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सत्यमेव जयते

भारत सरकार

Government of India

भाभा परमाणु अनुसंधान केन्द्र

Bhabha Atomic Research Centre

रिएक्टर इंजीनियरी प्रभाग

Reactor Engineering Division

हाल - 7,  
ट्रॉम्बे,  
मुंबई - 400 085,  
HALL No. 7,  
TROMBAY,  
MUMBAI - 400 085

Ref: RED/RCCS/LC/MF/ P-37719/2022

Date: 05/04/2022

Dear Sir (s),

**Sub: Invitation to quote against two part tender enquiry for procurement of raw material, machining, inspection, functional testing and safe delivery of Replica Tool-540 and spares.**

Quotations (Part-I & Part-II) are invited by Head, RCCS, RED (on behalf of the President of India) for Procurement of raw material, material testing, heat treatment, submission of machining procedure, machining, component inspection, assembly of components, inspection & functional testing and safe delivery of Replica Tool-540 and spares as per technical specification (RT/030222).

**General Notes:**

1. The quotation must reach to Head, RCCS, R.No. 213, RED, Hall No.-7, BARC, Trombay, Mumbai-400 085 by 28/04/2022 through speed post only. Hand delivered quotations will not be considered. Quotations will be opened on 29/04/2022 at 2 PM.
2. The above-mentioned Reference No., Date and Time of opening of bids must be clearly written on the sealed envelope containing the quotation.
3. Bidder shall note that two separate quotations in two separate sealed envelopes shall be submitted for technical and commercial offer. Technical offer (Part-I) should contain only technical details such as available features & facilities, experience, compliance against the technical specification etc. It shall not contain any commercial values. Details as per part II & III of technical specification no RT/030222
4. The Part-II of the offer shall contain the commercial details.
5. On the technical offer (Part-I) sealed envelope it should be written "technical offer" and on commercial offer (Part-II) sealed envelope it should be written "commercial offer". Both offers (Part-I & Part-II) must come together in a bigger envelope.
6. Technical offers received shall be evaluated by the purchaser and commercial offers of only technically acceptable offers will be considered and opened.
7. Firms, those are not sending their technical (Part-I) and commercial (Part-II) offers in two separate envelopes, their offers will not be considered.
8. Taxes and basic cost shall be quoted separately in quotation.
9. The quotations must bear PAN No. and GST registration no. etc. The quotations not having these numbers are liable to be rejected.
10. The quotations must be submitted on printed letterheads and must have rubber stamp of the company. Quotations on computer-generated letterheads and without rubber stamp are liable to be rejected.
11. No free issue material will be issued.
12. For any technical clarification the bidder may contact on telephone No. 25593974/25593719, e-mail [kundan@barc.gov.in](mailto:kundan@barc.gov.in).

## Two Part Tender Enquiry

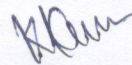
13. The work shall be subject to approval at bidder's works by our concerned Engineers. The final jobs shall not be dispatched without the approval of our Engineers. Necessary facilities for inspection shall be provided to our Engineer at bidder's premises.
14. The bidder shall deliver the finished job with documents to the concerned Engineer within **3 months** from the date of issue of the work order. The delivery is to be made at REZ store, Engineering Hall No. 7, B.A.R.C, Trombay, Mumbai -400 085.
15. Payment will be made as per rules after completion of the job satisfactorily. Part payment and advance payment are not possible.
16. Income tax @2% and Educational cess as applicable will be deducted from the bill.
17. The offer shall be kept open for acceptance for a period of 30 days from the date of opening of the quotation.
18. A brief list of similar jobs executed if any, and name of the organisation for which such job was carried out should be furnished with the quotation. Also, a list of machine tools and inspection instruments available with the bidder should be provided.
19. Head, RCCS, RED reserves the right to accept/reject any or all the quotations received without assigning any reason whatsoever.
20. The bidder shall furnish the detailed information regarding whether an ex-employee of BARC is working in your organisation or whether any of your relative is working in DAE/BARC or you are an ex-employee of DAE/BARC. In case of absence of such information or wrong information, the quotation or contract is likely to be rejected or cancelled.

### CONFIDENTIALITY CLAUSES:

- I. Confidentiality:  
No party shall disclose any information to any third party concerning the matters under this contract generally. In particular, any information identified as "Proprietary" in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to the sub-bidders, consultants, advisers or the employees engaged by the party with equal force.
- II. "Restricted information" categories under Section 18 of the Atomic Energy Act, 1962 and "Official Secrets" under Section 5 of the Official Secrets Act, 1923:-  
Any contravention of the above-mentioned provisions by any bidder, sub-bidder, consultant, adviser or the employees of a bidder will invite penal consequences under the aforesaid legislation.
- III. Prohibition against use of BARC's name without permission for publicity purposes:-  
The bidder or sub-bidder, consultant, adviser or the employees engaged by the bidder shall not use BARC's name for any publicity purpose through any public media like Press, Radio, T.V. or Internet without the prior written approval of BARC.

Thanking you,

Yours Sincerely,



(Dr. Kundan Kumar)  
Head, RCCS

For and on behalf of the President of India  
(The Purchaser)

Enclosure: 1) Technical Specification No.-RT/030222

**Part-I: Scope of Supply**

Procurement of raw material, material testing, heat treatment, submission of machining procedure, machining, component inspection, assembly of components, inspection & functional testing and safe delivery of Replica Tool-540 and spares as per attached enclosures and as specified below:

**Table-1**

Sr. No.	Particulars	Qty	Remarks
1	Replica Tool-540 as per Drg. No. A1-3113-M-4662-GA	1 No.	
2	Replica Plate (Part No. 35) as per Drg. No. A2-3113-M-4677-DD	5 Nos.	Spare
3.	'O'Ring (Part No. 35/1) as per Drg. No. A23113-M-4677-DD	10 Nos.	Spare

**Part-II: Technical Specification****2.1 Procurement of Raw Materials and Heat treatment:**

The supplier has to procure the materials as per the Bill of Material table given in Drg. No. A1-3113-M-4662-GA. The materials shall be tested at government approved laboratories, in presence of purchaser's engineers, for confirmation of the material-specification for chemical and mechanical properties, like hardness, strength etc. The test certificates shall be supplied along with the material. Fasteners shall conform to relevant Indian Standard, viz. IS1363, IS 1367 etc. All the raw materials shall be properly stamped prior to machining by the purchaser only after meeting acceptance criteria. SS410 material shall be subjected to heat treatment for achieving the required hardness and strength.

**2.2 Submission of Machining Procedure**

The supplier shall prepare the machining and fabrication procedure including the method of inspection and testing and the same shall be submitted for approval of the purchaser, before start of machining & fabrication.

**2.3 Machining & Fabrication**

The supplier shall use only approved procedure for machining and fabrication as per requirements (dimensions, tolerances and surface finish etc.) as specified in relevant drawings. Machining/Fabrication of components shall be done as per approved drawings. All the components shall be subjected to the following inspection after its machining or fabrication:

- Visual,
- DPT (Wherever felt necessary, to be decided by the purchaser),
- Surface roughness tests (wherever required)
- Dimensional inspection as per approved drawings followed by its report and acceptance

Some components, like Replica Plate, Replica Cover plate, etc., shall be made by wire-cut EDM only as these are critical components. These components shall be made from single raw material for each one. Joining of two finished parts by welding or brazing is not permitted.

## **2.4 Component Inspection:**

After completion of machining of the parts, all components shall be inspected by the supplier and inspection report shall be submitted for scrutiny by the purchaser and acceptance. The components dimensions shall be cross-checked physically by the purchaser while final inspection. If required, necessary gauges shall be used for conforming the dimensions and geometrical tolerances as mentioned in this specification and relevant drawings.

The supplier must accept quality surveillance by the purchaser or his representative. This, however, does not relieve the supplier from his responsibility to supply the components as per relevant drawings and to have his own inspection to maintain the quality.

## **2.5 Assembly and Testing**

2.5.1 The components are to be assembled as per approved drawing and assembly procedure. The fits of the mating components shall be checked at this stage. Any mismatch in assembly of any item shall call for alteration of the components.

2.5.2 The assembly shall be subjected for testing as per check dimensions. The purchaser shall supply check dimensions at the time of inspection.

2.5.3 The assembly shall be subjected to pressure test and leak test wherever pressure retainer systems are involved.

2.5.4 The leak test shall be for 8 kg/sq. cm. pneumatic pressure and pressure hold time for 15 minutes.

2.5.5 All the helical Compression springs shall be subjected to qualification test as per relevant IS standards.

2.5.6 The assembly shall be subjected to functional test, and Replica trial test for which a 103.4mm ID x 4.3mm thick stainless steel or equivalent pipe.

## **2.6 Performance Qualification Trials (PQT)**

The supplier shall meet all the criteria as mentioned in para 2.5 for acceptance of the job. It will be sole responsibility of the supplier to make the tool workable to purchaser's satisfaction and meeting all qualification and inspection criteria mentioned in this specification. The job shall be rejected, if the PQT is not met.

## **2.7 Pre-Dispatch Inspection (PDI)**

All the items along with spare parts and their quantity shall be inspected/checked thoroughly before delivery. The supplier shall be able to deliver only after acceptance and approval of the purchaser.

## **2.8 Delivery**

2.8.1 All machined parts shall be cleaned, dried and assembled before packing. All the parts shall be packed suitably to avoid any damages and contamination during subsequent transportation, handling and storage. Spare parts shall be packed separately.

2.8.2 The finished parts shall not be dispatched without pre-dispatch-inspection by the purchaser.

### **Part-III: General Requirements**

- 3.1 Dimensional Inspection Report shall be prepared by the supplier and submitted to the purchaser before a call for inspection. Random check may be done by the purchaser for the dimensions.
- 3.2 Sharp edges and corners to be rounded off to 0.3mm radius, if not mentioned otherwise. Mating corners to be rounded off to meet the assembly requirements. Assembly of all the components shall be done as per assembly drawing.
- 3.3 Approved procedure shall be followed for welding wherever welding is involved.
- 3.4 Raw material test, Pressure Test of Assembly and Functional Test Assembly, as described above, shall be done in the presence of the purchaser's engineer/representative.

