

प्लाज्मा अनुसंधान संस्थान

(भारत सरकार के परमाणु ऊर्जा विभाग का सहायता प्राप्त संस्थान)

इंदीरा ब्रिज के पास, भाट, गांधीनगर - 382428, भारत

दूरभाष: 079-23962020/23962021, फ़ैक्स: 079-23962277

CORRIGENDUM NO. 2 DATED 04-05-2022

Tender Notice No: IPR/TN/PUR/TPT/ET/21-22/063 Dated 31st March, 2022 for Design, Drawings, Manufacturing, Factory Acceptance Testing, Supply, Installation, Integration, Demonstration at IPR Site and Training of Cylindrical Sputtering System alongwith Required Accessories as per the detailed specifications mentioned in the tender documents.

The Section – D of tender documents has been replaced and the updated/revised Section-D i.e. Technical Specifications of Stores alongwith revised Drawings is uploaded.


Sr. No.	Particulars	Corrigendum for
1	Section – D of Tender Documents : Technical Specifications of Stores and Drawings	The revised/updated Section-D of tender documents alongwith revised drawings has been uploaded and the same is appended below.

Bidders may take a note of the above before uploading their bids. All other details mentioned in the Tender documents will remain unchanged.

Eligible vendors are requested to submit their tender through online **upto 13.00 hrs. on 31-05-2022.**

For more details, kindly refer the following website:

<http://www.ipr.res.in/documents/tenders.html> & <https://eprocure.gov.in/eprocure/app>


Head – Purchase Section
For, Institute for Plasma Research
Bhat, Gandhinagar
Gujarat

SECTION 'D' :
TECHNICAL SPECIFICATIONS OF STORES
AND
DRAWINGS

Institute for Plasma Research

(An Aided Institute of Dept. of Atomic Energy)

Bhat, Gandhinagar

QUALIFYING REQUIREMENTS

ITEM DESCRIPTION	Design, Drawings, Manufacturing, Factory Acceptance Testing, Supply, Installation, Integration, Demonstration at IPR Site and Training of Cylindrical Sputtering System alongwith Required Accessories as per the detailed specifications mentioned in the tender documents.	
Sr. No.	Detailed Criteria	Documents required to submit / upload
1	Bidder should be an Original Equipment Manufacturer (OEM) or Authorized Dealer/Distributor of OEM.	<u>If the bidder is an OEM :-</u> Bidder should upload company profile of OEM products with technical details. <u>If the bidder is an authorized dealer/distributor of OEM:-</u> Latest and valid agreement/dealership/distributorship certificate of OEM along with the company profile of OEM products with technical details.
2	Bidder should have executed at least 02 nos. of purchase order for sputter coating system with substrate heating mechanism in the last 5 years from the date of publication of this tender.	Bidder should upload at least 02 copies of UN-PRICED Purchase Orders alongwith technical details and orders completion certificate issued by the purchaser.
3	Bidder should have manufactured at least 01 No. of high vacuum system with internal heating mechanism up to 700 °C or higher in the last 5 years from the date of publication of this tender.	Bidder should upload at least one copy of UN-PRICED Purchase Order alongwith technical details and order completion certificate issued by the purchaser.
4	Bidder must have the valid ISO 9001 certificate.	Bidder should upload latest and valid copy of ISO 9001 certificate.
Note:		
a	The response to tender without submission of proof of above points will summarily be rejected without further communication	
b	The bidder shall not be under a declaration of ineligibility for corrupt or fraudulent practices or blacklisted with any of the Government agencies	
c	Original documents shall be produced for verifications, if required	

**REVISED TECHNICAL
SPECIFICATIONS OF STORES
AND DRAWINGS**

DESIGN, DRAWINGS,
MANUFACTURING, TESTING,
ACCEPTANCE, INSTALLATION, AND
DEMONSTRATION OF
CYLINDRICAL SPUTTERING SYSTEM
AND
REQUIRED ACCESSORIES

Institute for Plasma Research

Bhat, Gandhinagar

Gujarat, India

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1.0 Introduction:

Institute for Plasma Research (IPR) is an autonomous physics research institute located in Gandhinagar, Gujarat, India. It is devoted to basic research in plasma sciences and development of technological applications. Facilitation Centre for Industrial Plasma Technologies (FCIPT) links industries with IPR to exploit generated advanced and non-conventional plasma-based technologies for material processing and environmental remediation.

IPR intend to purchase a cylindrical geometry sputter coating system with option of deposition in reactive mode by DC as well as RF power. In particular, IPR intend to sputter erbium metal with magnetized argon plasma in presence of desired oxygen as reactive gas. It can also be used for any other type of reactive sputter deposition.

This tender document describes the information of the system as well as the necessary instruction for the tender documents. Bidder should carefully read the document prior to submit the bid.

IPR is looking for a reputed vendor who can do the designing, drawing preparation manufacturing, testing, acceptance, installation and demonstration of cylindrical sputtering system along with the required accessories. Bidder is responsible to supply a vacuum chamber with uniformly heating substrate heater, provisions of active cooling mechanism to maintain the chamber wall at room temperature, power sources and controllers for heater and sputtering, active cooling mechanism for cathode, temperature sensors, vacuum measurements, necessary feedthroughs, viewport with shutter, spares, Installation, etc.

2.0 System Description:

Sputtering is a plasma-based deposition process in which energetic ions are accelerated towards a target. The ions strike the target and atoms are sputtered from the surface. These atoms travel towards the substrate and incorporate into the growing film. The conceptual model of sputtering system along with the required accessories is shown in Figure 1.

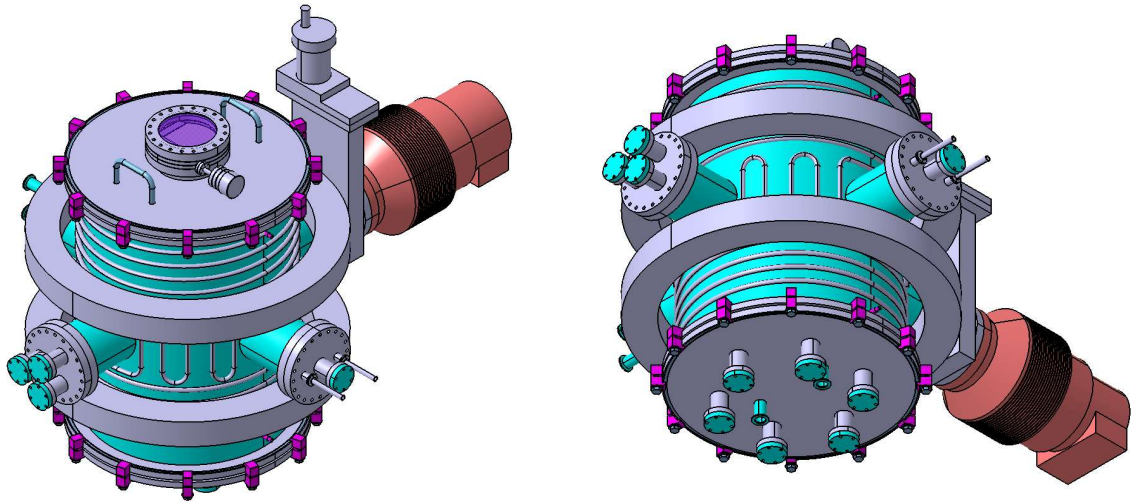


Figure 1: Conceptual 3-D Model of Sputtering system

3.0 Scope of Bidder:

3.1 *Preparation of engineering design, drawings and model:* Bidder will study the conceptual drawings (attached as Appendix – 2) provided along with this tender and will submit the design documents which includes the final engineering drawings and models, analysis reports / calculations etc. for the followings:

- (a) Vacuum Chamber along with its components with cooling provisions & support structure
- (b) Heater
- (c) Cathode with cooling provisions and substrate pipe
- (d) Lifting arrangement for top flange
- (e) Support structure for Heater, Cathode and substrate pipe

The design criteria and technical details are given in clause no. 3.6. IPR will review and approve the engineering drawings and models to start the manufacturing. **However, Bidder will be solely responsible to demonstrate the component and system compliance with the technical requirements defined in this tender document during the component and system acceptance test(s)**

Bidder will also submit the final engineering and fabrication drawings and models to IPR in soft (CATIA/Autocad) and hard copies for review and approval.

3.2 *Procurement of Material:* Bidder will procure the required material as listed in bill of material of approved drawings to execute the scope of this tender. Bidder will submit the test reports to IPR for review and approval prior to use.

3.3 *Preparation of Quality documents:* Bidder will prepare Quality Plan, Manufacturing and Inspection Plan, Quality Procedure(s), Work Instruction and submit it to IPR for review and approval prior to start the work.

3.4 *Preparation of welding documents:* Bidder will prepare and submit Welding Procedure Specification (WPS), Procedure Qualification Record (PQR) and Welder Procedure Qualification Record (WPQR) to IPR for review and approval. Bidder will make sure that the submitted documents are approved prior to start the welding related work.

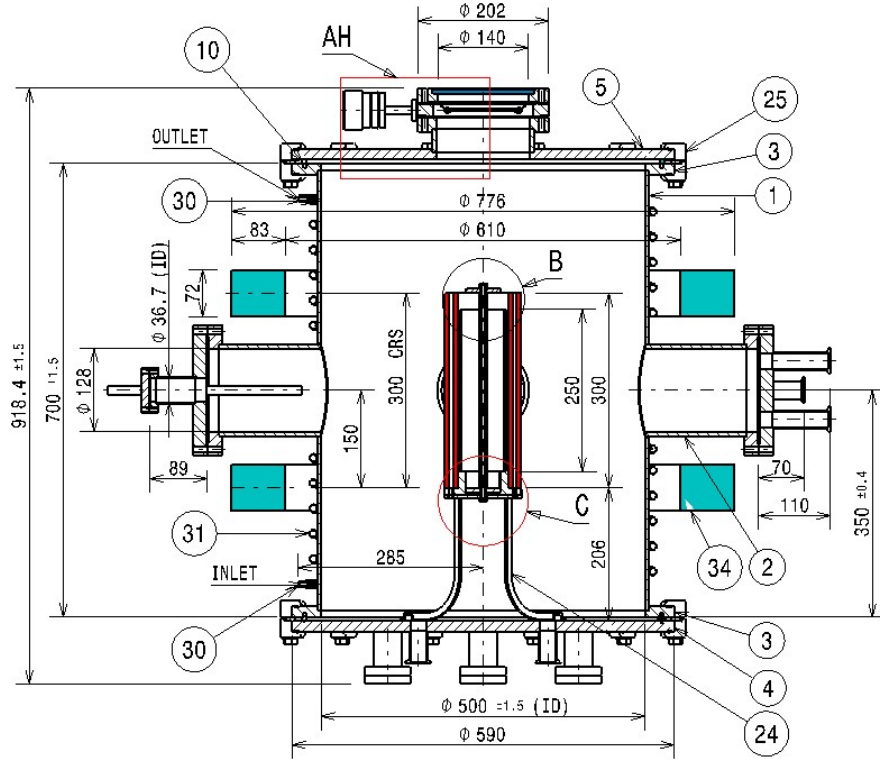
3.5 *Manufacturing and Assembly of Sputtering System:* Bidder will manufacture and assemble the sputtering system as per the specification listed below:

3.5.1 *Fabrication of Vacuum Chamber:* It is the chamber where the process will take place. It is a single wall which will be manufactured by using the SS 304L Material. Following table provides the key parameters of the SS 304L. Bidder must ensure that he will submit the material testing reports as per the ASTM A 240 or equivalent Indian standard to IPR for review and approval

Material	SS 304 L
UNS No.	S30403
Chemical Composition	As per requirements given in ASTM A 240 – 240 M or equivalent Indian standard
Mechanical Properties	
Inspection	
Procurement & acceptance	

Key parameters of vacuum chamber are as follows:

- (i) Type : Single wall along with the cooling channel
- (ii) Internal Dia. (mm) : 500 mm ± 1.5 mm
- (iii) Height including collar flange : 700 mm ± 1.5 mm



20	SUBSTRATE PIPE	1	SS316	REFER SHEET 06 OF 06	39	FASTENERS (BOLT, NUT, WASHER ETC)	SS304L	QTY. AS REQUIRED	
19	CATHODE	1	ETP COPPER	REFER SHEET 06 OF 06	38	BOLT M8x20	1	SS304L	REFER SHEET 05 OF 06
18	GAS INLET PIPE	2	SS304L	REFER SHEET 05 OF 06	37	16KF COUPLER	2	SS304L	REFER SHEET 05 OF 06
17	25KF COUPLER-2	2	SS304L	REFER SHEET 05 OF 06	36	BOLT M8x14	1	SS304L	REFER SHEET 05 OF 06
16	16KF BLANK FLANGE	2	SS304L	REFER SHEET 05 OF 06	35	C_PLATE-3	2	HIGH DENSITY GRAPHITE	REFER SHEET 06 OF 06
15	25KF COUPLER	4	SS304L	REFER SHEET 05 OF 06	34	COIL	2	-	FOR INFORMATION ONLY
14	150CF_QUARTZ_VIEWPORT	1	SS304L & GLASS	STANDARD PART	33	TURBOPUMPS	1	-	FIM (STANDARD PART)
13	VIEWPORT_SHUTTER-150CF	1	SS304L	STANDARD PART	32	150CF-GATE_VALVE	1	-	STANDARD PART
12	150CF FLANGE-5	1	SS304L	REFER SHEET 05 OF 06	31	COOLING-TUBE	1	COPPER	USE AS PER SYSTEM REQUIREMENT.
11	TOP PIPE	1	SS304L	REFER SHEET 05 OF 06	30	NOZZLE	2	COPPER/SS	STANDARD PART
10	O-RING	2	SILICON	-	29	35CF BLANK FLANGE	10	SS304L	REFER SHEET 05 OF 06
9	150CF FLANGE-4	1	SS304L	REFER SHEET 04 OF 06	28	35CF FLANGE	10	SS304L	REFER SHEET 05 OF 06
8	150CF FLANGE-3	1	SS304L	REFER SHEET 04 OF 06	27	PIPE-1_35CF	10	SS304L	REFER SHEET 05 OF 06
7	150CF FLANGE-2	1	SS304L	REFER SHEET 04 OF 06	26	LIFTING HOOK	2	SS304L	REFER SHEET 06 OF 06
6	150CF FLANGE-1	4	SS304L	REFER SHEET 04 OF 06	25	CLAW CLAMP	24	SS304	STANDARD PART
5	TOP FLANGE	1	SS304L	REFER SHEET 03 OF 06	24	SUPPORT LEG	4	SS304L	REFER SHEET 06 OF 06
4	BOTTOM FLANGE	1	SS304L	REFER SHEET 03 OF 06	23	SUPPORT C PLATE-2	1	SS304L	REFER SHEET 06 OF 06
3	FLANGE-1	2	SS304L	REFER SHEET 02 OF 06	22	C PLATE-1	1	CERAMIC	REFER SHEET 06 OF 06
2	SIDE PIPE-1	4	SS304L	REFER SHEET 02 OF 06	21	HEATER (HEATING ELEMENT AND CASING)	1	KANTHAL AND INCONEL 718	REFER SHEET 06 OF 06
1	CYLINDRICAL CHAMBER INNER	1	SS304L	REFER SHEET 02 OF 06					
Item No.	Description	Qty.	Material	Remarks					

Figure 2: Vacuum chamber along with flange and other components

Bidder will use the Tungsten Inert Gas (TIG) welding method for chamber fabrication. He will ensure that he will follow the requirements given in ASME Section IX or equivalent Indian standard during the execution of welding and associated inspections. In addition to the Dimension and NDT Inspection, all weld joints will be tested by Leak testing using helium leak detector to an individual leak rate of $\leq 5.0 \times 10^{-9}$ mbar l/s.

