the Supplier shall be fully responsible for any difficulties/problems faced during the manufacturing and testing of the component and shall bear the cost of any repair/rework carried out to solve the problems.

7 Preparation of Manufacturing Drawings and Documents

Supplier shall submit the manufacturing drawings to ITER-India for approval before start of manufacturing. Supplier shall assess the tolerance required for welding fit up and the same shall be proposed in manufacturing drawings to I-I for approval.

The approval of manufacturing drawing does not relieve the supplier from his responsibility of providing the component and their assembly in accordance with this specification.

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Supplier shall prepare manufacturing drawings for all sub components, indicating required details like Bill of material, Weld joint design, welding process, dimensions and their tolerance, examination details, surface finish etc.

8 Welding Requirements

8.1 Welding General Requirements

- Welding shall be done on the job, strictly following the approved welding procedures using skilled welding operators. The welding operator who performs the WPS & PQR shall only perform all the welding related to this job as specified in section 4 and 5.
- All joints shall be checked with 100% Radiographic Test (RT).

8.2 Manufacturer’s responsibility

WPS, Procedure Qualification Record (PQR), shall include weld joint details along with Weld Data Sheet (WDS) and shall get approved by the purchaser or his authorized inspector.


8.3 Acceptable Welding processes

EB welding shall be used for welding of Cu to Cu and Cu to Inconel.

8.4 Inspection of Welds

- Weld Data Sheet (WDS)
The manufacturer shall identify all the welds in a component by serial numbers indicating on a weld reference sketch. The WDS as per annexure shall be filled for each of these welds, by the manufacturer and shall be signed by the purchaser’s as well as manufacturer’s inspectors.
- Weld Surface –Finish
The welds shall have a regular surface. In general, all weld surfaces shall be ground smooth and merged smoothly into the adjacent base metal.
- Visual Examination
Visual Examination shall be carried out as per ASME Sec V/EN/similar international standards
Weld spatter, surface cracks, surface porosity and such other defects shall not be permitted.
- Radiographic Test (RT)
All weld joints shall be radiographic examined and qualified.

The radiographic examination shall be carried out as per ASME Sec V/EN/similar international standards

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Acceptance criteria for radiographic examination shall be as per ASME Sec VIII Div 1/similar international standards

- He leak test

All weld joints shall be subject to 100% helium leak testing as per section 9.1.4 of this document.

- Repairs

Any repair welding involving grinding or grinding followed by welding shall be reexamined by all the non-destructive tests applicable to that joint. The repair shall be carried out with prior approval of purchaser and in presence of them.

The procedure and acceptance criteria for repaired weld remain unchanged.

9 Acceptance Requirements

9.1 Factory Acceptance Test

9.1.1 Visual Inspection

All finished metallic parts shall be checked visually in the proper presence of light. Finished parts shall be free from any surface defects.

9.1.2 Dimensional Test

Dimensional check shall be carried out on all the dimensions of each metal parts. The Dimensions shall conform to those of the drawings. Exact list of dimensions and checking procedure shall be proposed by the Contractor and after mutual agreement between I-I and Contractor on it, dimensional check shall be carried out by the Contractor and shall submit the report.

9.1.3 Pressure Test


- Pneumatic pressure test of all the weld joints shall be performed as per applicable specification:

ASME Boiler and Pressure Vessel Code Sec VIII Div.2 or similar DIN / EN ISO

- Test Temperature: Room temperature.
- Test Pressure: 30 bar

Visual Examination shall be made for leakage and permanent deformation of all joints and connections.

Any leakages that are present, except for that leakage that may occur at temporary test closures, shall be satisfactory repaired and retested.

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The inspector shall reserve the right to reject the Pressure test program if there are any visible signs of permanent distortion and deformation.

9.1.4 He Leak Test

He leak test is mandatory for all the weld joints. Following requirements of testing shall be followed by Contractor:

- a) The test procedure shall be proposed by Contractor. After mutual agreement between I-I and Contractor, Contractor shall perform the test.
- b) For each test, a document must be prepared showing the mechanical set-up, the number of the assembly, base pressure, calibration and measured leak rate which must be equal to or less than 10^{-10} Pa.m³/s at 20°C
- c) In case of failure of test, Contractor shall submit a recovery procedure and after mutual agreement between I-I and Contractor, Contractor shall proceed with next course of action accordingly.

ITER-India shall witness all above specified tests.

Only after positive results of the Factory Acceptance Tests satisfying the conformance with the requirements as set out in the contract, the transport and delivery of manufactured items shall be done by supplier.

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 of the faulty deliverable free of charge, managing the repair or replacement by means of a proper non conformity management procedure.

Note:


All required testing equipment and other necessary items required for testing and inspection for factory acceptance test as specified above shall be arranged by supplier.

9.2 Site Acceptance Test

After delivery of components at ITER-INDIA’s Site, ITER-INDIA will inspect every component and check the physical state and condition of the packing for possible damage during transportation.

Final Site Acceptance Tests (SAT) include

- Checks of the physical state and condition of the packing for possible damage during transportation.

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- Checks of the component cleaning and conservation.
- Successful completion of the visual inspection.

If any of the SAT 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 free of charge, managing the repair or replacement by means of a proper non conformity management procedure.

After positive results of all the Site Acceptance Tests, delivery of the complete contractual documentation and ITER-INDIA’s review of the delivered documentation, the metallic components will be eventually accepted.