### **Part-IV: Notes to Bidders**

- 4.1. The bidder shall quote for all the items as mentioned under the scope of supply. Part offer is not acceptable. Bidder is requested to mention the price for Replica Plate (Part No. 35) separately, if quoted in lump-sum. This will be beneficial if the component is required to be procured more than what is specified.
- 4.2. The supplier shall acknowledge the receipt of work order within two weeks after receipt of the work order.
- 4.3. Proof of Ability (Mandatory Vendor Evaluation Criteria):
  - 4.3.1. The bidder shall have prior experience of at least 10 years in manufacturing and supplies of similar jobs. The suppliers need to give necessary documentary evidence, like Purchase order copy/ invoice and satisfactory performance certificate related to these supplies for the same along with quotation. Relevant catalogues and literature need to be attached to the offer.
  - 4.3.2. The bidder shall have the required machining, infrastructure and inspection facilities for this work available at their premises. Documentary evidences pertaining to the same shall be submitted along with the offer. The bidder should demonstrate and explain these facilities to the purchaser or his representative at the time of technical evaluation, before placing the work/purchase order.
  - 4.3.3. In case the bidder is likely to outsource some facilities required for this job, the bidder shall clearly state the facilities and names of the firms to be outsourced in their quotation. It will be a binding on the bidder/supplier to utilise the facilities of the outsourced firms as mentioned in their quotation. The bidder/supplier shall take prior approval, if the outsourced firm(s) is/are required to be changed. The changed outsourced firm, if required shall mandatorily have equal or better facilities as compared to the firms mentioned in their quotation. Evaluation of the outsourced firm(s) shall also be carried out during technical evaluation prior to recommendation.

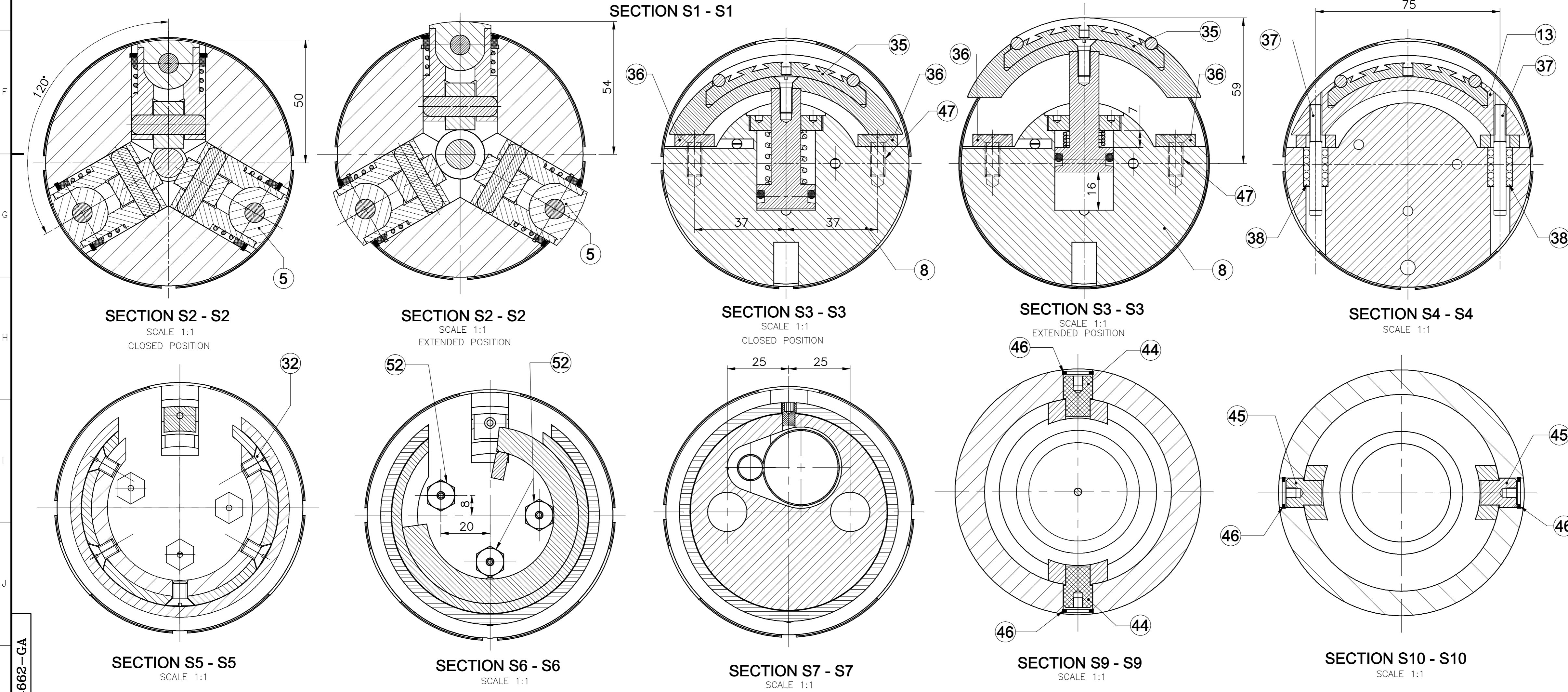
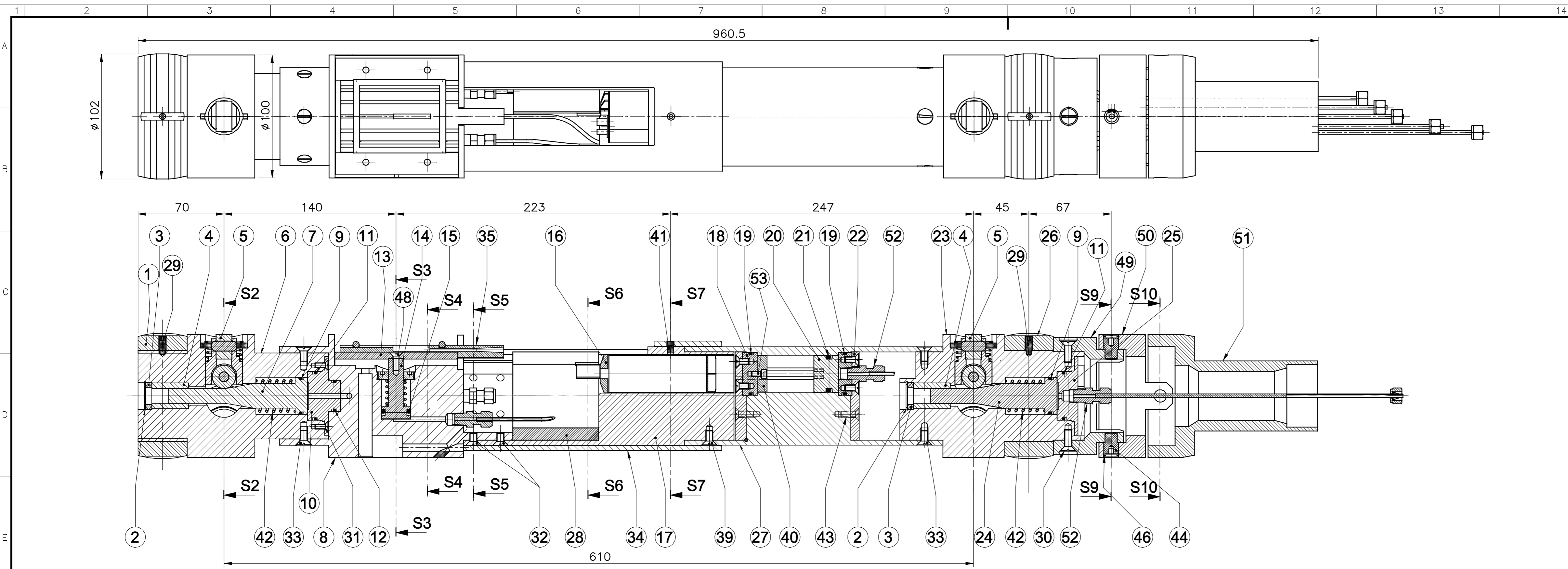
- 4.3.4. The supplier shall be responsible to the purchaser for the part of work that to be sub-contracted, if any. The bidder shall note that critical activities like overall co-ordination of manufacturing, all PQTs, assembly and testing shall not be sub-contracted.
- 4.3.5. **Technical evaluation of bidder(s) is mandatory prior to recommendation. During the technical evaluation, the bidder shall demonstrate and meet all the points/features and facilities required as mentioned in this specification failing which may call for rejection of offer. A technical evaluation team from BARC may visit bidders' premises at its discretion to verify the credentials of the bidders.**
- 4.3.6. The bidder's company shall have a team of design and fabrication engineers assigned for this work. The profile of these personnel assigned for this work should be submitted along with the offer. Based on the credentials of the team, the user will be assessed by the capability of the Bidder in successfully executing the work. At the time of technical evaluation of the offers, the User may interact with the design & fabrication team of the Bidder to assess their understanding and capability in executing the work.
- 4.3.7. The bidder shall have dust free assembly room facilities in their factory/company for proper assembly, inspection and testing of the jobs.
- 4.3.8. **Though the criteria mentioned under vendor evaluation (4.3) are mandatorily to be met but these are not the only criteria for a vendor to be qualified. The vendor need to match the entire specification and must reply to all the queries raised by the Purchaser satisfactorily during technical evaluation of bidders. The right to decision on acceptance or rejection of bid(s)/bidder(s) shall remain only with the Purchaser and bidder should give irrevocable consent on the same.**
- 4.4. If the bidder has executed any order for similar items to Department of Atomic Energy, it shall be mentioned in the offer along with purchase / work order.
- 4.5. The firm shall provide necessary access to purchaser or his representative to their premises and the sub-contractor's premises, if applicable during the period of execution of the job for carrying out the follow up work, inspection and testing of the job.
- 4.6. Post supply inspection in respect of supplies made is not permitted. Any offer containing the condition of post supply inspection will be out-rightly rejected. It is therefore, mandatory for the bidders, while quoting, to indicate in clear terms the requirement of post supply inspection by any outside agency.
- 4.7. The offered product shall meet all the technical requirements and the bidder shall respond to the technical queries, if asked by purchaser's representative within one week, failing which will call for rejection of their offer.
- 4.8. The items under the scope of supply shall be transported safely to Purchaser's premises. The bidder shall mention the mode of transport in the quotation clearly. The bidder shall specify the charges for insurance, transportation, packaging & forwarding etc., if applicable for the total supply. The bidder shall specify clearly, in case of free delivery of the items.
- 4.9. The decision taken by the purchaser or his representative on acceptance of the items to be

supplied will be final and supplier/bidder shall give their irrevocable consent on the same.