All procured fasteners material must meet the specification mentioned in approved drawings.

- 3.5.2 *Electro-polishing*: Bidder will do the electro-polishing of the inner surface (including its part) of the chamber once welding operations are completed and accepted. Bidder will make sure that the surface finish of the inner surface shall meet the requirements of 2 delta surface finish.
- 3.5.3 *Ultra-high vacuum (UHV) cleaning*: Chamber along with all parts should be cleaned as per the UHV procedure including the ultrasonic cleaning.
- 3.5.4 *Heater*: Cylindrical heater having a length of ~ 300 mm and capable of radiatively heating the concentric pipe substrate up to $100\text{ }^{\circ}\text{C}$ to $700\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ (Temporal tolerance) flat-top will be installed in vacuum chamber as shown in Figure – 3. The heater should be capable to limit the temperature difference between the substrate pipe center to the substrate pipe edges within $25\text{ }^{\circ}\text{C}$ and having the necessary shielding to ensure that the specified temperature requirements are met. The temperature ramp-up rate should be adjustable from $1\text{ }^{\circ}\text{C}/\text{min}$ to $15\text{ }^{\circ}\text{C}/\text{min}$ with an adjustable step of $1\text{ }^{\circ}\text{C}/\text{min}$. Bidder will ensure that suitable DC power supply along with suitable controller should be provided. Suitable power feedthrough and temperature sensor feedthroughs for at least 3 sensors (to be attached to substrate pipe center and two edges) must be installed on the vacuum chamber.

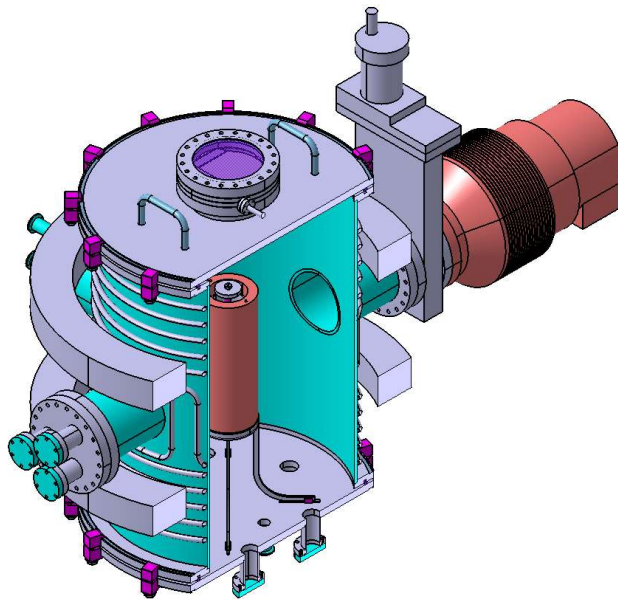


Figure 3: Arrangement of Heater, Substrate Pipe and Cathode in Vacuum Chamber

The suggested material for casing and heating element are Alloy 718 / Alloy 600 and Kanthal (which is FeCrAl (Iron-Chromium-Aluminum) alloy), respectively. Following table provides the key parameters of the FeCrAl alloy, Alloy 718 and Alloy 600 materials. Bidder must ensure that he will receive the approval on the submitted test reports prior to use. Bidder will be responsible to demonstrate the compliance of the heater performance with the technical requirements during the acceptance of component and system.

Material	FeCrAl Alloys
Chemical Composition	Cr (20-30%), Al (4-7.5%) and Fe (Balance)
Mechanical Property	Tensile Strength: 680 N/mm ² Hardness: 230 Hv Density: 7.10 g/cm ³ Yield Point: 470 N/mm ²
Melting Point	1425 °C

Material	Alloy 718
UNS No.	N07718
Chemical Composition	As per requirements given in ASTM B670-07 or equivalent Indian standard
Mechanical Properties	
Inspection	
Procurement & acceptance	

Material	Alloy 600
UNS No.	N06600
Chemical Composition	As per requirements given in ASTM B168-08 or equivalent Indian standard
Mechanical Properties	
Inspection	
Procurement & acceptance	

3.5.5 *Cathode and Substrate Pipe:* Cathode having a length of ~ 300 mm and substrate pipe having a length of ~ 250 mm which will be installed in vacuum chamber. In addition to 300 mm length, cathode should have removable electron trap plates at both ends which will be made from high density graphite. Cathode should also have DM water cooling provision to avoid its melting under ion bombardment and thermal load from heater. The substrate pipe and heater should be having a same vertical and horizontal center. There should be minimal required gap between substrate pipe OD and Heater ID to take care of thermal expansion. Substrate pipes should be duly polished / electropolished on inner surfaces for coating experiments. The surface finish of the inner surface shall meet the requirements of 3 delta surface finish. Cathode will be made from ETP copper and substrate pipe from SS 316 material. Following table provides the key parameters of the ETP Copper and SS 316 materials. Bidder must ensure that he will receive the approval on the submitted test reports prior to use.

Material	ETP Copper
UNS No.	C10100
Chemical Composition	As per requirements given in ASTM B152M – 97a or equivalent Indian standard
Mechanical Properties	
Inspection	
Procurement & acceptance	

Material	SS 316
UNS No.	S31603
Chemical Composition	As per requirements given in ASTM A240 – 240M or equivalent Indian standard
Mechanical Properties	
Inspection	
Procurement & acceptance	

Bidder will also supply 01 (One) dummy cathode made from ETP Copper and 10 (Ten) substrate pipes made from SS 316 along with the sputtering system. It will be used for installation and demonstration purpose.

3.5.6 *Demountable flange along with Silicon O-rings and clamp* shall be on top surface of vacuum chamber. Applicable dimensions are given in drawings attached as Appendix - 2. Bidder will make sure that the flange and chamber dimensions are in-line with each other. This flange has the view port having a size of 150 CF along with the manual operated shutter mechanism as shown in following figure to view the inner area of the vacuum chamber. The main aim of the shutter mechanism is to prevent the damage to the viewport glass from the sputter deposition.

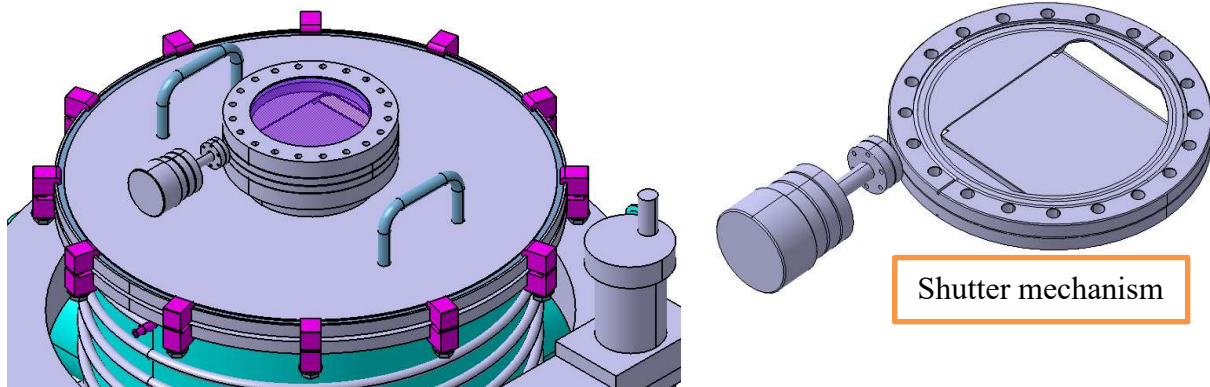


Figure – 4: View port along with the shutter mechanism

Top flange should have the provision to lift at least by 700 mm or a combination of lift of 150 mm and then move aside with automation to get the access of chamber from the top side. Conceptual provisions are given in the drawings attached as Appendix - 2. However, bidder can provide the alternative procedure to lift the top flange. Bidder will submit the lifting scheme along with the drawings to IPR for review and approval.

The procedure to lift the top flange should not make any obstacle to use the view port or viewing inside the chamber from the view port. The lifting mechanism should be integral part of the on-wheel support structure of the system.

3.5.7 *Demountable flange along with Silicon O-rings and clamp* shall be on bottom surface of vacuum chamber. Applicable dimensions are given in drawings attached as Appendix - 2. Bidder will make sure that the flange and chamber dimensions are in-line with each other. 6 numbers of 35 CF flange and 2 numbers of 25 KF ports to be provided on bottom flange as shown in following figure.

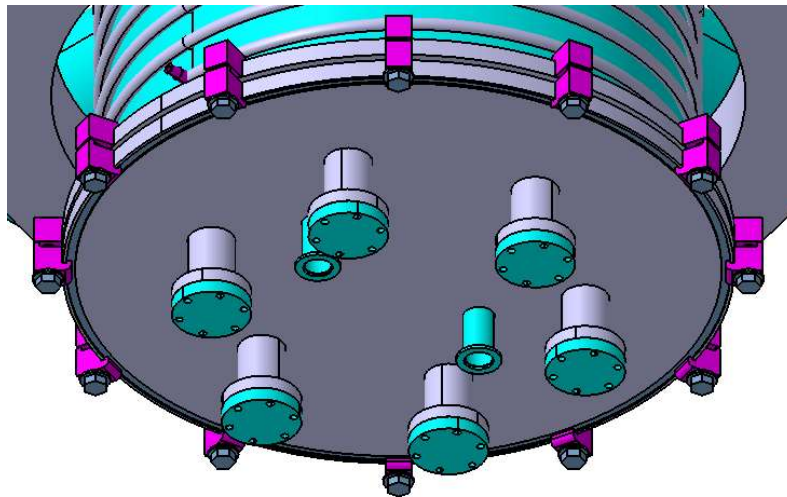


Figure – 5: Bottom flange along with CF flange and KF Couplers

3.5.8 *Four 150 CF ports* as described in following table will be installed on vacuum chamber.

Port	Location	Details
Port 1	Pump side	Gate valve Turbo pump (FIM)
Port 2	Opposite to Pump side	3 Nos. of 35 CF Flange
Port 3	90° anti-clock wise from Port 1	4 Nos. 25 KF coupler
Port 4	Opposite to Port 3	1 Nos. of 35 CF Flange 2 Nos. of gas inlet through 16KF ports

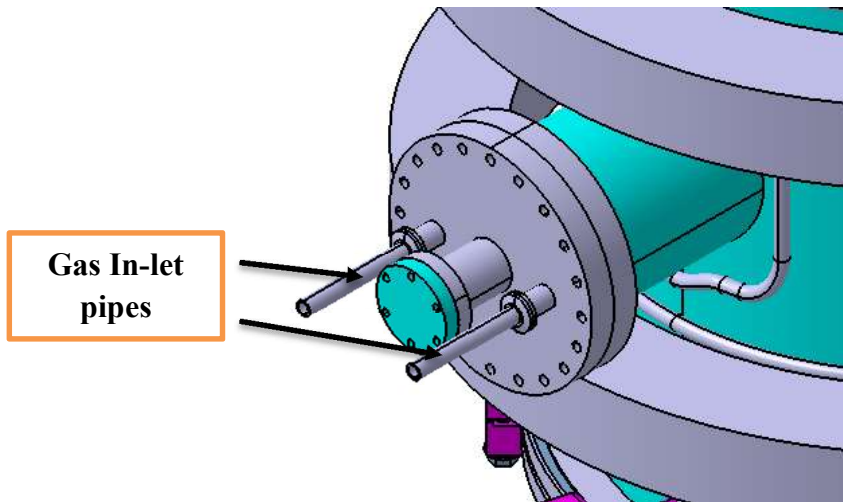


Figure – 6: Arrangement of gas in-let pipes

3.5.9 *Cooling provisions:* Cooling channels to be wrapped on surface of the vacuum chamber to remove the generated heat. Bidder will use the given concept to develop the engineering design and will ensure that the final design can maintain the chamber wall temperature at room temperature i.e., 35 ± 5 °C maximum while the internal substrate pipe is at 700°C for at least 3 hours. In addition to this, cathode (described in point no. 3.5.5) to be cooled by circulation of DM water through the drilled hole across its length. Bidder shall design metallic cathode cooling for magnetized plasma sputtering of it under the temperature effect from the concentric substrate pipe, which is at 700 °C at the time of the sputtering for at least 3 hours. The cathode material for demonstration is ETP copper.

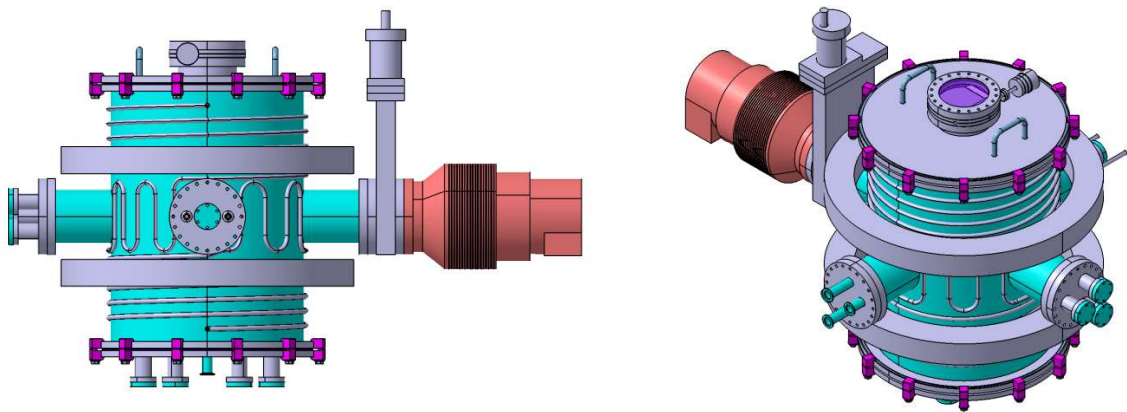


Figure – 7: Cooling Provisions

3.5.10 *Support provisions:* The support structure to be manufactured to provide a support to the heater, cathode and substrate pipe. Conceptual design of support provisions is given in Appendix - 2. Bidder will submit the final provisions for support along with the fabrication drawings to IPR for review and approval. The support provisions should meet the requirements of

- (a) It should be capable to withstand the load of cathode, heater and substrate pipes

- (b) Support structure should keep cathode, heater and substrate pipe electrically as well as thermally isolated mutually as well as from the electrical ground.