- 4.10. The purchaser or his authorized representative shall subject the item to inspection, testing, evaluation and discussion/clarification of technical requirement.
- 4.11. No party shall disclose any information to any third party concerning the matters under this Contract generally. In particular, any information identified as "Proprietary" in nature by disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to sub-contractors, consultants, advisors or the employees engaged by a party with equal force.
- 4.12. "Restricted information" categories under section 18 of the Atomic Energy Act, 1962 and "Official secrets" under section 5 of the Official Secrets Act, 1923: Any contravention of the above mentioned provisions by any contractor / sub-contractor, consultant, advisor or the employees of the contractor will invite penal consequences under the aforesaid legislation.
- 4.13. Prohibition against the use of BARC's name without permission for publicity purpose. The contractor or sub-contractors, consultants, advisors or the employees engaged by a party shall not use BARC's name for publicity purpose through any public media like: press, radio, TV or Internet without any prior approval of BARC (wide circular ref.: 2/Misc-9/Lgl/2001/92 date 30/04/2001)
- 4.14. No advance payment shall be made.
- 4.15. The bidder shall note that the exclusive ownership of the item(s) shall remain with the purchaser for which the payment is made.
- 4.16. Bidder should note that language must be precise and universally accepted nomenclature for components or parts or products shall only be used while including in the specifications (for example guide lines mentioned in documents like ASTM, IUPAC, IS, IEEE, BS, IEC etc., may be followed).
- 4.17. No Free Issue Material (FIM) shall be supplied by BARC for manufacturing of items covered under the scope of supply. Materials, tools, manpower etc. required for the work under the scope of supply will not be supplied by the user. Supplier has to arrange the above on his own.
- 4.18. A manufacturing schedule, giving break-up of the time periods, needed for Procurement of raw material, submission of machining procedure, machining, component inspection, assembly of components, inspection & functional testing of assembly and safe delivery shall be provided with quotation.
- 4.19. A brief list of similar jobs executed, if any, and name of the organization for which such job was carried out should be furnished with the quotation. Also, a list of machine tools and inspection instruments available with the bidder should be provided.
- 4.20. The purchaser reserves the right to slightly modify the drawings of components, which may be required for simplifying the machining, assembly and functional requirements.

- 4.21. The fabrication work shall be subject to inspection at supplier's works by our concerned Engineers. The finished jobs shall not be dispatched without the approval of our Engineers based on inspection carried out at supplier's works. Necessary inspection facilities shall be provided to our Engineers during inspection of job at supplier's premises.
- 4.22. The bidder shall furnish the detailed information regarding whether an ex-employee of BARC is working in your organization or whether any of your relative is working in DAE/BARC or you are an ex-employee of DAE/BARC. In case of absence of such information or wrong information, the quotation or contract is likely to be rejected or cancelled.



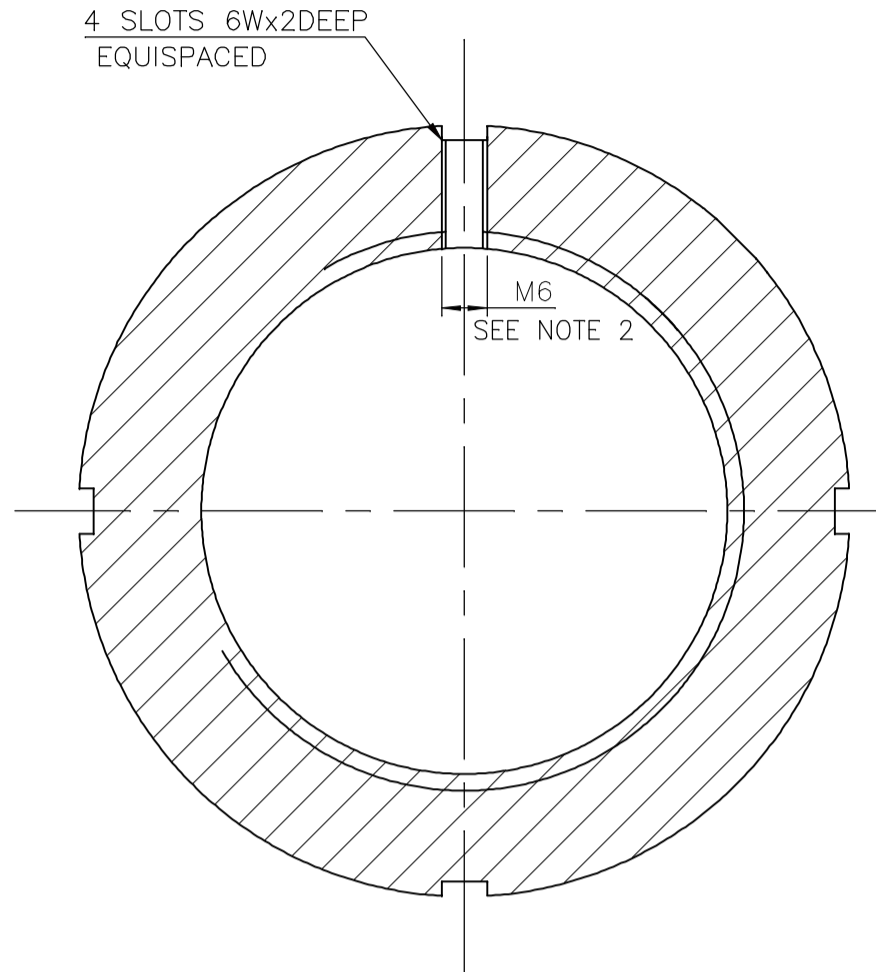
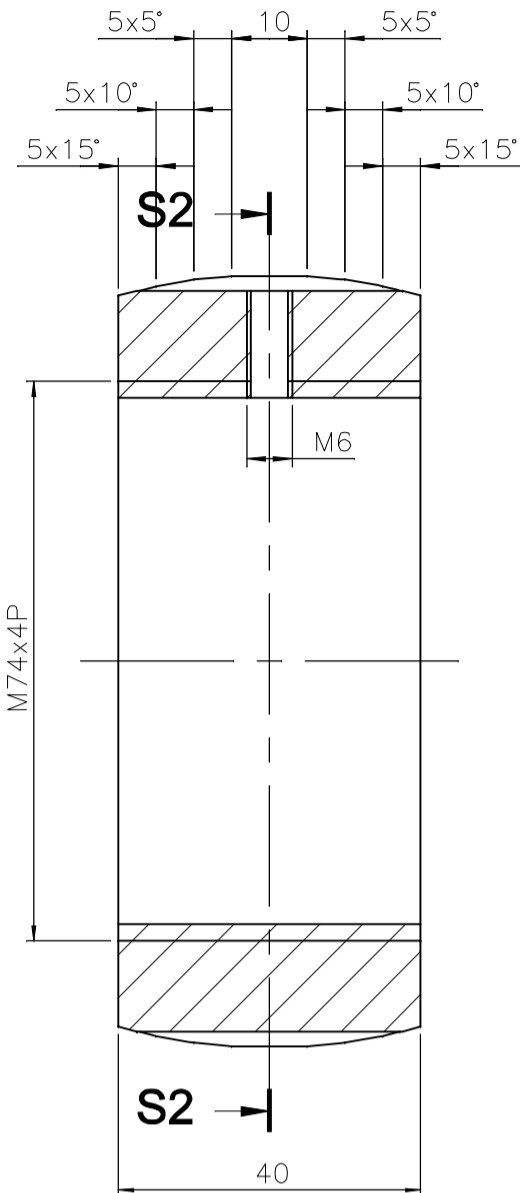
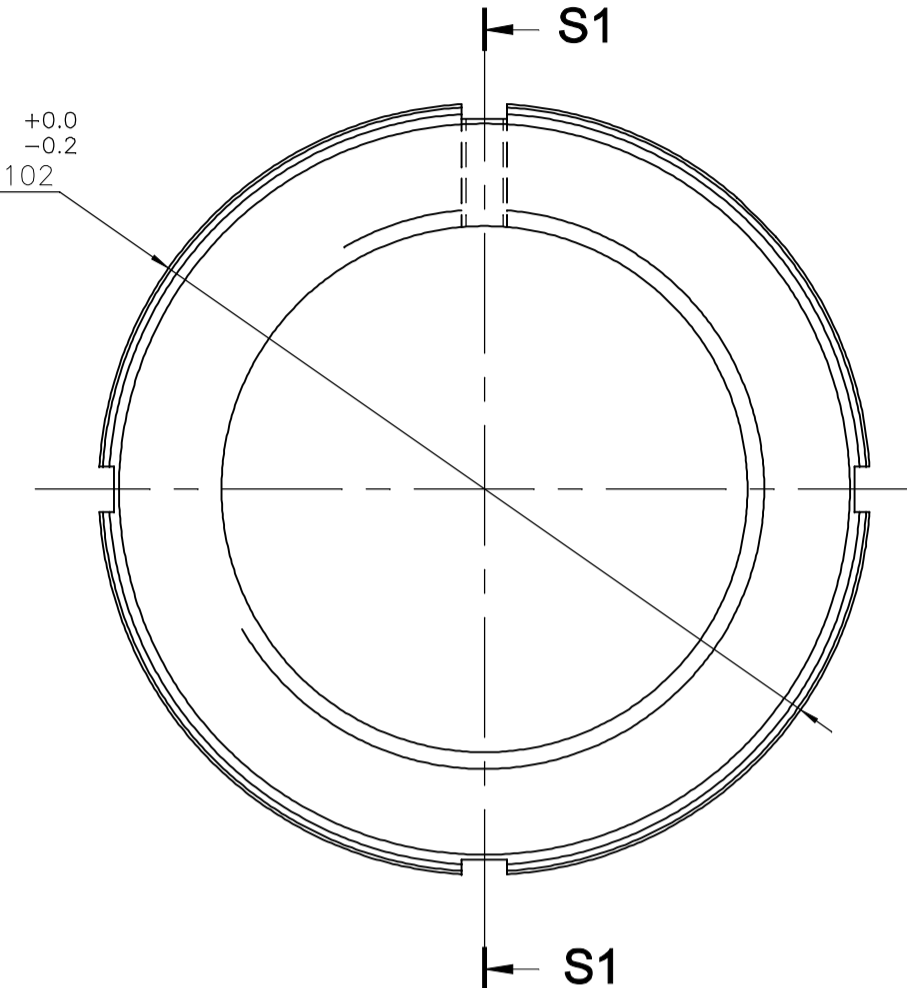