In addition to the support structure provided for heater, cathode and substrate pipe, bidder will provide a support structure on wheels to the whole system for the easy movement. Bidder must note that this support structure should not make any obstacle to the assembly or disassembly of electro-magnets. Final dimensions along with the magnet assembly are given in Appendix - 2. The lifting mechanism should be integral part of the on-wheel support structure of the system.

3.5.11 Power supply for Sputtering system: Following items for power supply to be provided by bidder

- (a) DC Power supply of 3 kw: This power supply should meet the requirements of

- Voltage : 150 – 1000 V
- Current : 3A max.
- Line regulation : 0.5% or better
- Load regulation : 0.1% or better
- Output ripple : 1 Vrms or better

Bidder must get the approval of technical data sheet from IPR prior to use. He should ensure that it is manufactured by a recognized manufacturer and designed specifically for plasma sputtering application with the features like arc resistance etc.,

- (b) Digital panel meter for voltage and current display. This panel should display the unit in 3 digits and should meet the following requirements

- Voltage setting : 10 turn potentiometer
- Current setting : 1 turn potentiometer

- (c) Suitable Power feedthrough for sputtering power supply to connect to Cathode and substrate (grounded anode) must be installed on the vacuum chamber.

3.5.12 Measurement Instrument and Utilities: Following items to be supplied by bidder

- (a) Capacitance Manometer along with 16/25 KF connecting port, controller and cable. Bidder will submit the technical data sheet to IPR
- (b) A set of two digital pirani vacuum gauge sensors (one each on roughing pump mouth and on main chamber) and display meter.

- (c) 02 (Two) Numbers of Mass flow controller along with the necessary plumbing from cylinders to chamber to control oxygen and Argon flow. The control range should be 0-200 sccm for Argon and 0-100 sccm for Oxygen. Bidder will submit the technical data sheet to IPR
- (d) Gas lines with isolation valves and cylinder regulators
- (e) All gas fittings and tubing should be made from non-corrosive and non-magnetic stainless-steel material.
- (f) Interconnecting plumbing which includes valves for chamber roughing, backing and venting.
- (g) Manual 150CF gate valve to isolate the process chamber from high vacuum pumping system.
- (h) Pumping system will be provided by IPR as a free issue item to the bidder at the time of installation at IPR premises. Assembly and integration of it to the system is in the scope of this tender.

3.5.13 *Supply of control system and instrumentation panel:* Following items to be supplied by bidder

- (a) Industrial rack which should have the provision to adjust height for leveling and with castors & stoppers for easy movement. All control and instrumentations required for monitoring and operation of the system to be mounted in this rack. It should be completely wired internally with various components and instruments. The electrical cabling between panel and main system should be done through the cable tray as per the industrial practice.
- (b) Full manual control with full manual overrides for maintenance and safety services
- (c) All necessary safety interlocks i.e. Water interlock, Pneumatic interlock, Vacuum interlock, water cooling interlocks, Cathode cooling interlock, etc.,
- (d) All safety interlocks must be supplied with the sound alarm / LED messages etc., which are associated with the equipment related to vacuum, water, compressed air, electrical etc.,
- (e) All panels for electrical power distribution, instruments and for utilities should be located on the system frame.

3.5.14 *Integration of Free Issue Items to the main system at IPR site:* Following items will be provided as a free issue item to the bidder once the site acceptance of the system is successfully completed at IPR.

- (a) High vacuum pumping system
- (b) Power, water, gas and other consumables (at the time of installation)

The integration of the above items is in the scope of this tender. Bidder can submit a request in case any other facilities / utilities which may be required during the integration of the above-mentioned items to the main system.

Vendor should depute their trained and experienced person to perform the installation of the system at IPR and its integration with pumping system, etc.,

3.5.15 *Safety Provisions:* Bidder must note that supplied system should meet the following requirements

- (a) All chassis of power supplies, measuring instruments, sputtering chamber, metallic support structure and cabinets should be properly ground for human and equipment safety.
- (b) Provision to be done that power to the heater and other power supplies to be shut down if the chamber is not under vacuum.

3.5.16 *Packing, Loading, Transportation and Un-loading of system and spares to IPR*

3.5.17 *User / operation manual along with electrical circuit diagram* to be supplied along with the system.

3.5.18 Documentation to be delivered by bidder:

- (a) Design documents (as mentioned in clause No. 3.1)
- (b) Fabrication drawings and models (as mentioned in clause No. 3.1)
- (c) Quality Assurance Plan
- (d) Manufacturing and Inspection Plan
- (e) Quality Procedure
- (f) Work Instructions and NDT Instructions
- (g) Welding documents
- (h) Material test reports
- (i) Fasteners test reports and off-shelf procured items reports
- (j) Manufacturing and Inspection records
- (k) Packing and shipment records
- (l) User / operation manual along with electrical circuit diagram
- (m) Deviation request and Non-compliance report (if any)
- (n) Warranty certificate

3.5.19 *Required Spares:* Following items to be supplied along with the main system as required spares

- (a) Cylindrical heater having same rating and type which is used in system: 1 Nos.
- (b) Dummy cathode of ETP Copper: 1 Nos. (as mentioned in 3.5.5)
- (c) Substrate pipe made from SS 316: 10 Nos. (as mentioned in 3.5.5)
- (d) O-rings set for the complete system: 03 Sets
- (e) 25 KF Right angle vacuum valves: 02 Nos.
- (f) One set of Sputtering power feed through, heater power feed through and temperature sensor feed throughs for vacuum systems similar to those installed on the system

3.5.20 *Training:* Bidder will also arrange a training session at IPR for full operational and basic troubleshooting of the system.

4.0 Scope of IPR:

4.1 IPR will supply conceptual drawings and models of sputtering system and its components to the bidder for final engineering and fabrication drawings and models.

4.2 IPR will provide following items as a free issue item for integration:

- (a) High vacuum pumping system
- (b) Power, water, gas and other consumables (at the time of installation)

4.3 IPR will review and approve the design documents which includes the final engineering drawings, models, analysis reports / calculations, fabrication drawings, Quality documents and Work Instructions (if any), etc. prior to start the work / operation.

4.4 IPR representative shall do the random witness during the (i) NDT Inspection of welding operation as per the approved procedures / work-instruction, (b) Dimension Inspection of sputtering system and components, (c) Acceptance of raw material and components. Manufacturing and Inspection plan for this tender will be decided mutually by the bidder and IPR prior to start the work. Suggested Inspection and acceptance test plan is given in section 6.0

4.5 IPR will provide the space information to install the system at IPR premises.

5.0 Inspection and Acceptance:

5.1 *Stage-wise inspection:* IPR representative will perform the inspection at various stages of contract execution. IPR representative will do Documentation review (DR), Witness on sampling basis, NC review and decision to ensure that the performed operation / activities are

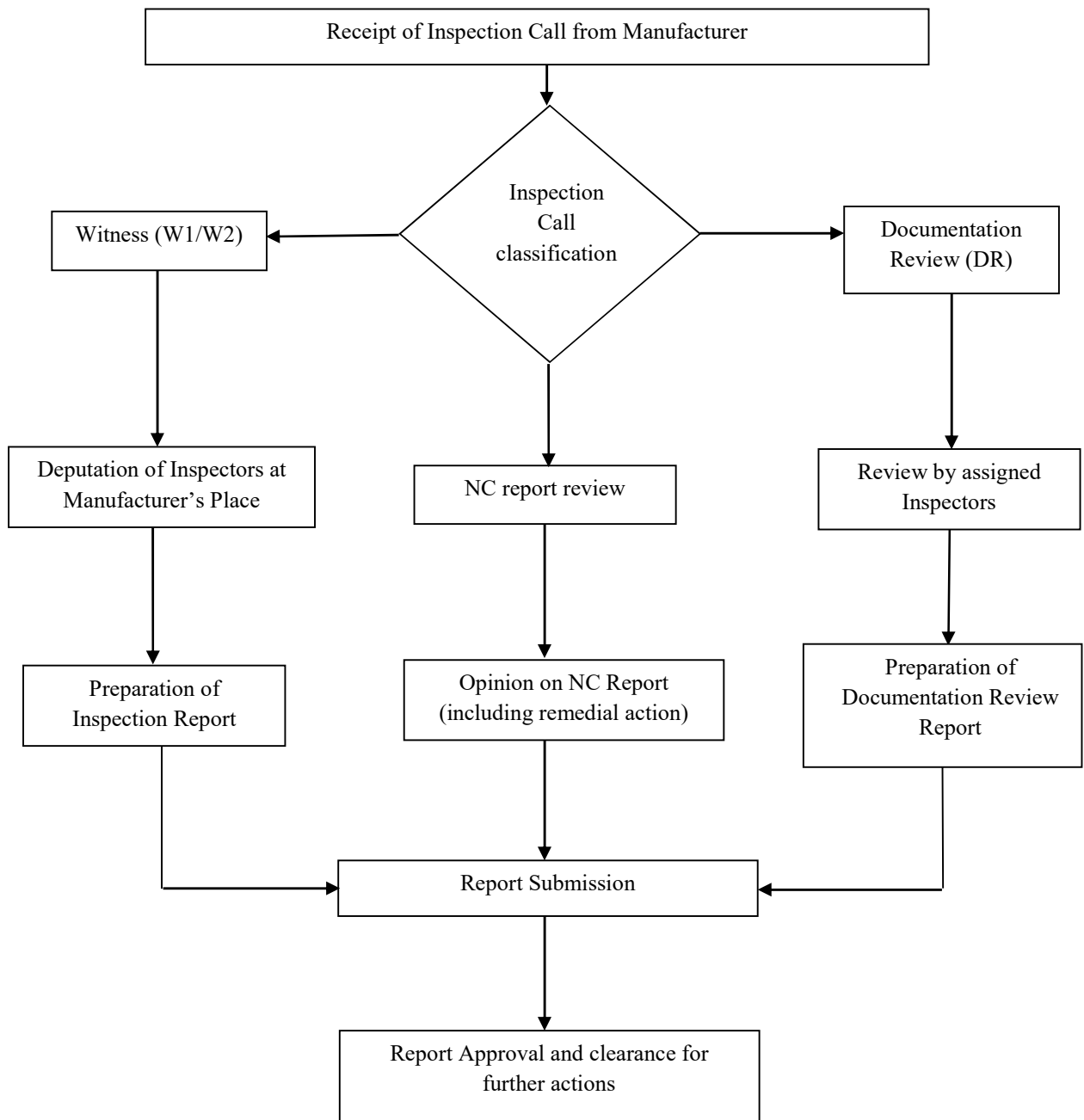
in-line with the approved procedures. Representative flow chart is given at end of this section.

5.2 *Factory Acceptance / Pre-Dispatch Inspection:* IPR representative will check the following parameters to ensure that the manufactured system is in-line with the specification

- (a) System Dimensions
- (b) System should achieve the base pressure of $\leq 5.0 \times 10^{-7}$ mbar and operating pressure of 5.0×10^{-3} to 2.0×10^{-1} mbar at room temperature. TMP, Rotary pumps and High Vacuum Gauge shall be arranged by vendor for this test.
- (c) He Leak Testing of the weld joints for the leak rate of $\leq 5.0 \times 10^{-9}$ mbar l/s. He Leak Detector shall be arranged by vendor for this test.
- (d) Bidder should demonstrate that heater must be capable to heat the middle of substrate pipe to 700 ± 5 °C (temporal tolerance) for 3 hours flat-top. The temperature difference between the heater center to the both heater edges within 25 °C and temperature of any part of the chamber should not be more than 35 ± 5 °C maximum. The temperature ramp-up rate should be adjustable from 1 °C/min to 15 °C/min with an adjustable step of 1 °C/min with the specified substrate pipe.
- (e) Interlocking mechanism: All interlocks except the ones associated with FIM will be checked for its function and the sound alarm / LED messages.
- (f) Sputtering power supply to be tested for its operational parameter range on dummy load to be arranged by vendor.

5.3 *IPR Site Acceptance Criteria:* Vendor has to perform and demonstrate the following test during installation to IPR representative.

- (a) Visual Inspection for any damaged during the loading, unloading or transportation
- (b) System should achieve the base pressure of $\leq 5.0 \times 10^{-7}$ mbar and operating pressure of 5.0×10^{-3} to 2.0×10^{-1} mbar after installation at IPR. TMP (~700 l/s pumping speed) and suitable rotary pump would be provided by IPR. High vacuum Gauge will be provided by IPR.
- (c) He Leak Testing of the weld joints for the leak rate of $\leq 5.0 \times 10^{-9}$ mbar l/s. He Leak detector will be provided by IPR
- (d) Bidder should demonstrate that heater must be capable to heat the middle of substrate pipe to 700 ± 5 °C (temporal tolerance) for 3 hours flat-top. The temperature difference between the heater center to the both heater edges within 25 °C and temperature of any part of the chamber should not be more than 35 ± 5 °C maximum. The temperature ramp-up rate should be adjustable from 1 °C/min to 15 °C/min with an adjustable step of 1 °C/min.
- (e) Interlocking Mechanism: All interlocks will be checked for its function and the sound alarm / LED messages.
- (f) Bidder has to arrange a training session at IPR to train IPR manpower.



6.0 Instructions to the bidders:

6.1 Pre-bid meeting shall be organized through online mode. For more details, bidder may refer the NIT documents for registration link.

6.2 Bidder should study the system description, scope of work, system drawings and other respective terms and conditions in detail prior to submit the bid.

7.0 Warranty:

The supplied item should cover comprehensive warranty of 1 (one) year from the date of acceptance at IPR.

8.0 Non-compliances and deviations:

- 8.1 All non-compliances along with the remedial and preventive action must be reported within 1 week to IPR for review and approval. Bidder must hold the further operation / activity until the report along with remedial and preventive action is approved by IPR.
- 8.2 All work must conform to the specification and tolerances mentioned in approved drawings unless a deviation is approved in the form of written change to the specification. Unless agreed, this document with amendments and revision in effect on the date of the contract shall apply. Later stage, any additions / subtractions may be used by mutual consent between the bidder and IPR without having any impact on total cost.

9.0 Schedule

Award of contract / Signature of Letter of Intent (LOI) = T0

Sr. No.	Milestone	Duration
1	Submission of fabrication drawings and models	T0 + 30 days
2	Submission of Quality Documents	T0 + 30 days
3	Demonstration of lifting mechanism	T0 + 20 days
4	Review and approval of drawings and Quality documents	T0 + 45 days

Completion of above activities and clearance to start manufacturing = T1

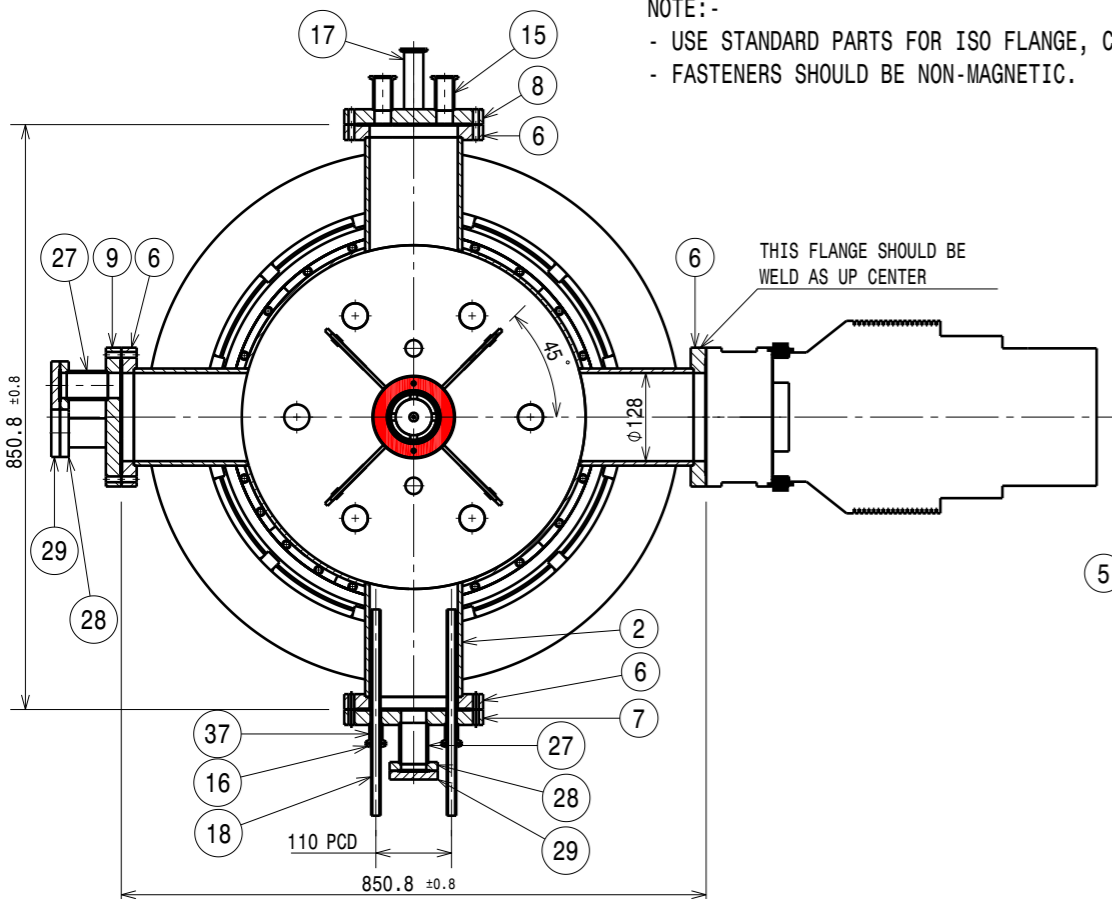
Sr. No.	Milestone	Duration
1	Manufacturing and assembly of sputter coating system	T1 + 120 days
2	Pre-dispatch inspection and acceptance	T1 + 135 days
3	Packing, Loading and delivery to IPR	T1 + 155 days
4	Site Inspection and acceptance	T1 + 185 days
5	Closure of Contract	T1 + 185 days

Appendix 1

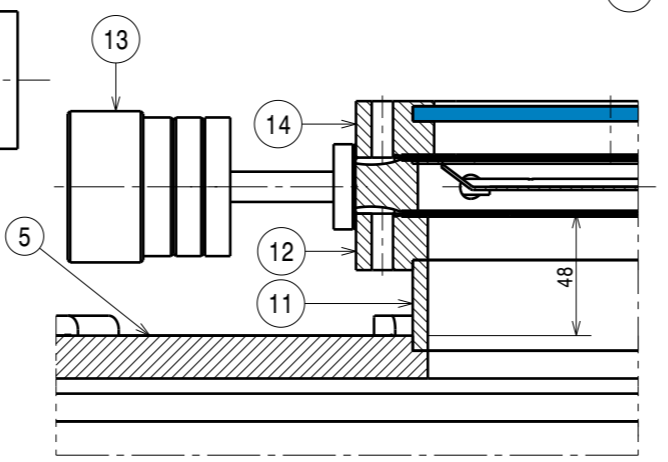
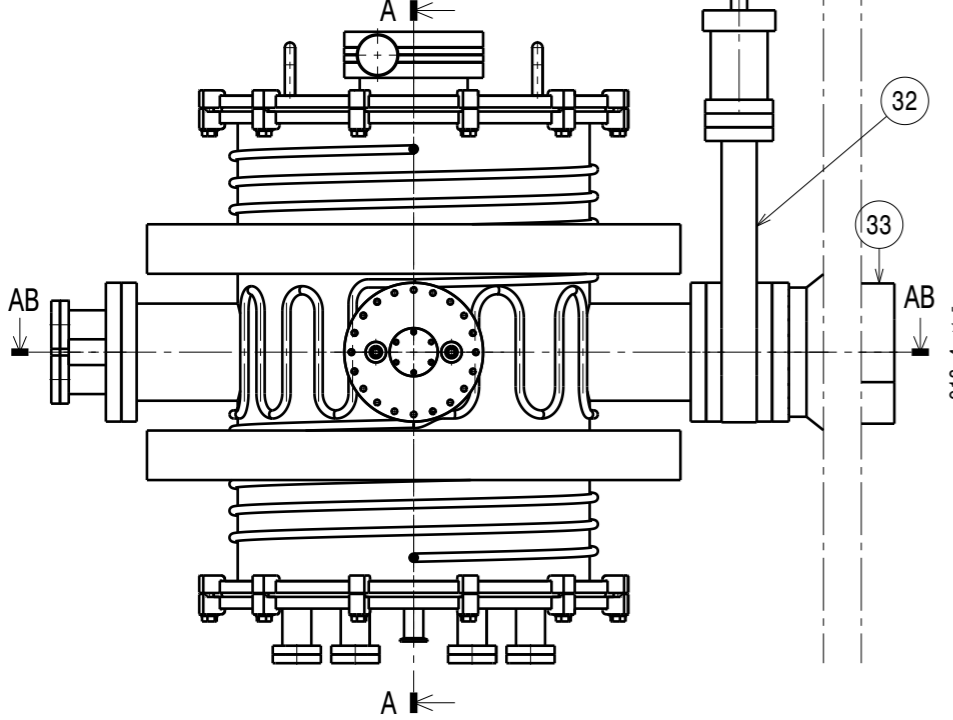
List of Drawings

Drawing Title	Drawing No.	Rev. No.	Sheet No.
Cylindrical sputtering system	IPR/21/A3/CS5/8994	01	01 of 06
Details parts of cylindrical sputtering system	IPR/21/A3/CS5/8994	01	02 of 06
Details parts of cylindrical sputtering system.02	IPR/21/A3/CS5/8994	01	03 of 06
Details parts of cylindrical sputtering system.03	IPR/21/A3/CS5/8994	01	04 of 06
Details parts of cylindrical sputtering system.04	IPR/21/A3/CS5/8994	01	05 of 06
Details parts of cylindrical sputtering system.05	IPR/21/A3/CS5/8994	01	06 of 06

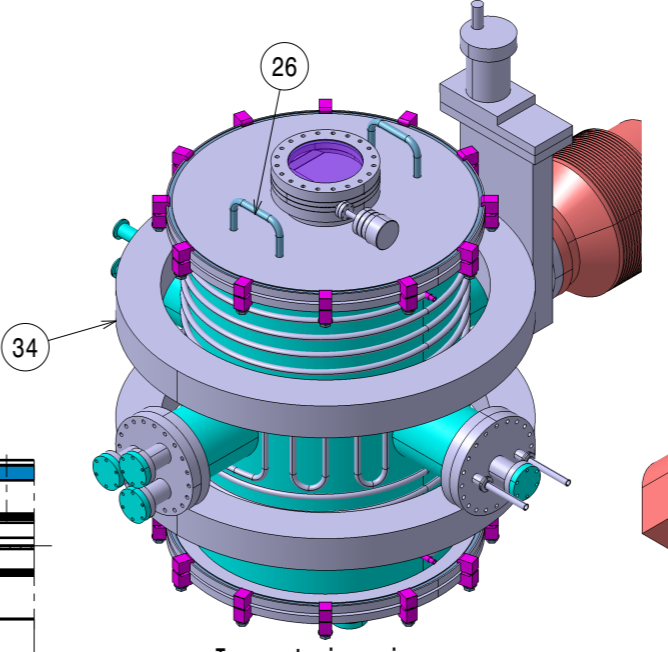
NOTE:-
 - USE STANDARD PARTS FOR ISO FLANGE, CF FLANGE AND KF COUPLERS.
 - FASTENERS SHOULD BE NON-MAGNETIC.