BILL OF MATERIAL				
PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO. REMARKS
1	FRONT SIDE BEARING	AL. BRONZE (BS 1400 Gr. AB2)	01	A2-3113-M-4663-00
2	INTERNAL CIRCLIP (LIGHT B.21 IS 3075)	ASTM A276 TYPE 304	02	STANDARD
3	SPACER O.D.22 X I.D.14 X 5 THK	ASTM A276 TYPE 304	02	
4	BUSH O.D.21 X I.D.12 X 30 LG.	ASTM A276 TYPE 304	02	
5	CENTERING PLUNGER SUB ASSEMBLY	-	06	A2-3113-M-4664-SA
6	FRONT CYLINDER	ASTM A276 TYPE 410	01	A2-3113-M-4665-00
7	FRONT PISTON	ASTM A276 TYPE 410	01	A1-3113-M-4666-00
8	REPLICA BODY	ASTM A276 TYPE 410	01	A2-3113-M-4667-00
9	O RING I.D. 25.07 X W 2.62	BUNA-N	02	P-2-120 M/S PARKAR
10	FRONT CAP	ASTM A276 TYPE 304	01	A1-3113-M-4666-00
11	O RING I.D. 34.59 X W 2.62	BUNA-N	02	P-2-126 M/S PARKAR
12	O RING I.D. 20.29 X W 2.62	BUNA-N	01	P-2-117 M/S PARKAR
13	REPLICA COVER PLATE	AL. BRONZE (BS 1400 Gr. AB2)	01	A2-3113-M-4668-00
14	GRIPPING PISTON SUB ASSEMBLY	-	01	A3-3113-M-4669-SA
15	O RING I.D. 17.04 X W 3.53	BUNA-N	01	P-2-209 M/S PARKAR
16	CARTRIDGE	ASTM A276 TYPE 410	01	A2-3113-M-4670-00
17	MAIN BODY - 1	ASTM A276 TYPE 410	01	A1-3113-M-4671-SA
18	FRONT CAP SUB ASSEMBLY	-	01	A1-3113-M-4671-SA
19	O RING I.D. 29.82 X W 2.62	BUNA-N	02	P-2-123(S) M/S PARKAR
20	PISTON - 1 SUB ASSEMBLY	-	01	A2-3113-M-4672-SA
21	O RING I.D. 23.39 X W 3.53	BUNA-N	01	P-2-213(S) M/S PARKAR
22	REAR CAP SUB ASSEMBLY	-	01	A1-3113-M-4671-SA
23	REAR CYLINDER	ASTM A276 TYPE 410	01	A2-3113-M-4673-00
24	REAR PISTON	ASTM A276 TYPE 410	01	A1-3113-M-4666-00
25	REAR CAP	ASTM A276 TYPE 304	01	A1-3113-M-4666-00
26	REAR SIDE BEARING	AL. BRONZE (BS 1400 Gr. AB2)	01	A2-3113-M-4680-00
27	MAIN BODY - 2	ASTM A276 TYPE 410	01	A2-3113-M-4675-00
28	CARTRIDGE LOCK SUB ASSEMBLY	-	01	A2-3113-M-4676-SA
29	GRUB SCREW M6X15LG.	ASTM 276 TYPE 304	02	STANDARD
30	COUNTERSUNK HD. SCREW M6 X 18 LG.	ASTM 276 TYPE 304	04	STANDARD
31	COUNTERSUNK HD. SCREW M4 X 8 LG.	ASTM 276 TYPE 304	04	STANDARD
32	COUNTERSUNK HD. SCREW M6 X 10 LG.	ASTM 276 TYPE 304	10	STANDARD
33	COUNTERSUNK HD. SCREW M6 X 12 LG.	ASTM 276 TYPE 304	08	STANDARD
34	PROTECTIVE SLEEVE	ASTM A312 TYPE 304	01	A2-3113-M-4681-00
35	REPLICA PLATE	ASTM A276 TYPE 304	01	A2-3113-M-4677-00
36	SPACER PLATE	ASTM A276 TYPE 304	02	A3-3113-M-4678-00
37	GUIDE ROD	ASTM A276 TYPE 304	02	A2-3113-M-4678-00
38	Linear bearing 10x5x15mm	ASTM 276 TYPE 304	02	STANDARD
39	COUNTERSUNK HD. SCREW M6 X 12 LG.	ASTM 276 TYPE 304	05	STANDARD
40	SPACER	ASTM A276 TYPE 304	01	A3-3113-M-4679-00
41	GRUB SCREW	ASTM 276 TYPE 304	01	A2-3113-M-4681-00
42	HELICAL COMPRESION SPRING	ASTM A313 TYPE 302	01	
43	COUNTERSUNK HD. SCREW M5 X 15 LG.	ASTM 276 TYPE 304	04	STANDARD
44	PIN 1	ASTM A276 TYPE 304	02	A2-3113-M-4674-00
45	PIN 2	ASTM A276 TYPE 304	02	A2-3113-M-4674-00
46	INTERNAL CIRCLIP (LIGHT B.12, IS 3075)	ASTM A276 TYPE 304	04	STANDARD
47	COUNTERSUNK HD. SCREW M6 X 17 LG.	ASTM 276 TYPE 304	04	STANDARD
48	COUNTERSUNK HD. SCREW M5 X 12 LG.	ASTM 276 TYPE 304	01	STANDARD
49	UNIVERSAL CONNECTOR	ASTM A276 TYPE 304	01	A2-3113-M-4674-00
50	END CONNECTOR	ASTM A276 TYPE 304	01	A2-3113-M-4674-00
51	EXTENSION TUBE ADPTER	ASTM A276 TYPE 304	01	A2-3113-M-4674-00
52	1/8" TUBE FITTING	ASTM 276 TYPE 304	05	STANDARD
53	HEX. SCOKET COUNTERBORE HD. SCREW M4 X 10 LG.	ASTM 276 TYPE 304	01	STANDARD

SPRING SPECIFICATIONS	
DESCRIPTION	SPRING PART NO. 42
MEAN COIL DIA	24 mm
WIRE DIA	1.8 mm
TOTAL NO. OF TURNS	5
MAX. LOAD ON SPRING	9.9 Kg.
STIFFNESS	0.5 Kg/mm
FREE LENGHT	36 mm
END	SQUARED & GROUND

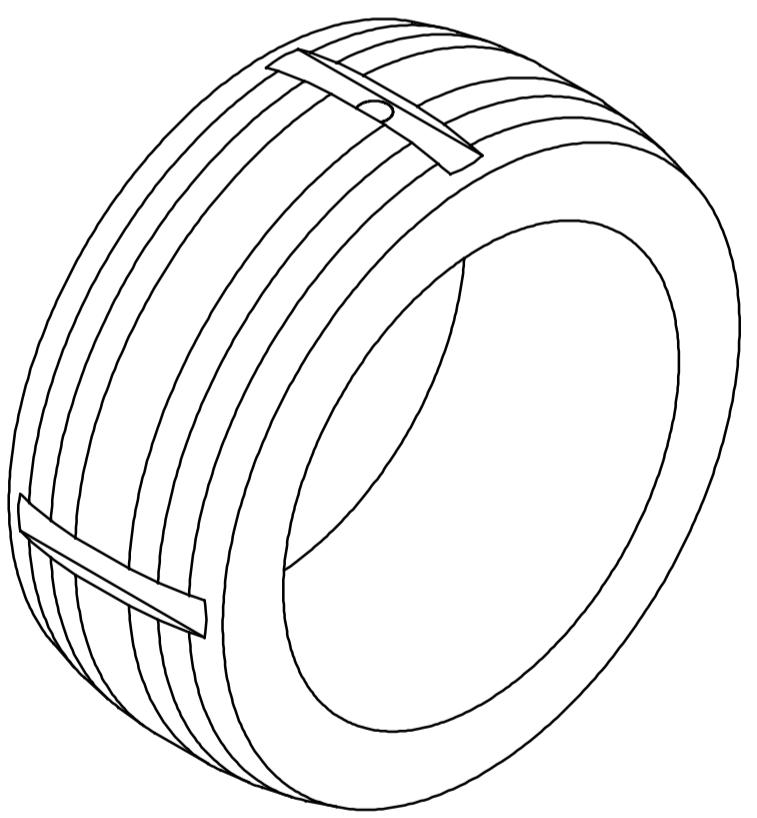
**NOTES :-**  
 1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)										
DIMENSIONS	TOL.	DIMENSIONS	TOL.							
UP TO 3	± 0.1	120-315	± 0.5							
3 - 6	± 0.1	315-1000	± 0.8							
6 - 30	± 0.2	1000-2000	± 1.2							
30-120	± 0.3	2000-4000	± 2.0							
RADI AND CHAMFERS				0.5-3	3-6	6-30				
TOLERANCE				+/-0.2	+/-0.5	+/-1.0				
SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.										
THIS DESIGN AND DRAWING IS THE PROPERTY OF BHABHA ATOMIC RESEARCH CENTRE AND SHALL BE RETURNED WITH QUOTATION OR UPON DELIVERY OF MATERIAL AND EQUIPMENT AND MUST NOT BE USED EXCEPT BY PERMISSION OF THE OWNER DRG.NO. A1-3113-M-4662-GA PHWR REPLICA TOOL FOR #103 PRESSURE TUBE ASSEMBLY A1-3113-M-4662-GA GOVERNMENT OF INDIA BHABHA ATOMIC RESEARCH CENTRE PHWR REPLICA TOOL FOR #103 PRESSURE TUBE-MARK II ASSEMBLY SCALE:- 1:2 PROJECTION SHEET 1 OF 1 REV. NO. 0										