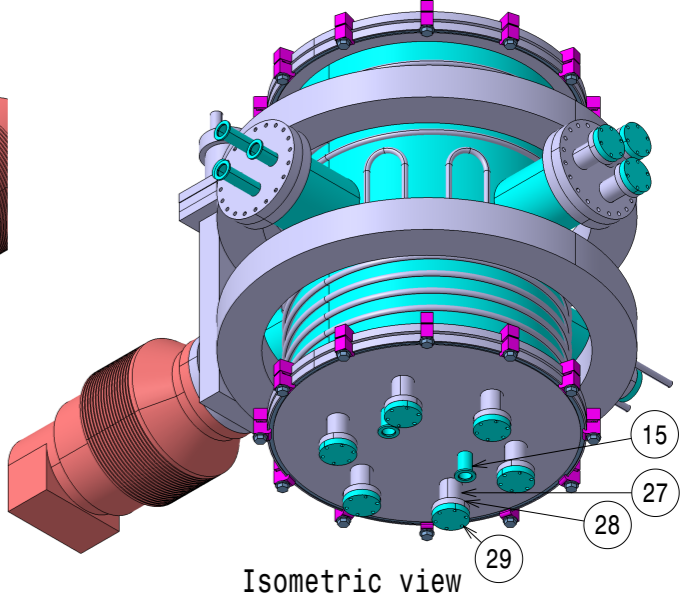
Section view AB-AB



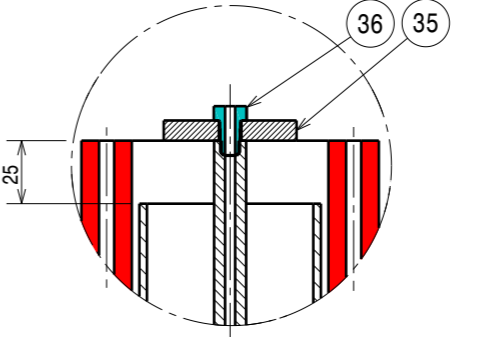
Detail AH



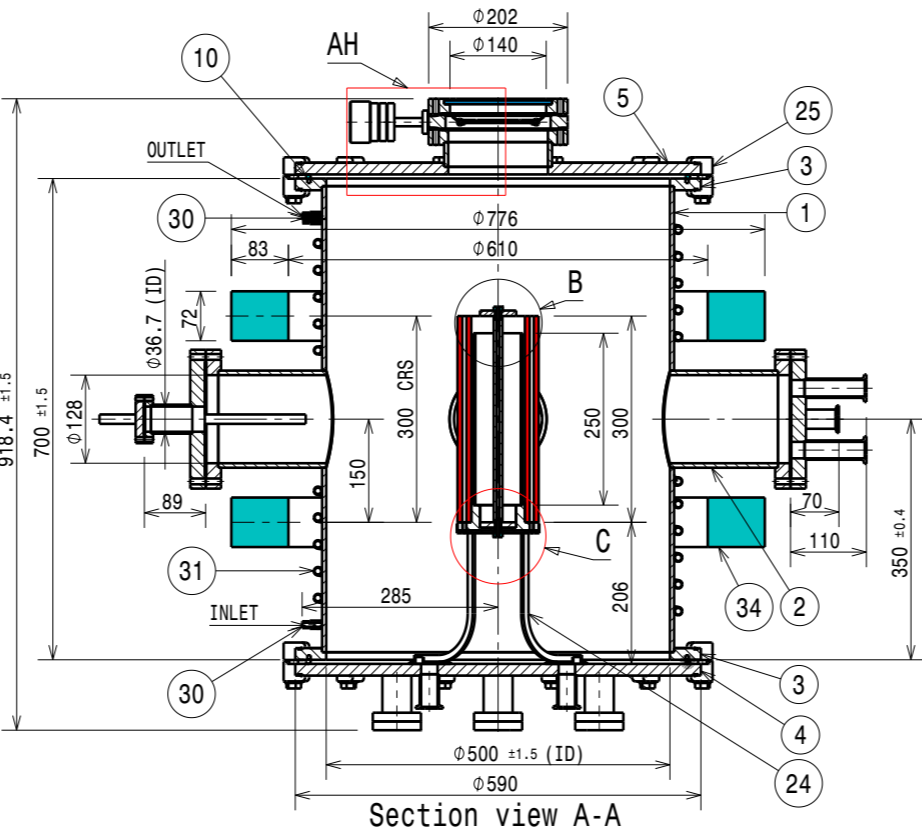
Isometric view



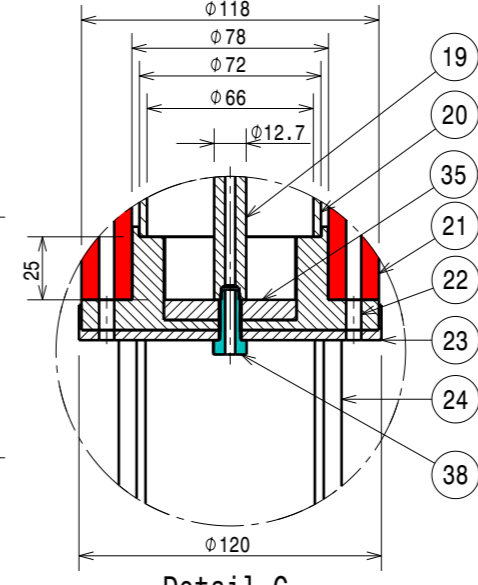
Isometric view



Detail B



Section view A-A



Detail C

Item No.	Description	Qty.	Material	Remarks
39	FASTENERS (BOLT, NUT, WASHER ETC)		SS304L	QTY. AS REQUIRED
38	BOLT M8x20	1	SS304L	REFER SHEET 05 OF 06
37	16KF_COUPLER	2	SS304L	REFER SHEET 05 OF 06
36	BOLT M8x14	1	SS304L	REFER SHEET 05 OF 06
35	C_PLATE-3	2	HIGH DENSITY GRAPHITE	REFER SHEET 06 OF 06
34	COIL	2	-	FOR INFORMATION ONLY
33	TURBOPUMPS	1	-	FIM (STANDARD PART)
32	150CF_GATE_VALVE	1	-	STANDARD PART
31	COOLING-TUBE	1	COPPER	USE AS PER SYSTEM REQUIREMENT.
30	NOZZLE	2	COPPER/SS	STANDARD PART
29	35CF BLANK FLANGE	10	SS304L	REFER SHEET 05 OF 06
28	35CF FLANGE	10	SS304L	REFER SHEET 05 OF 06
27	PIPE-1_35CF	10	SS304L	REFER SHEET 05 OF 06
26	LIFTING HOOK	2	SS304L	REFER SHEET 06 OF 06
25	CLAW CLAMP	24	SS304	STANDARD PART
24	SUPPORT LEG	4	SS304L	REFER SHEET 06 OF 06
23	SUPPORT C PLATE-2	1	SS304L	REFER SHEET 06 OF 06
22	C PLATE-1	1	CERAMIC	REFER SHEET 06 OF 06
21	HEATER (HEATING ELEMENT AND CASING)	1	KANTHAL AND INCONEL 718	REFER SHEET 06 OF 06
20	SUBSTRATE PIPE	1	SS316	REFER SHEET 06 OF 06
19	CATHODE	1	ETP COPPER	REFER SHEET 06 OF 06
18	GAS INLET PIPE	2	SS304L	REFER SHEET 05 OF 06
17	25KF_COUPLER-2	2	SS304L	REFER SHEET 05 OF 06
16	16KF BLANK FLANGE	2	SS304L	REFER SHEET 05 OF 06
15	25KF COUPLER	4	SS304L	REFER SHEET 05 OF 06
14	150CF_QUARTZ_VIEWPORT	1	SS304L & GLASS	STANDARD PART
13	VIEWPORT_SHUTTER-150CF	1	SS304L	STANDARD PART
12	150CF FLANGE-5	1	SS304L	REFER SHEET 05 OF 06
11	TOP PIPE	1	SS304L	REFER SHEET 05 OF 06
10	O-RING	2	SILICON	-
9	150CF FLANGE-4	1	SS304L	REFER SHEET 04 OF 06
8	150CF FLANGE-3	1	SS304L	REFER SHEET 04 OF 06
7	150CF FLANGE-2	1	SS304L	REFER SHEET 04 OF 06
6	150CF FLANGE-1	4	SS304L	REFER SHEET 04 OF 06
5	TOP FLANGE	1	SS304L	REFER SHEET 03 OF 06
4	BOTTOM FLANGE	1	SS304L	REFER SHEET 03 OF 06
3	FLANGE-1	2	SS304L	REFER SHEET 02 OF 06
2	SIDE PIPE-1	4	SS304L	REFER SHEET 02 OF 06
1	CYLINDRICAL CHAMBER INNER	1	SS304L	REFER SHEET 02 OF 06

DRG.NO	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
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REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

ASS'Y GROUP/DIVISION:	SIZE A3
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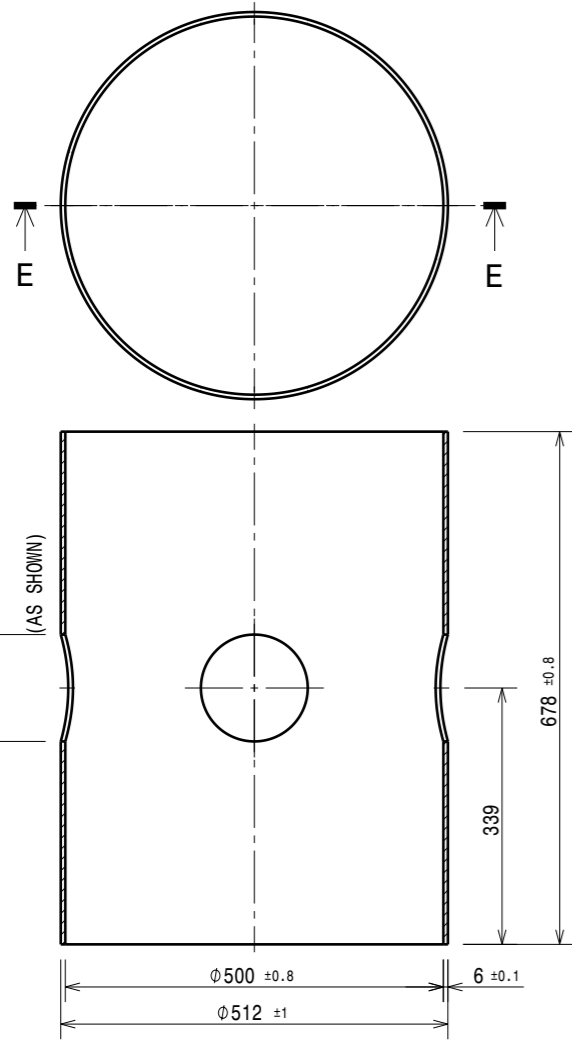
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 INDIA

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS				
LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA
UPTO 10	10-50	50-120	OVER 120-400	
±1°	±0°-30'	±0°-20'	±0°-10'	

SCALE	NTS	DATE

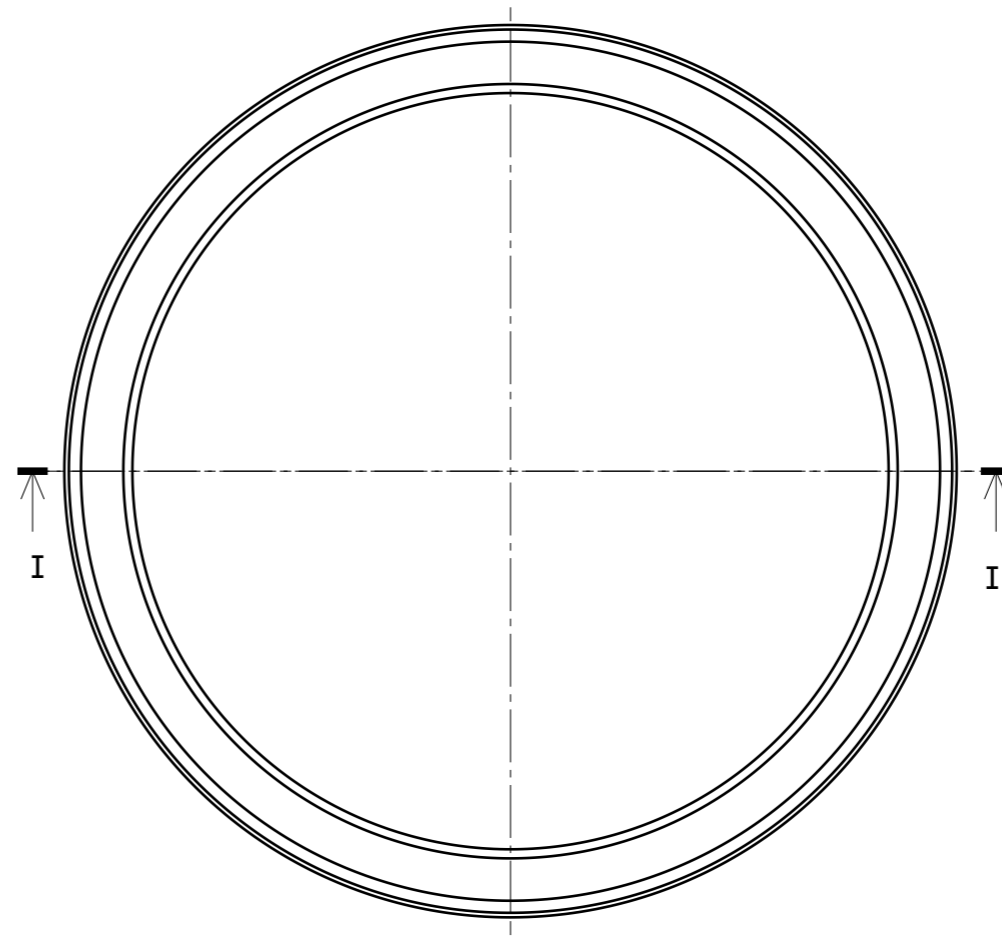
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CHECKED	JIGAR RAVAL SUBHADIP DAS	
APPROVED	P.A. RAYJADA	

TITLE	CONCEPTUAL DRAWING FOR CYLINDRICAL SPUTTERING SYSTEM
REF DRG NO:	
DRG.NO	IPR/21/A3/CSS/8994
REV	01
SHEET	01 OF 06



Section view E-E

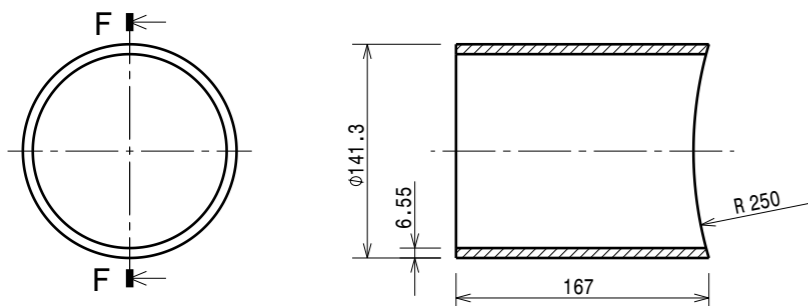
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Section view I-I

3

GROOVE FOR CLAW CLAMP SHOULD BE AS PER REQUIREMENT.



Section view F-F

2

DRG.NO	▽ 8-25	▽▽ 1.6-8	▽▽▽ 0.025-1.6	▽▽▽▽ < 0.025
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CO-ORDINATED BY				
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MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS				
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LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-400
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
				400-1000	1000-2000	2000-4000	4000 & ABOVE	
±1°	±0°-30'	±0°-20'	±0°-10'	±0.8	±1.2	±2.0	±3.0	

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

ASS'Y GROUP/DIVISION:	SIZE A3
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ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

SCALE	NTS	DATE
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DRAWN	SK PATNAIK	26-04-2022
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CHECKED	JIGAR RAVAL SUBHADIP DAS
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APPROVED	P A RAYJADA
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INDIA

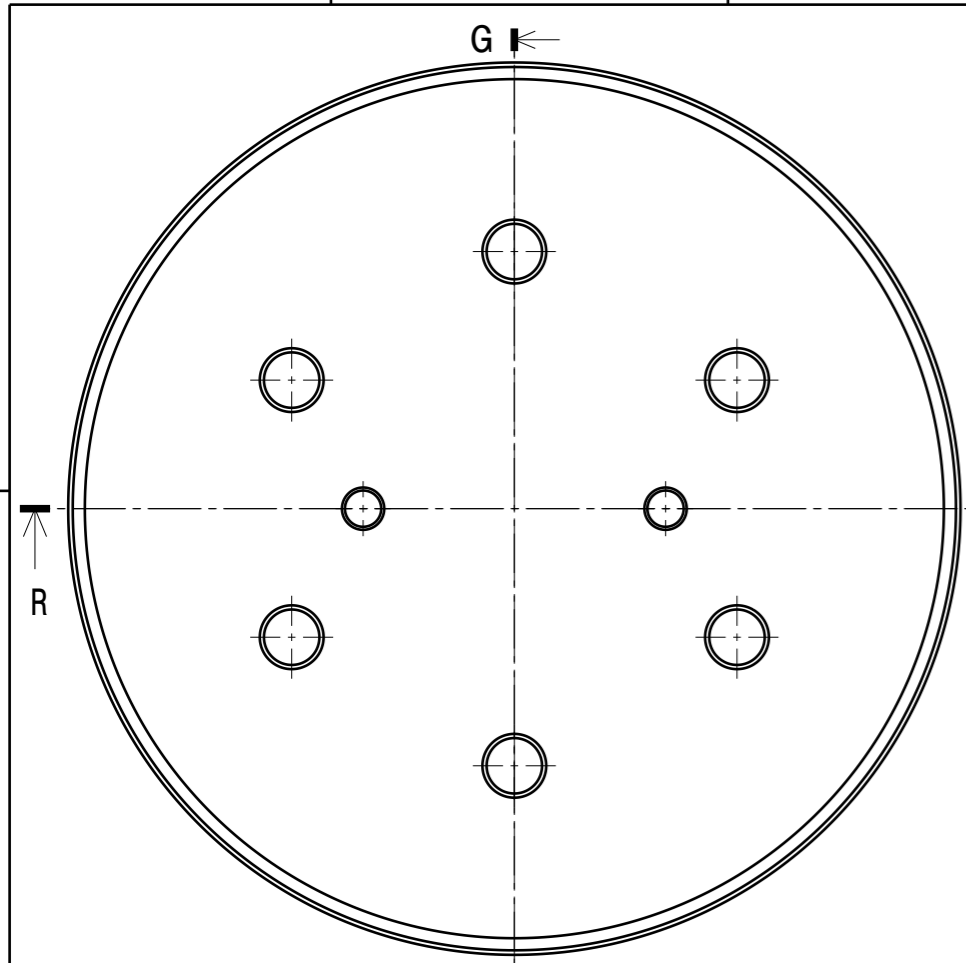
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REF DRG NO:

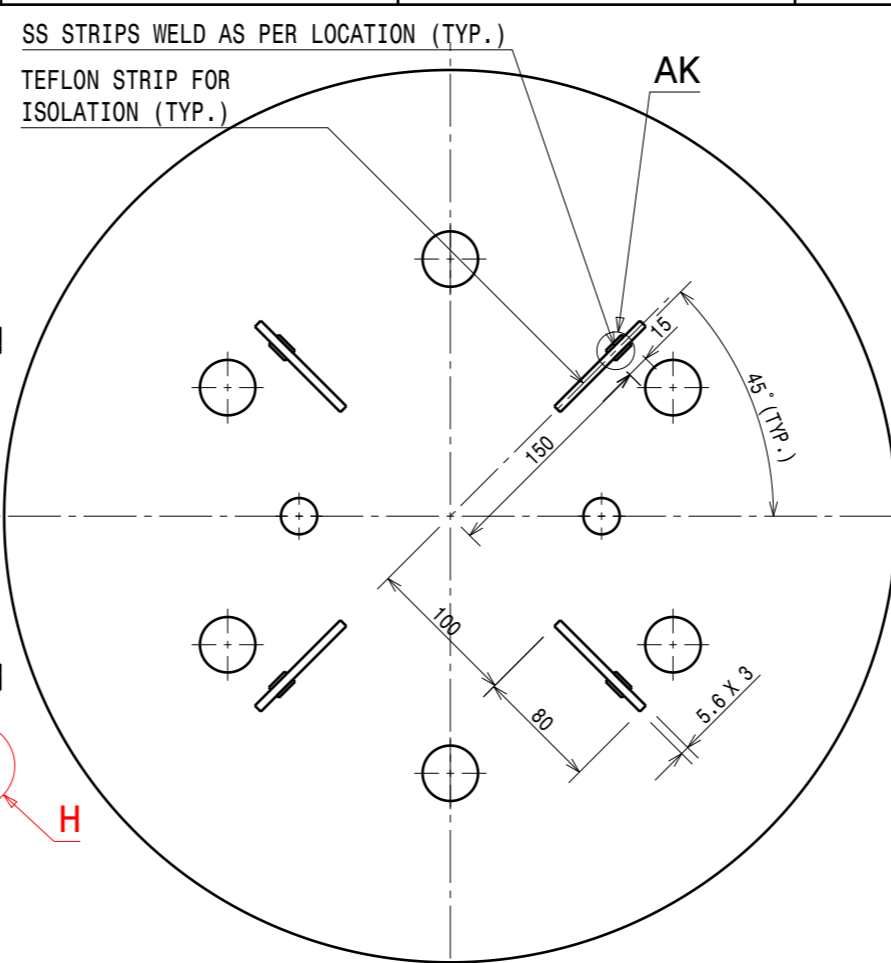
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REV 01

SHEET 02 OF 06



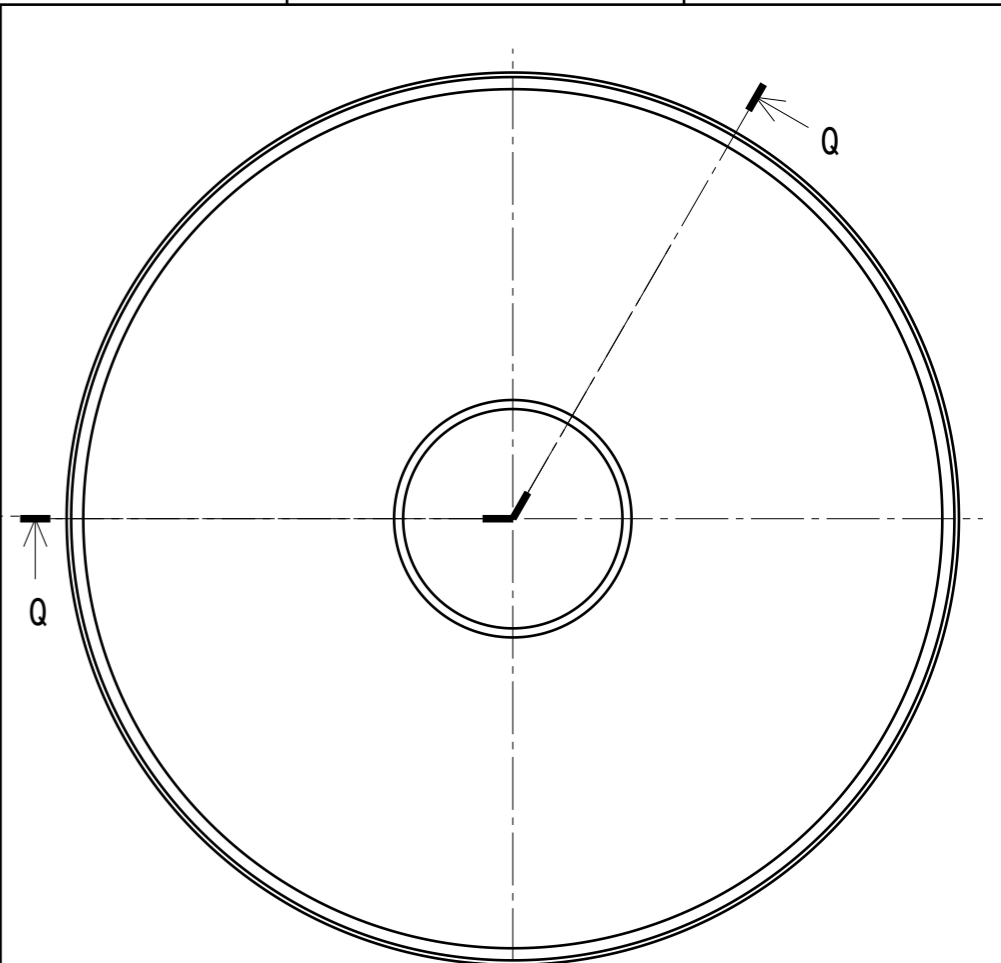
Front view



Rear view

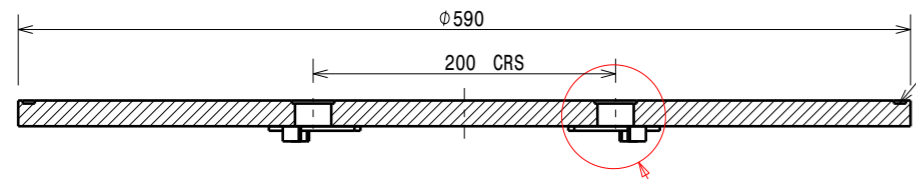
Section view G-G

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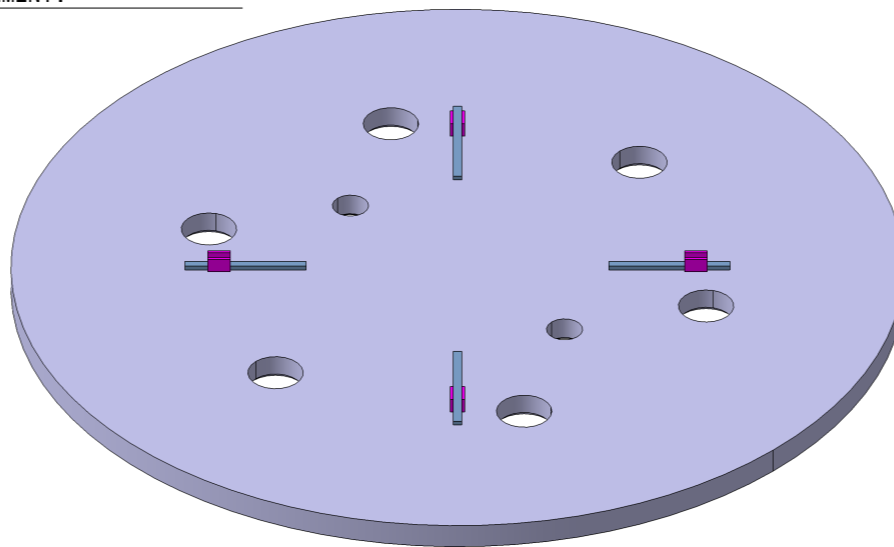
Section view Q-Q

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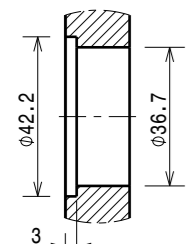


Section view R-R

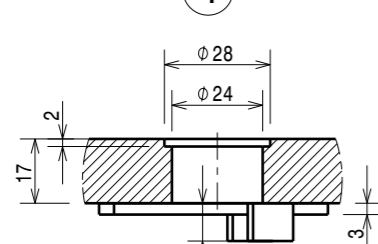
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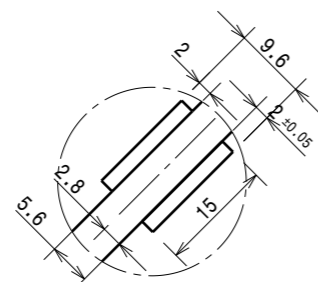
Isometric Rear view



Detail H (TYP.)



Detail A0 (TYP.)



Detail AK (TYP.)

DRG.NO	▽ 8-25	▽ 1.6-8	▽ 0.025-1.6	▽ < 0.025
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CO-ORDINATED BY				
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MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS				
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LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-400
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'	±0.8	±1.2	±2.0	±3.0	

REVISION COLUMN					
REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

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ASS'Y GROUP/DIVISION:	SIZE A3
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ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		
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SCALE	NTS	DATE
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DRAWN	SK PATNAIK	26-04-2022
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CHECKED	JIGAR RAVAL SUBHADIP DAS
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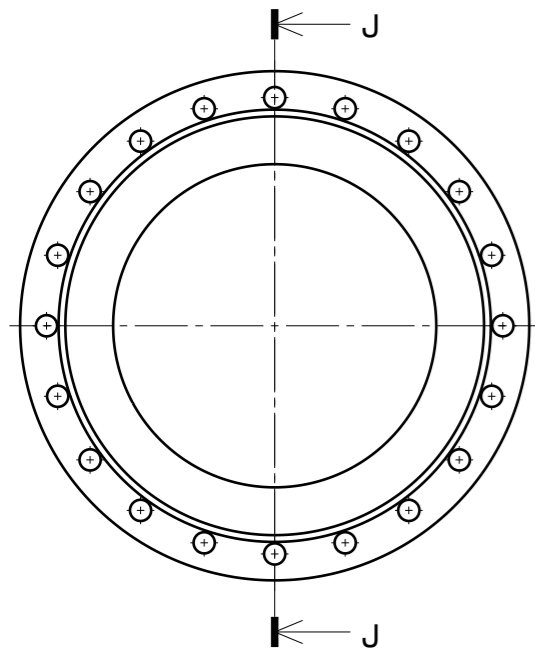
APPROVED	P A RAYJADA
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INDIA

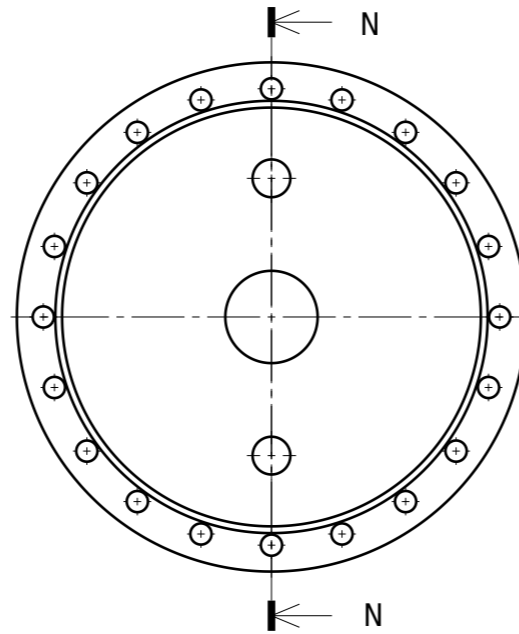
TITLE
DETAIL PARTS OF CYLINDRICAL SPUTTERING SYSTEM

REF DRG NO:	REV 01
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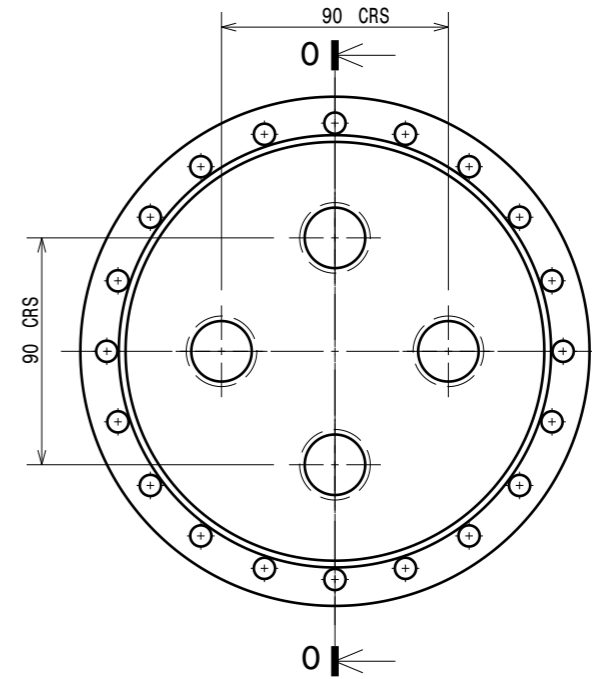
DRG.NO	IPR/21/A3/CSS/8994	SHEET 03 OF 06
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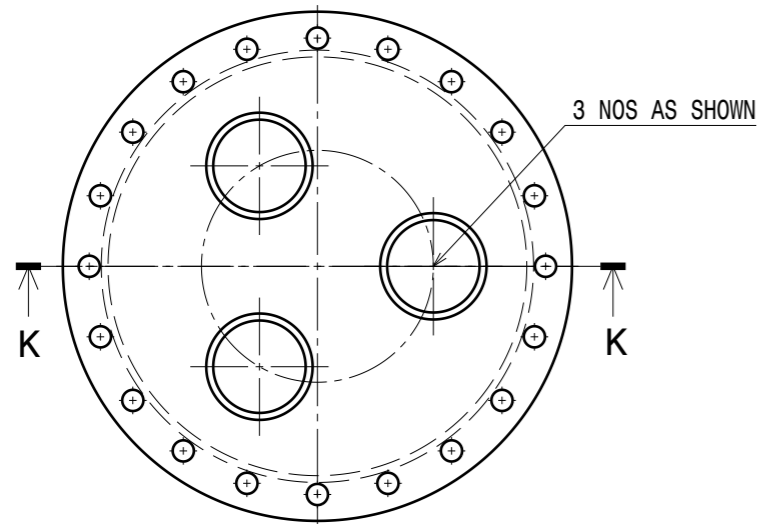
Section view J-J
⑥



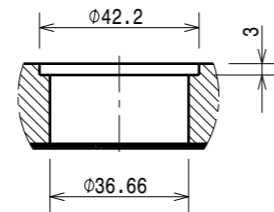
Section view N-N
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Section view 0-0
⑧



Section view K-K
⑨



Detail M
(TYP.)

DRG.NO	▽ 8-25	▽ 1.6-8	▽ 0.025-1.6	▽ < 0.025
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CO-ORDINATED BY				
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MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS				
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LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-400
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'	±0.8	±1.2	±2.0	±3.0	

REVISION COLUMN				
REV	ZONE	DESCRIPTION	DATE	REMARKS

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ASS'Y GROUP/DIVISION:	SIZE A3
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ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		
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SCALE	NTS	DATE
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DRAWN	SK PATNAIK	26-04-2022
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CHECKED	JIGAR RAVAL SUBHADIP DAS
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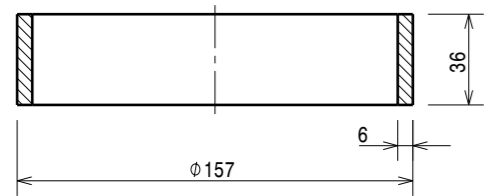
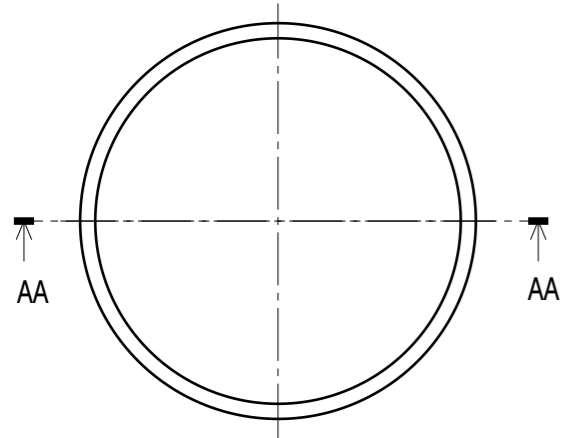
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INDIA

TITLE
DETAIL PARTS OF CYLINDRICAL SPUTTERING SYSTEM

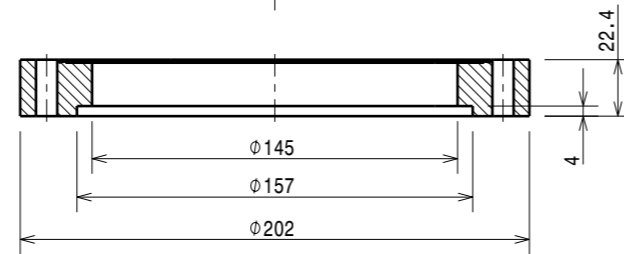
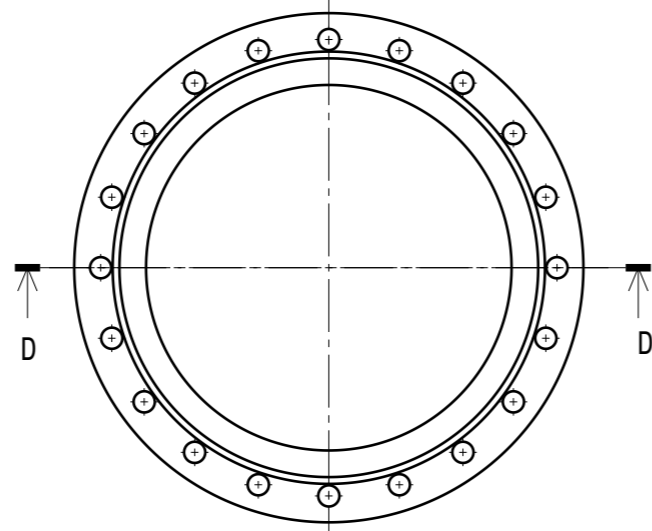
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DRG.NO	IPR/21/A3/CSS/8994	SHEET 04 OF 06
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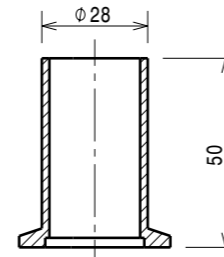
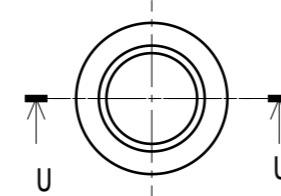
Section view AA-AA

11



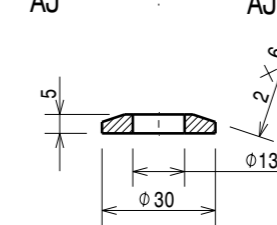
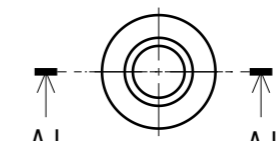
Section view D-D

12



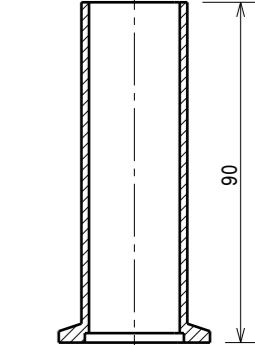
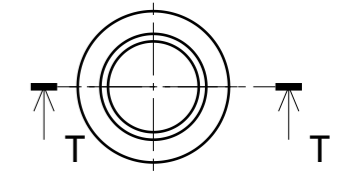
Section view U-U

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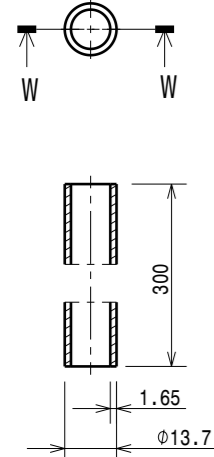
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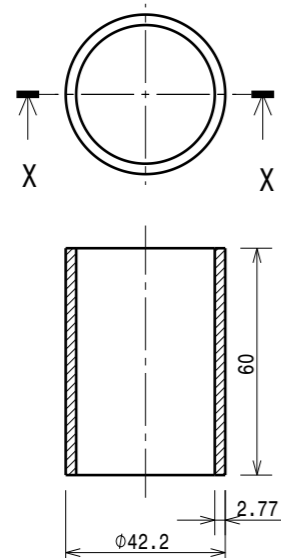
Section view T-T

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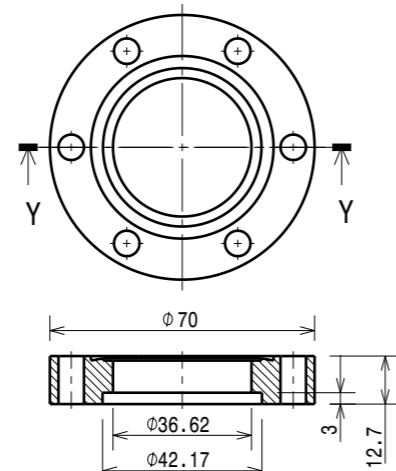
Section view W-W

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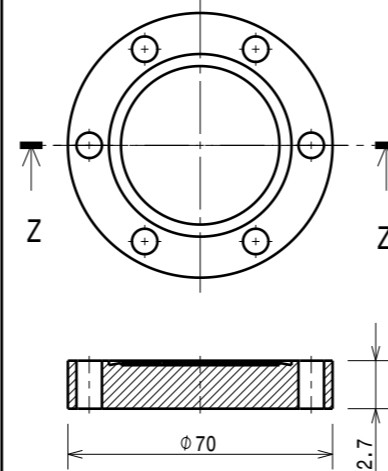
Section view X-X

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Section view Y-Y

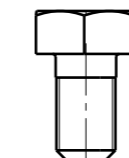
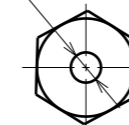
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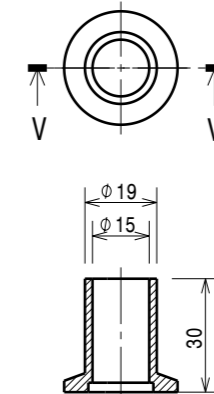
Section view Z-Z

29

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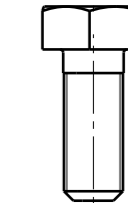
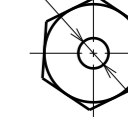
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Section view V-V

37

Ø4 THRU HOLE



38

DRG.NO 8-25 1.6-8 0.025-1.6 < 0.025

CO-ORDINATED BY

REVISION COLUMN

ASS'Y GROUP/DIVISION: SIZE A3

ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED

INSTITUTE FOR PLASMA RESEARCH BHAT, GANDHINAGAR-382 428. INDIA

MACHINING DEVIATIONS FOR NON-TOLERANCED DIMENSIONS

LENGTH IN mm OF SHORTER SIDE OF ANGLES				LENGTH OR DIA	UPTO 6	6-30	30-120	120-400
UPTO 10	10-50	50-120	OVER 120-400		±0.1	±0.2	±0.3	±0.5
±1°	±0°-30'	±0°-20'	±0°-10'	±0.8	±1.2	±2.0	±3.0	

SCALE NTS DATE

DRAWN SK PATNAIK 26-04-2022

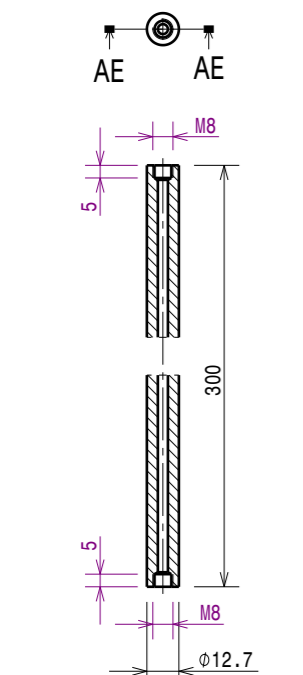
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APPROVED P A RAYJADA

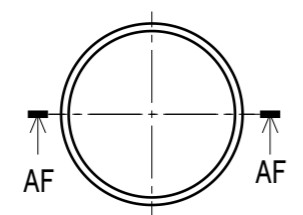
TITLE DETAIL PARTS OF CYLINDRICAL SPUTTERING SYSTEM

REF DRG NO: REV 01

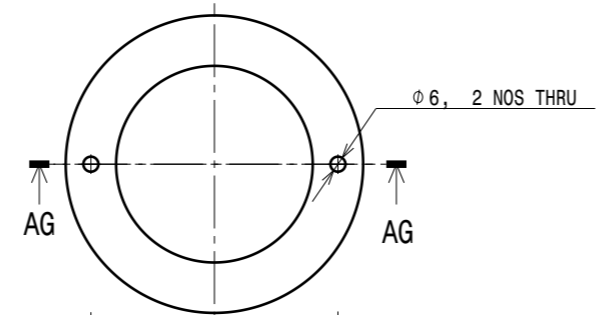
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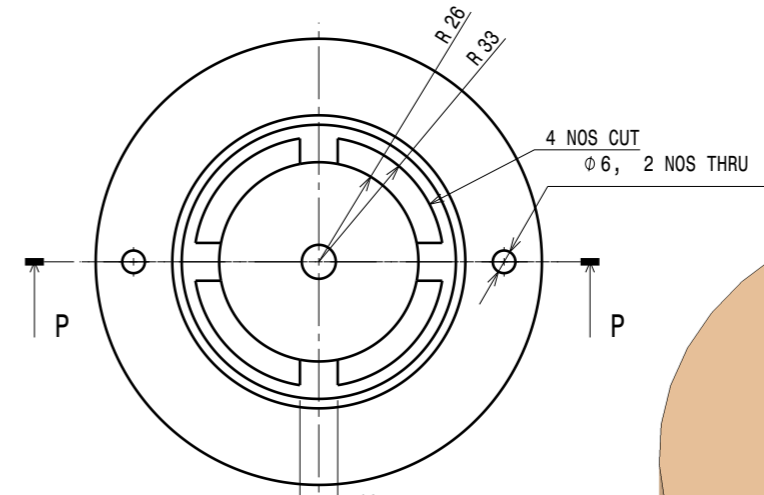
Section view AE-AE
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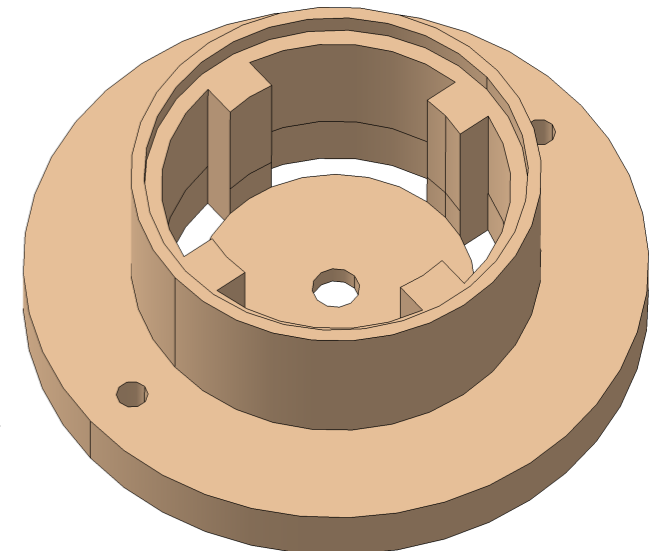
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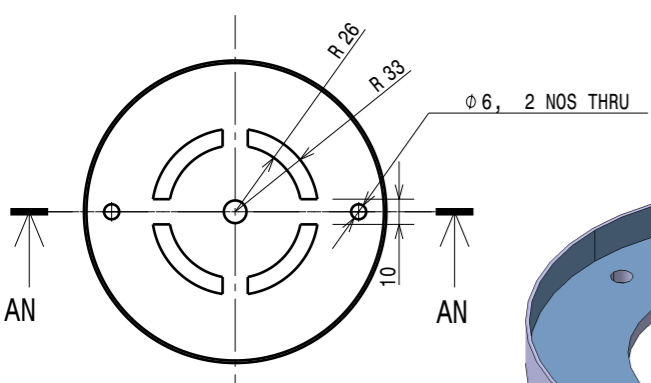
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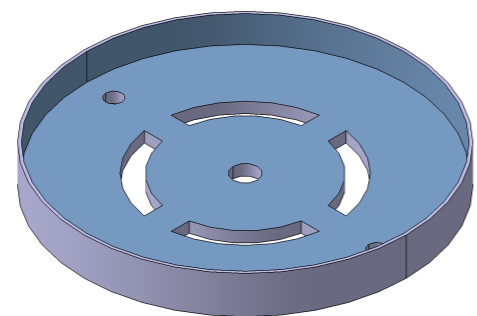
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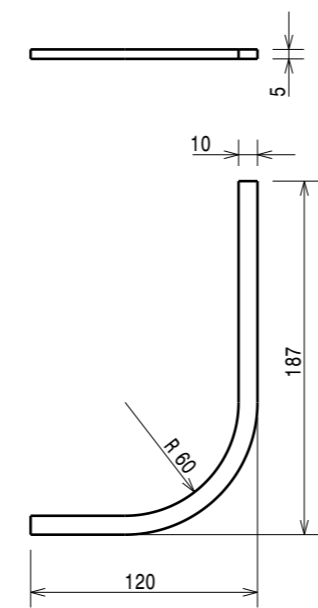
Isometric view



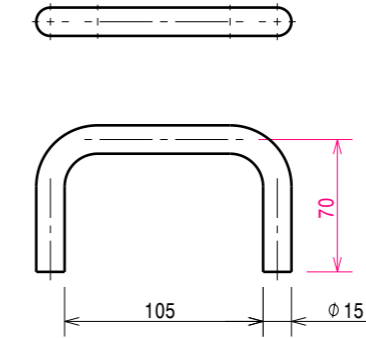
Section view AN-AN
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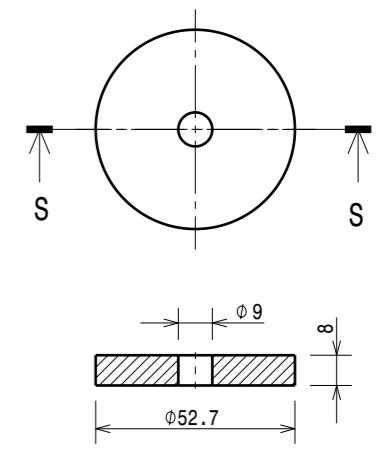
Isometric view