**FRONT SIDE BEARING  
PART NO. - 1**

MATERIAL - AL. BRONZE (BS 1400 Gr. AB2)



BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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**NOTES :-**

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
2. TO BE MADE AFTER ASSEMBLY WITH PART NO.6 (FRONT CYLINDER). (A2-3113-M-4665-DD)

DRG.NO. A2-3113-M-4663-DD

THIS DESIGN AND DRAWING IS THE PROPERTY OF BHABHA ATOMIC RESEARCH CENTRE AND SHALL BE RETURNED WITH QUOTATION OR UPON DELIVERY OF MATERIAL AND EQUIPMENT AND MUST NOT BE USED EXCEPT BY PERMISSION OF THE OWNER

REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DES.N. CHK'D.	DRN.& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
REPLICA TOOL FOR PHWR ASSEMBLY #103 PRESSURE TUBE-MARK II	A1-3113-M-4662-GA										
REVISIONS											

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)			
DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0
RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
**FRONT SIDE BEARING (PART NO. - 1)**

DRG.NO. A2-3113-M-4663-DD

SCALE-- 1:1	PROJECTION
SHEET 10F1	REV. NO. 0



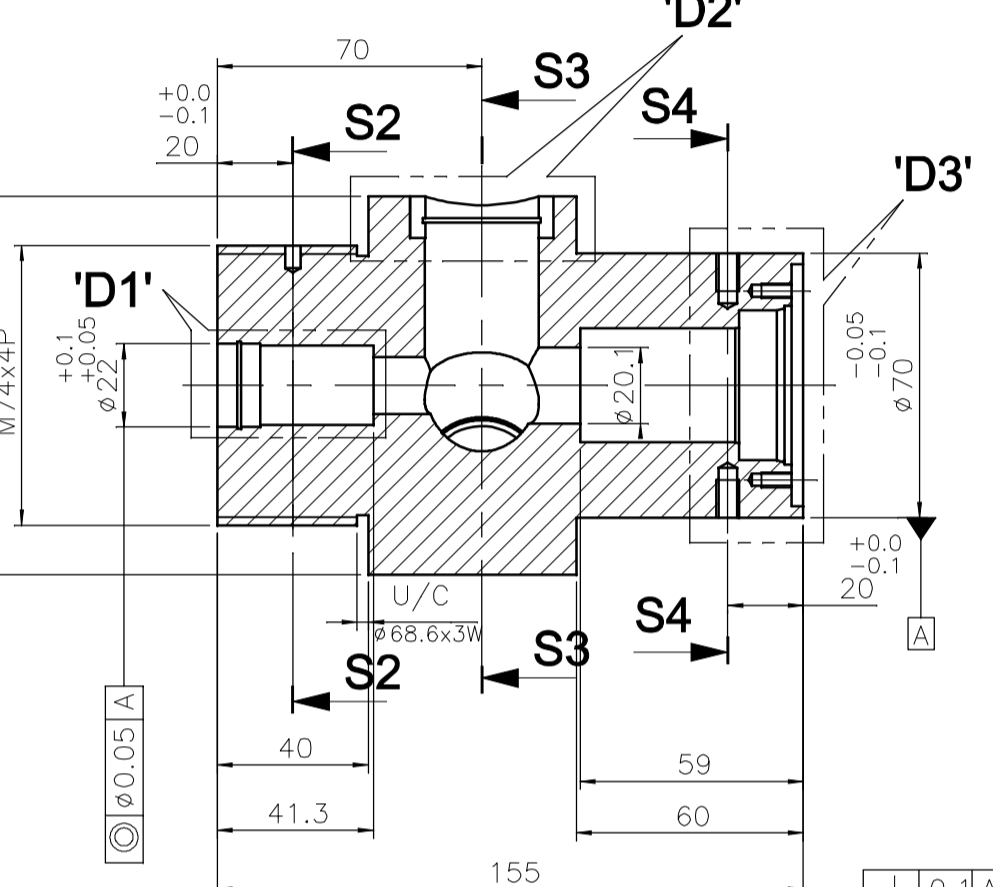
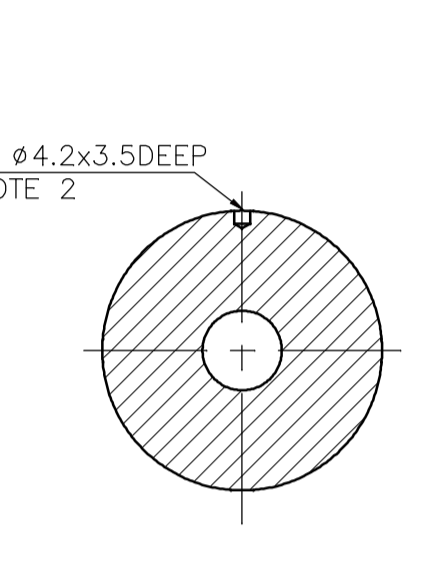
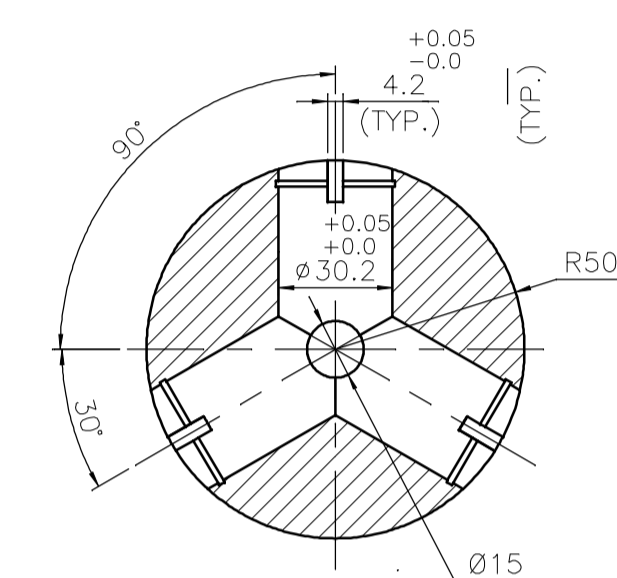
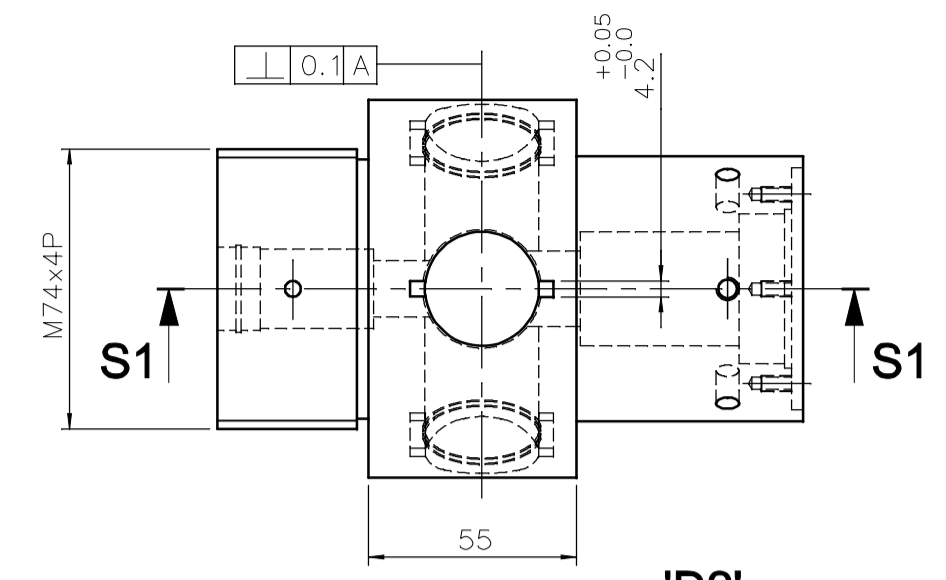
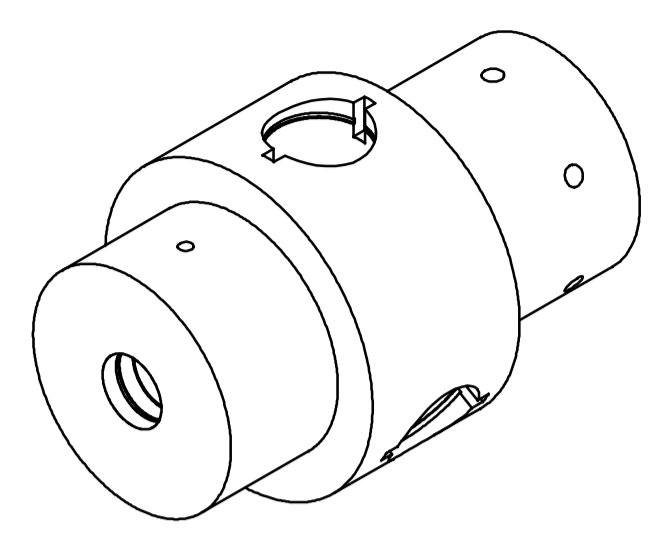
BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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**NOTES :-**