24



26



Section view S-S
35

DRG.NO	▽ 8-25	▽ 1.6-8	▽ 0.025-1.6	▽ < 0.025
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CO-ORDINATED BY	
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REV	ZONE	DESCRIPTION	DATE	REMARKS	APPROVED BY

ASS'Y GROUP/DIVISION:	SIZE A3
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ALL DIMENSIONS ARE IN 'mm' UNLESS OTHERWISE STATED		
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SCALE	NTS	DATE
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DRAWN	SK PATNAIK	26-04-2022
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CHECKED	JIGAR RAVAL SUBHADIP DAS
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APPROVED	P A RAYJADA
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INSTITUTE FOR PLASMA RESEARCH
BHAT, GANDHINAGAR-382 428.
INDIA

TITLE
DETAIL PARTS OF CYLINDRICAL SPUTTERING SYSTEM

REF DRG NO:	REV 01
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DRG.NO	IPR/21/A3/CSS/8994	SHEET 06 OF 06
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REVISED TECHNICAL COMPLIANCE STATEMENT

Sr. No.	Criteria	Bidder's response
1	<p>Bidder will prepare and submit the design documents which includes the final engineering drawings and models, analysis reports / calculations etc. for the followings</p> <p style="margin-left: 40px;">(a) Vacuum chamber along with its components with cooling provisions & support structure (b) Heater (c) Cathode with cooling provisions and substrate pipe (d) Lifting arrangements for top flange (e) Support structure for heater, cathode and substrate pipe</p> <p>Bidder will solely be responsible to demonstrate the component and system compliance with the technical requirements defined in this tender document during the component and system acceptance test(s)</p>	
2	Bidder will prepare and submit the final engineering and fabrication drawings and models to IPR in soft (CATIA/Autocad) and hard copies for review and approval.	
3	Bidder will procure the required material as listed in bill of material of approved drawings to execute the scope of this tender and will submit test reports to IPR for review and approval.	
4	Bidder will prepare Quality Plan, Manufacturing and Inspection Plan, Quality Procedure(s) and Work Instructions and submit it to IPR for review and approval	
5	Bidder will prepare Welding Procedure Specification, Procedure Qualification Records and Welder Procedure Qualification Record and submit it to IPR for review and approval	
6	Bidder will do the fabrication of vacuum chamber by using the SS 304L material.	
7	Bidder will follow Tungsten Inert Gas (TIG) welding method for chamber fabrication. Bidder will follow requirements given in ASME Section IX or equivalent Indian standard during the execution of welding and associated inspections.	
8	All weld joints will be tested by Leak testing using helium leak detector to an individual rate of $\leq 5.0 \times 10^{-9}$ mbar l/s.	
9	All fasteners must meet the specifications mentioned in approved drawings	
10	Bidder will do the electro-polishing of the inner surface of the chamber and it should meet the requirements of 2 delta finish	
11	Chamber along with all parts should be cleaned as per Ultra-high vacuum cleaning procedure including the ultrasonic cleaning	
12	Cylindrical heater should have a length of ~ 300 mm and capability of heating the concentric pipe substrate up to 100 °C to 700 °C \pm 5 °C (Temporal tolerance) flat-top. Suggested material for heater casing is Alloy 718 / Alloy 600 and heating element is a Kanthal which is FeCrAl (Iron-Chromium-Aluminum) alloy.	

13	<p>The heater should be capable to limit the temperature difference between the substrate pipe center to the substrate pipe edges within 25 °C and having the necessary shielding to ensure that the specified temperature requirements are met. The temperature ramp-up rate should be adjustable from 1 °C/min to 15 °C/min with an adjustable step of 1 °C/min. Bidder will ensure that suitable DC power supply along with suitable controller should be provided. As per the tender document, suitable power feedthrough and at least 3 temperature sensors feedthroughs (to be attached to substrate pipe center and two edges) and their connections must be installed on the vacuum chamber.</p>																
14	<p>Cathode having a length of ~ 300 mm and substrate pipe having a length of ~ 250 mm. Cathode should have removable electron trap plates at both ends which will be made from high density graphite. Cathode should have DM water cooling provision to avoid its melting under ion bombardment and thermal load from heater. The substrate pipe and heater should be having a same vertical and horizontal center. There should be minimal required gap between substrate pipe OD and Heater OD to take care of thermal expansion. Substrate pipes should be duly polished / electropolished on inner surfaces for coating experiments. The surface finish of the inner surface shall meet the requirements of 3 delta surface finish. Cathode will be made from ETP copper and substrate pipe from SS 316 material</p>																
15	<p>Demountable flange along with Silicon O-rings and clamp shall be on top surface of vacuum chamber. This flange has the view port having a size of 150 CF with the manual operated shutter mechanism.</p>																
16	<p>Top flange should have the provision to lift at least by 700 mm or a combination of lift of 150 mm and then move aside with automation to get the access of chamber from top side. Bidder will submit the final lifting scheme along with the drawings to IPR for review and approval. The lifting mechanism should be integral part of the on-wheel support structure of the system.</p>																
17	<p>Demountable flange along with Silicon O-rings and clamp shall be on bottom surface of vacuum chamber. 6 numbers of 35 CF Flange and 2 numbers of 25 KF ports to be provided on bottom flange as given in tender document</p>																
17	<p>Four 150 CF ports will be installed on Vacuum chamber as described in tender document. Port details is as follows:</p> <table border="1" data-bbox="296 1597 1217 2027"> <thead> <tr> <th data-bbox="296 1597 432 1664">Port</th> <th data-bbox="432 1597 874 1664">Location</th> <th data-bbox="874 1597 1217 1664">Details</th> </tr> </thead> <tbody> <tr> <td data-bbox="296 1664 432 1776">Port 1</td> <td data-bbox="432 1664 874 1776">Pump side</td> <td data-bbox="874 1664 1217 1776">Gate valve Turbo pump (FIM)</td> </tr> <tr> <td data-bbox="296 1776 432 1843">Port 2</td> <td data-bbox="432 1776 874 1843">Opposite to Pump side</td> <td data-bbox="874 1776 1217 1843">3 Nos. of 35 CF Flange</td> </tr> <tr> <td data-bbox="296 1843 432 1910">Port 3</td> <td data-bbox="432 1843 874 1910">90° anti-clock wise from Port 1</td> <td data-bbox="874 1843 1217 1910">4 Nos. 25 KF coupler</td> </tr> <tr> <td data-bbox="296 1910 432 2027">Port 4</td> <td data-bbox="432 1910 874 2027">Opposite to Port 3</td> <td data-bbox="874 1910 1217 2027">1 Nos. of 35 CF Flange 2 Nos. of gas inlet through 16KF ports</td> </tr> </tbody> </table>	Port	Location	Details	Port 1	Pump side	Gate valve Turbo pump (FIM)	Port 2	Opposite to Pump side	3 Nos. of 35 CF Flange	Port 3	90° anti-clock wise from Port 1	4 Nos. 25 KF coupler	Port 4	Opposite to Port 3	1 Nos. of 35 CF Flange 2 Nos. of gas inlet through 16KF ports	
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18	<p>Cooling channels to be wrapped on surface of the vacuum chamber to remove the generated heat. Bidder will use the given concept to develop the engineering design and will ensure that the final design can maintain the chamber wall temperature at room temperature i.e., 35 ± 5 °C maximum while the internal substrate pipe is at 700°C for at least 3 hours. In addition to this, cathode to be cooled by circulation of DM water through the drilled hole across its length. Bidder shall design metallic cathode cooling for magnetized plasma sputtering of it under the temperature effect from the concentric substrate pipe, which is at 700 °C at the time of the sputtering for at least 3 hours. The cathode material for demonstration is ETP copper</p>	
19	<p>Support structure to be manufactured to provide a support to the heater, cathode and substrate pipe. Bidder will submit final provisions for support scheme to IPR for review and approval. The support structure should meet the requirements defined in tender document. Bidder will also provide support structure on wheels to the whole system for easy movement. Support structure should not make any obstacle to the assembly or disassembly of electro-magnets. The lifting mechanism should be integral part of the on-wheel support structure of the system.</p>	
20	<p>Bidder will use DC power supply of 3 kw which is manufactured by a recognized manufacturer and designed specifically for a plasma sputtering application with the features like arc resistance.</p>	
21	<p>Bidder will use digital panel meter for voltage and current display in 3 digits and should meet the requirements given in tender document.</p>	
22	<p>Bill will supply suitable power feedthrough for sputtering power supply to connect to Cathode and substrate (grounded anode) as described in tender document</p>	
23	<p>Bidder will supply capacitance manometer along with 16/25 KF connecting port, controller and cable</p>	
24	<p>Bidder will supply a set of two digital Pirani vacuum gauge sensors (one each on roughing pump mouth and on main chamber) and display meter</p>	
25	<p>Bidder will supply 02 numbers of Mass flow controller along with necessary plumbing from cylinders to chamber to control oxygen and argon flow. The control range should be 0 to 200 sccm for argon and 0 to 100 sccm for oxygen.</p>	
26	<p>Bidder will supply gas lines with isolation valves and cylinder regulators. All gas fittings and tubing should be made from non-corrosive and non-magnetic SS material</p>	
27	<p>Bidder will supply Interconnecting plumbing which includes valves for chamber roughing, backing and venting</p>	
28	<p>Bidder will supply Manual 150CF gate valve to isolate the process chamber from high vacuum pumping system</p>	
29	<p>Bidder will do the assembly and integration of pumping system (FIM).</p>	

30	<p>Bidder will supply of control system and instrumentation panel which includes</p> <ul style="list-style-type: none"> (a) industrial rack has a provision to adjust height for levelling and with castors and stoppers for easy movement. All control and instrumentations required for monitoring and operation of the system to be mounted in this rack. It should be completely wired internally with various components and instruments. The electrical cabling between panel and main system should be done through the cable tray as per the industrial practice. (b) Full manual control with full manual overrides for maintenance and safety services (c) All necessary safety interlocks i.e. Water interlock, Pneumatic interlock, Vacuum interlock, Helmholtz coil water cooling interlock, Cathode cooling interlock, magnet shorting interlock etc., (d) All safety interlocks must be supplied with the sound alarm / LED messages etc., which are associated with the equipment related to vacuum, water, compressed air, electrical etc., (e) All panels for electrical power distribution, instruments and for utilities should be located on the system frame. 	
31	<p>Bidder will do the integration of the free issue items to the main system at IPR site as specified in tender document</p>	
32	<p>Bidder will supply the system along with the following safety provisions:</p> <ul style="list-style-type: none"> (a) All chassis of power supplies, measuring instruments, sputtering chamber, metallic support structure and cabinets should be properly ground for human and equipment safety. (b) Provision to be done that power to the heater and other power supplies to be shut down if the chamber is not under vacuum. 	
33	<p>Bidder will do the packing, loading, transportation and un-loading of system and spares to IPR</p>	
34	<p>Bidder will supply User / operation manual along with electrical circuit diagram</p>	
35	<p>Bidder will submit following documents to IPR as specified in tender document:</p> <ul style="list-style-type: none"> (a) Design documents (b) Fabrication drawings and models (c) Quality Assurance Plan (d) Manufacturing and Inspection Plan (e) Quality Procedure (f) Work Instructions and NDT Instructions (g) Welding documents (h) Material test reports (i) Fasteners test reports and off-shelf procured items reports (j) Manufacturing and Inspection records (k) Packing and shipment records (l) User / operation manual along with electrical circuit diagram 	

	(m) Deviation request and Non-compliance report (if any) (n) Warranty certificate	
36	Bidder will supply following required spares to IPR (a) Cylindrical heater having same rating and type which is used in system: 1 Nos. (b) Dummy cathode of ETP Copper: 1 Nos. (c) Substrate pipe made from SS 316: 10 Nos. (d) O-rings set for the complete system: 03 Sets (e) 25 KF Right angle vacuum valves: 02 Nos. (f) One set of Sputtering power feed through, heater power feed through and temperature sensor feed throughs for vacuum systems similar to those installed on the system	
33	Bidder will arrange a training session at IPR for full operational and basic troubleshooting of the system	
34	Factory Acceptance / Pre-Dispatch Inspection: IPR representative will check the following parameters to ensure that the manufactured system is in-line with the specification (a) System Dimensions (b) System should achieve the base pressure of $\leq 5.0 \times 10^{-7}$ mbar and operating pressure of 5.0×10^{-3} to 2.0×10^{-1} mbar at room temperature. (c) He Leak Testing of the weld joints for the leak rate of $\leq 5.0 \times 10^{-9}$ mbar l/s. He Leak detector shall be arranged by vendor for this test. (d) Bidder should demonstrate that heater must be capable to heat the middle of substrate pipe to 700 ± 5 °C (temporal tolerance) for 3 hours flat-top. The temperature difference between the heater center to the both heater edges within 25 °C and temperature of any part of the chamber should not be more than 35 ± 5 °C maximum. The temperature ramp-up rate should be adjustable from 1 °C/min to 15 °C/min with an adjustable step of 1 °C/min with the specified substrate pipe. (e) Interlocking mechanism: All interlocks except the ones associated with FIM will be checked for its function and the sound alarm / LED messages. (f) Sputtering power supply to be tested for its operational parameter range on dummy load to be arranged by vendor.	
35	Site Acceptance: IPR representative will check the following parameters in presence of vendor's representative to ensure that the manufactured system is in-line with the specification (a) Visual Inspection for any damaged during the loading, unloading or transportation (b) System should achieve the base pressure of $\leq 5.0 \times 10^{-7}$ mbar and operating pressure of 5.0×10^{-3} to 2.0×10^{-1} mbar after installation at IPR. TMP (~700 l/s pumping speed) and suitable rotary pump would be provided by IPR. High vacuum Gauge will be provided by IPR. (c) He Leak Testing of the weld joints for the leak rate of $\leq 5.0 \times 10^{-9}$ mbar l/s. He Leak detector will be provided by IPR	

	<p>(d) Bidder should demonstrate that heater must be capable to heat the middle of substrate pipe to 700 ± 5 °C (temporal tolerance) for 3 hours flat-top. The temperature difference between the heater center to the both heater edges within 25 °C and temperature of any part of the chamber should not be more than 35 ± 5 °C maximum. The temperature ramp-up rate should be adjustable from 1 °C/min to 15 °C/min with an adjustable step of 1 °C/min.</p> <p>(e) Interlocking Mechanism: All interlocks will be checked for its function and the sound alarm / LED messages.</p> <p>(f) Bidder has to arrange a training session at IPR to train IPR manpower</p>	
36	Bidder will meet the schedule requirements given in tender document.	

Name and Signature of Authorized Signatory

Official Seal

Date :- _____