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
- TO BE MADE AFTER ASSEMBLY WITH PART NO.1 (FORNT SIDE BEARING). (A2-3113-M-4663-DD)

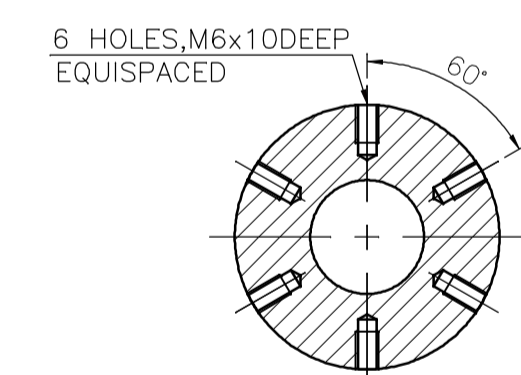
GOVERNMENT OF INDIA	
BHABHA ATOMIC RESEARCH CENTRE	
TITLE	PHWR
REPLICA TOOL FOR $\phi 103$ PRESSURE TUBE-MARK II	
FRONT CYLINDER (PART NO. 6)	
SCALE-- 1:2	PROJECTION
DRG.NO. A2-3113-M-4665-DD	SHEET 10F1
	REV. NO. 0



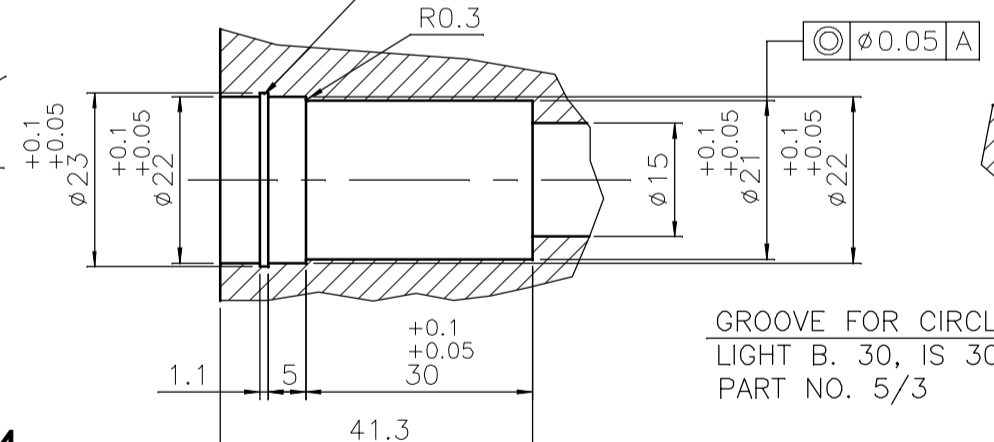
**SECTION S1 - S1  
FRONT CYLINDER  
PART NO. 6**

MATERIAL - ASTM A276 TYPE 410

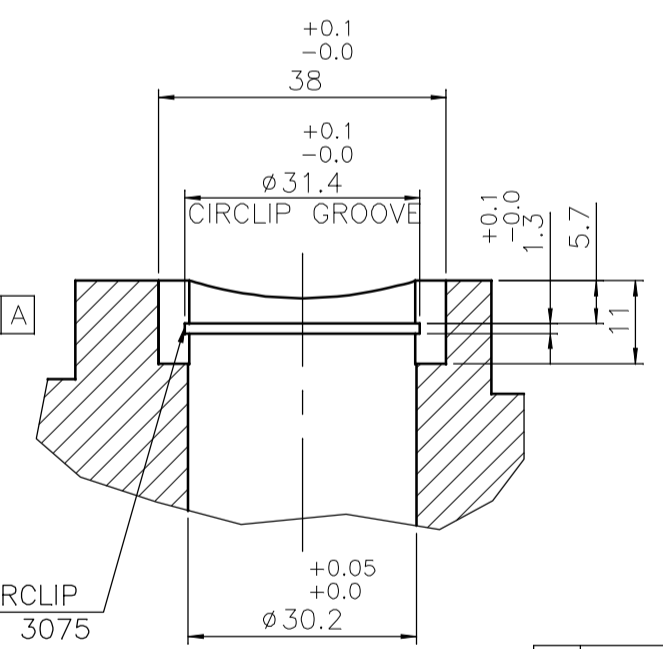
GROOVE FOR CIRCLIP  
LIGHT B. 21, IS 3075  
PART NO. 2



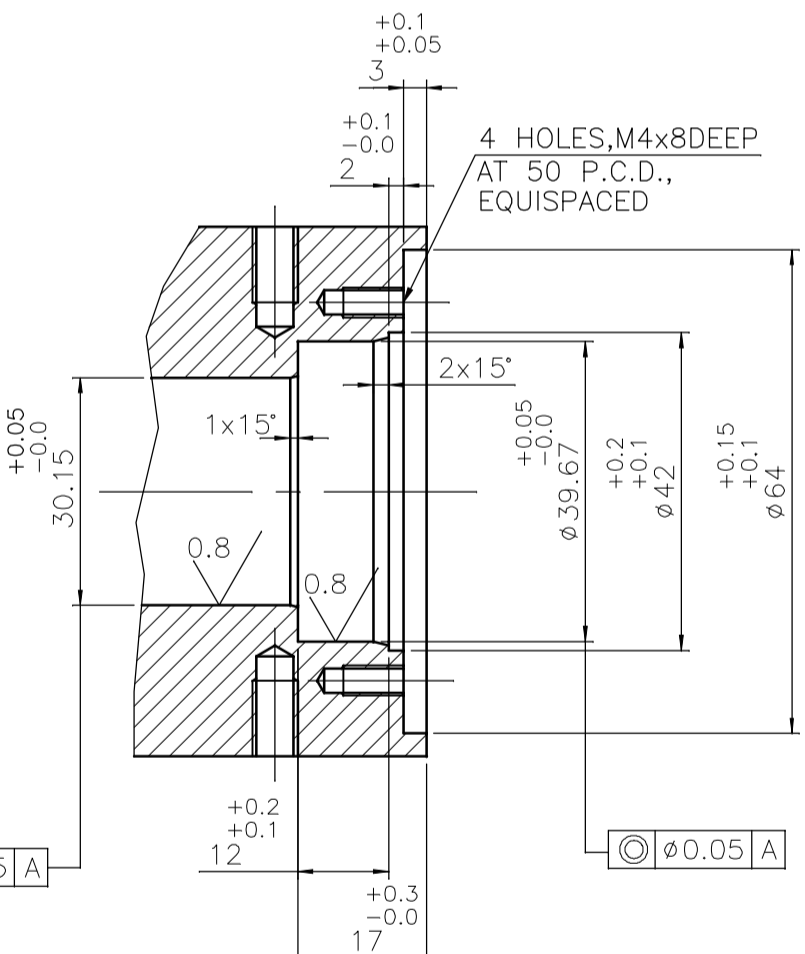
**SECTION S4 - S4**



**DETAIL - D1  
(SCALE 1:1)**



**DETAIL - D2  
(SCALE 1:1)**



**DETAIL AT - D3  
(SCALE 1:1)**

DRG.NO. A2-3113-M-4665-DD

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DES.N. CHK'D.	DRN.& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR REPLICA TOOL FOR $\phi 103$ PRESSURE TUBE-MARK II ASSEMBLY	A1-3113-M-4662-GA										

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)			
DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	$\pm 0.1$	120-315	$\pm 0.5$
3 - 6	$\pm 0.1$	315-1000	$\pm 0.8$
6 - 30	$\pm 0.2$	1000-2000	$\pm 1.2$
30-120	$\pm 0.3$	2000-4000	$\pm 2.0$
RADI AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	$\pm 0.2$	$\pm 0.5$	$\pm 1.0$

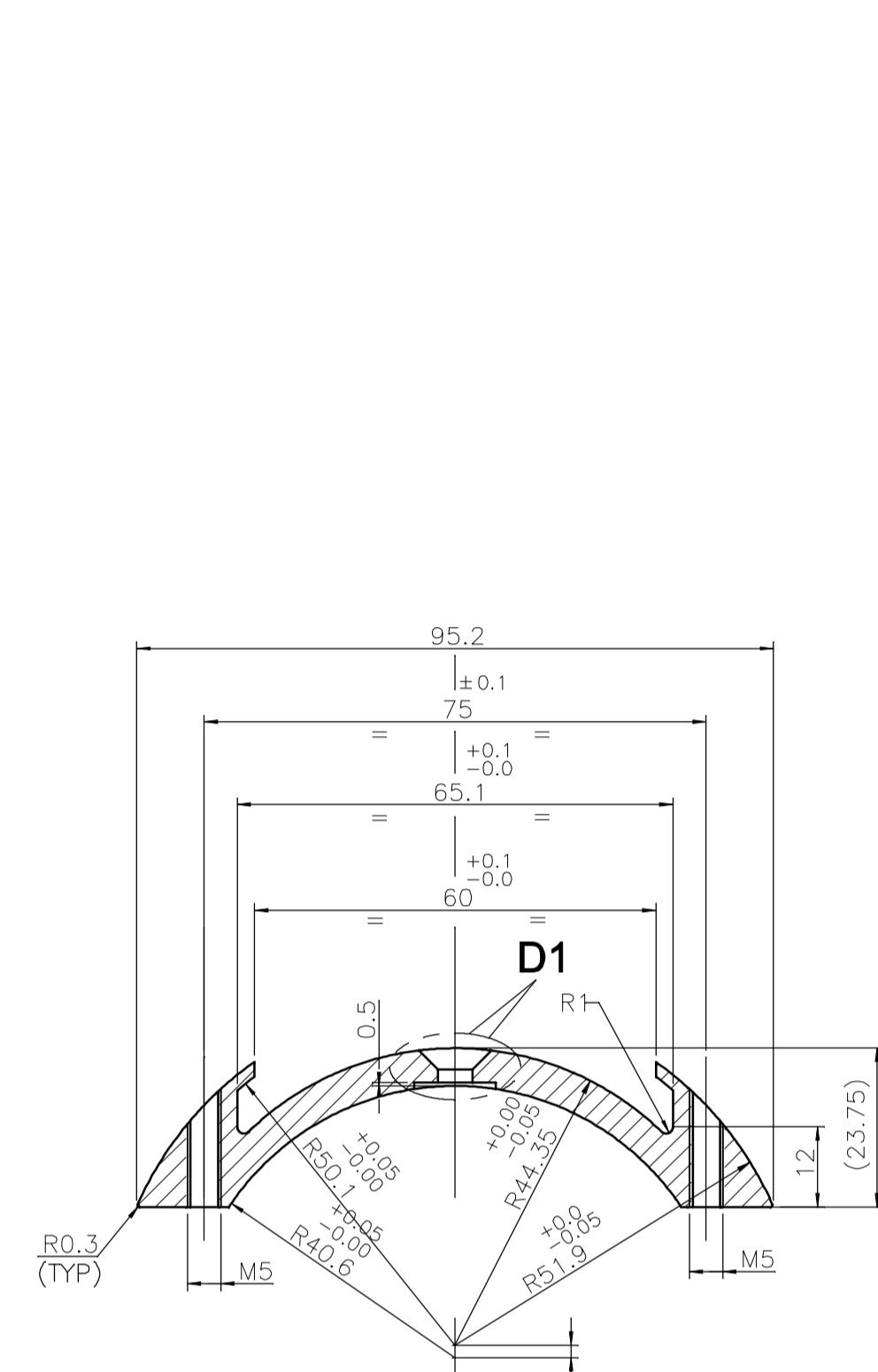
SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED.  
REMOVE ALL BURRS.  
ROUND SHARP CORNERS & EDGES  
TO R=0.3 MAX.



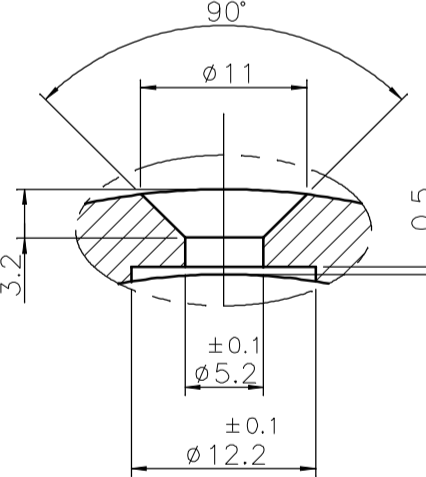


1 2 3 4 5 6 7 8 9 10 11 12

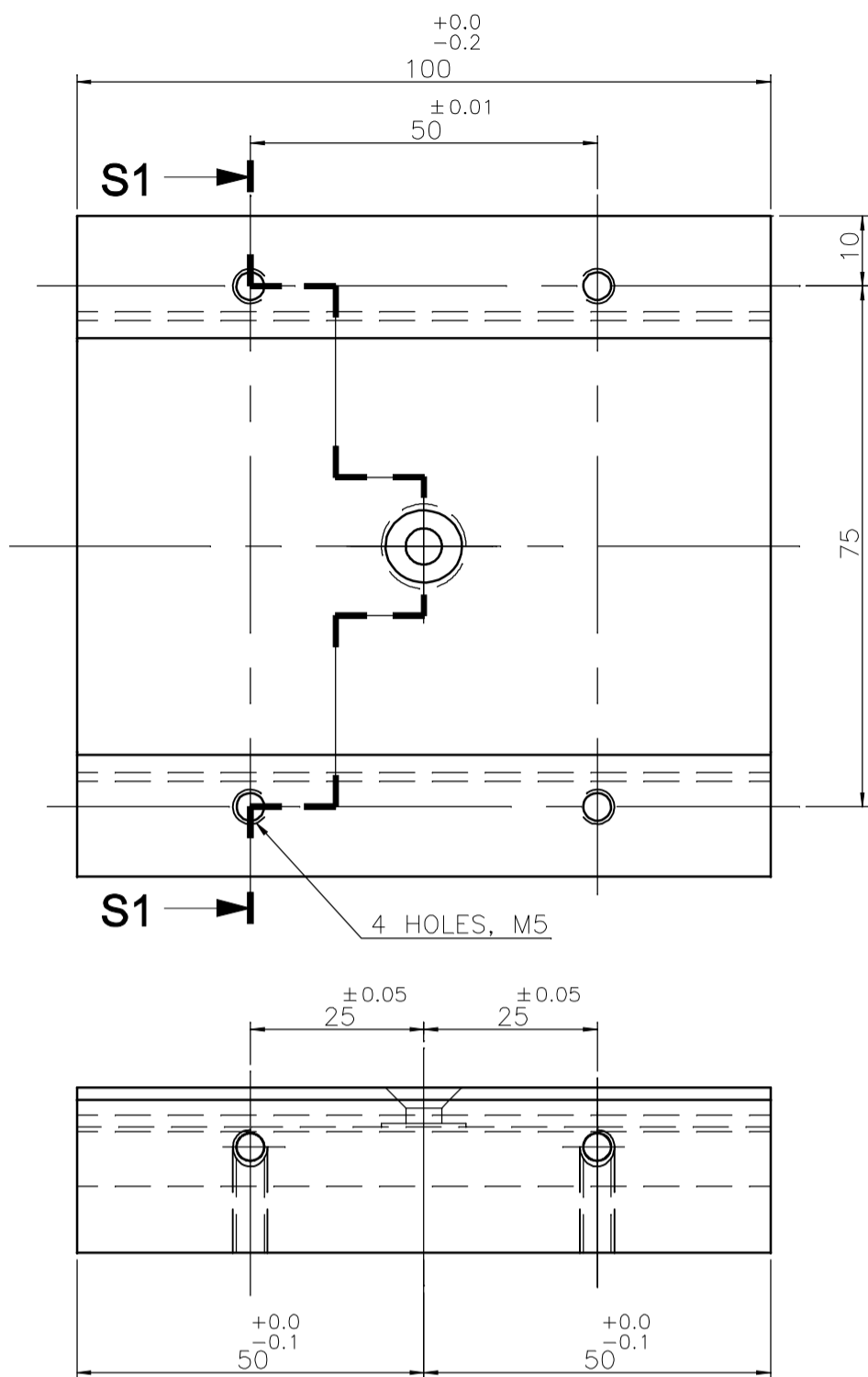
A  
B  
C  
D  
E  
F  
G  
H



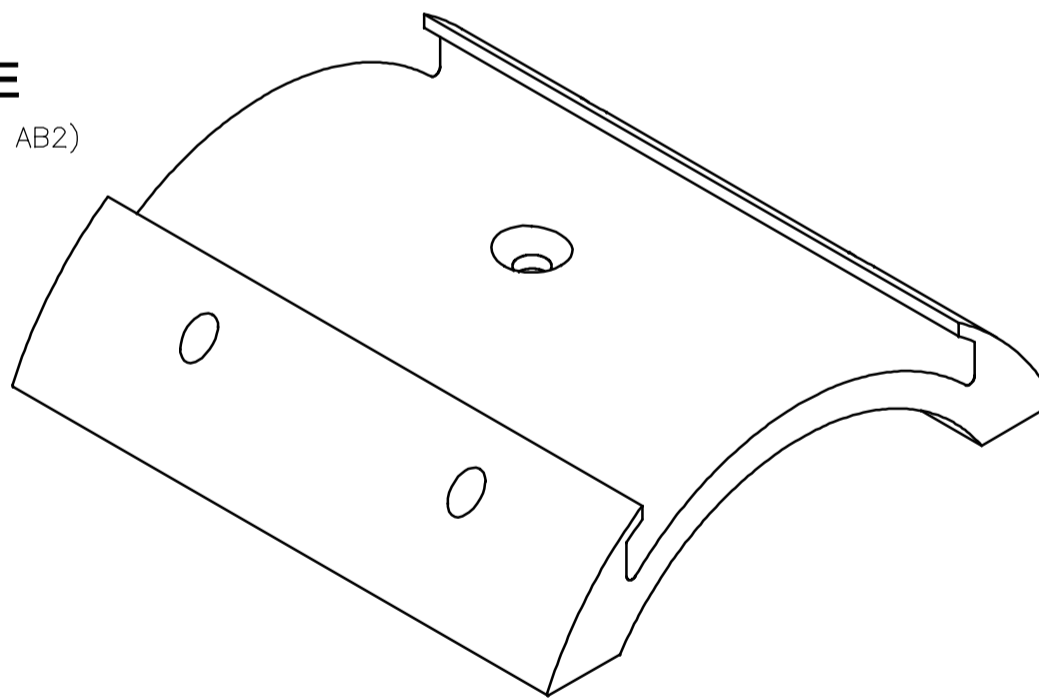
SECTION S1 - S1



DETAIL - D1



PART NO. - 13  
REPLICA COVER PLATE  
(MATERIAL - AL. BRONZE (BS 1400 Gr. AB2))



BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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NOTES :-

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG.NO. A2-3113-M-4668-DD

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN & DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II ASSEMBLY	A1-3113-M-4662-GA										
REVISIONS											

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0
RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

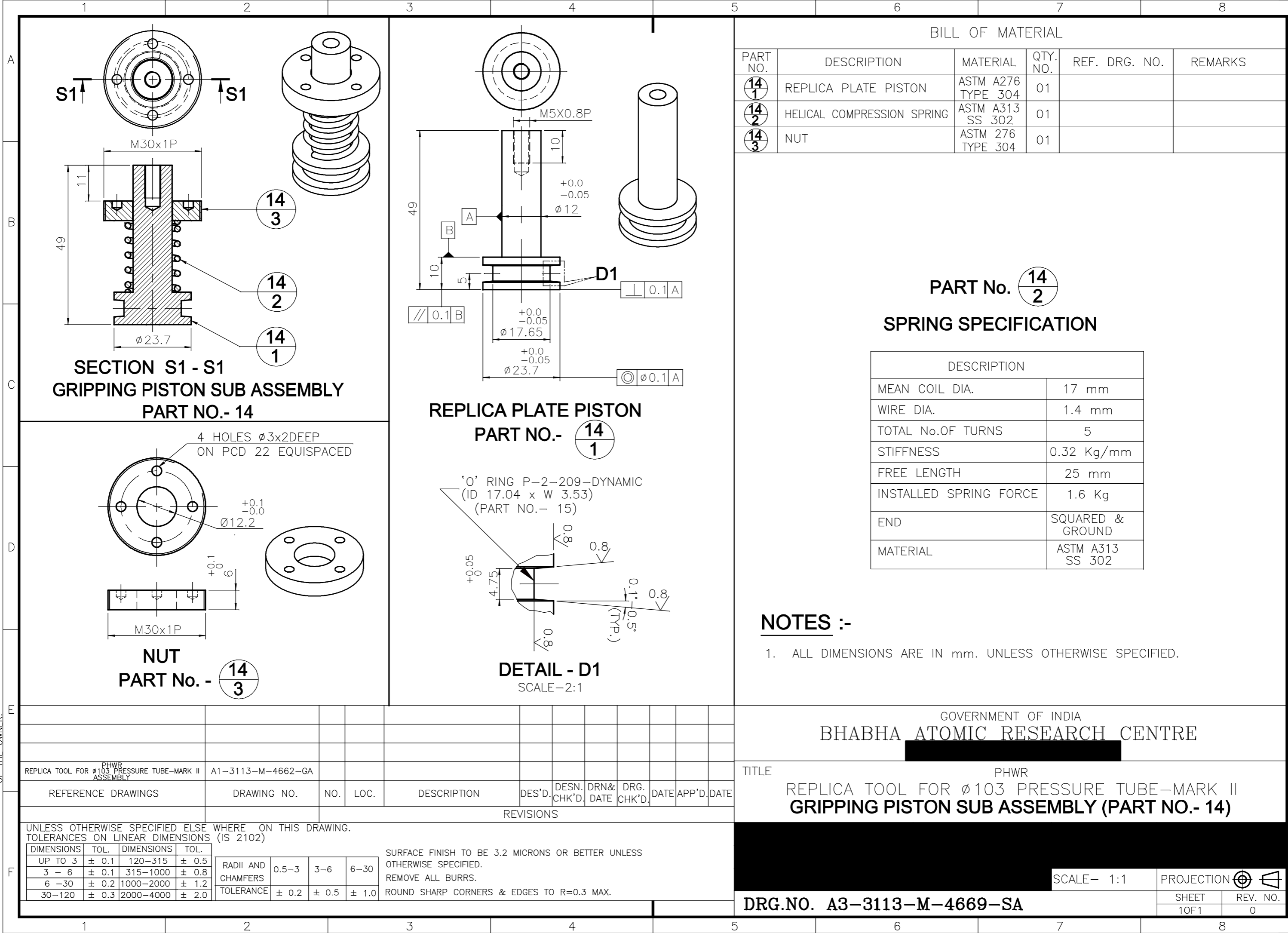
TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
REPLICA COVER PLATE (PART NO. - 13)

DRG.NO. A2-3113-M-4668-DD

SCALE-- 1:1	PROJECTION
SHEET 10F1	REV. NO. 0

1 2 3 4 5 6 7 8 9 10 11 12

THIS DESIGN AND DRAWING IS THE PROPERTY OF THE BHABHA ATOMIC RESEARCH CENTRE AND MUST BE RETURNED WITH QUOTATION OR UPON DELIVERY OF MATERIAL AND EQUIPMENT AND MUST NOT BE USED EXCEPT BY PERMISSION OF THE OWNER.



**BILL OF MATERIAL**

PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO.	REMARKS
14-1	REPLICA PLATE PISTON	ASTM A276 TYPE 304	01		
14-2	HELICAL COMPRESSION SPRING	ASTM A313 SS 302	01		
14-3	NUT	ASTM 276 TYPE 304	01		

**PART No. 14-2**  
**SPRING SPECIFICATION**

DESCRIPTION	
MEAN COIL DIA.	17 mm
WIRE DIA.	1.4 mm
TOTAL No.OF TURNS	5
STIFFNESS	0.32 Kg/mm
FREE LENGTH	25 mm
INSTALLED SPRING FORCE	1.6 Kg
END	SQUARED & GROUND
MATERIAL	ASTM A313 SS 302

**NOTES :-**

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

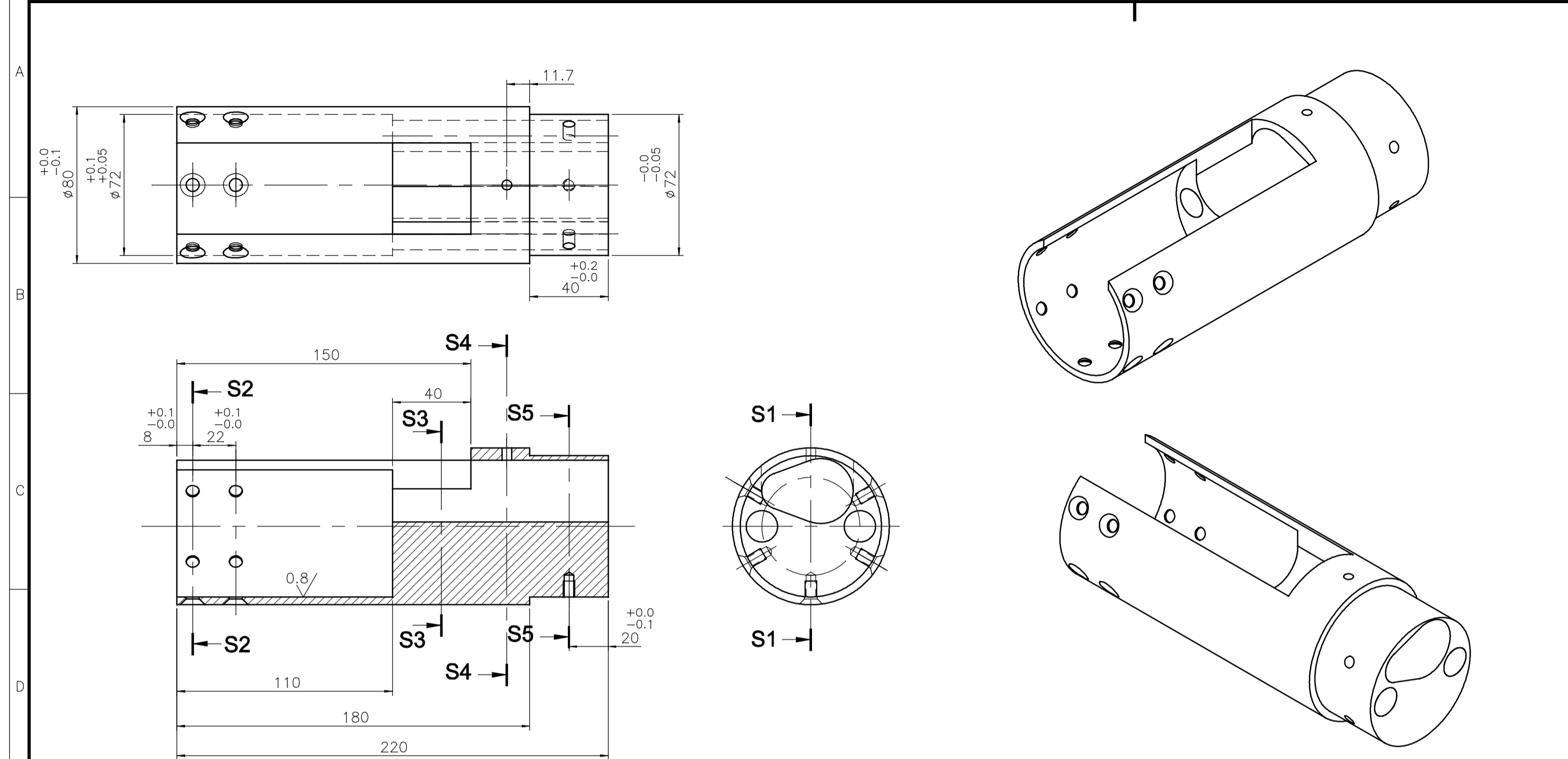
TITLE PHWR  
REPLICA TOOL FOR  $\phi 103$  PRESSURE TUBE-MARK II  
**GRIPPING PISTON SUB ASSEMBLY (PART NO.- 14)**

REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR ASSEMBLY REPLICA TOOL FOR $\phi 103$ PRESSURE TUBE-MARK II	A1-3113-M-4662-GA										

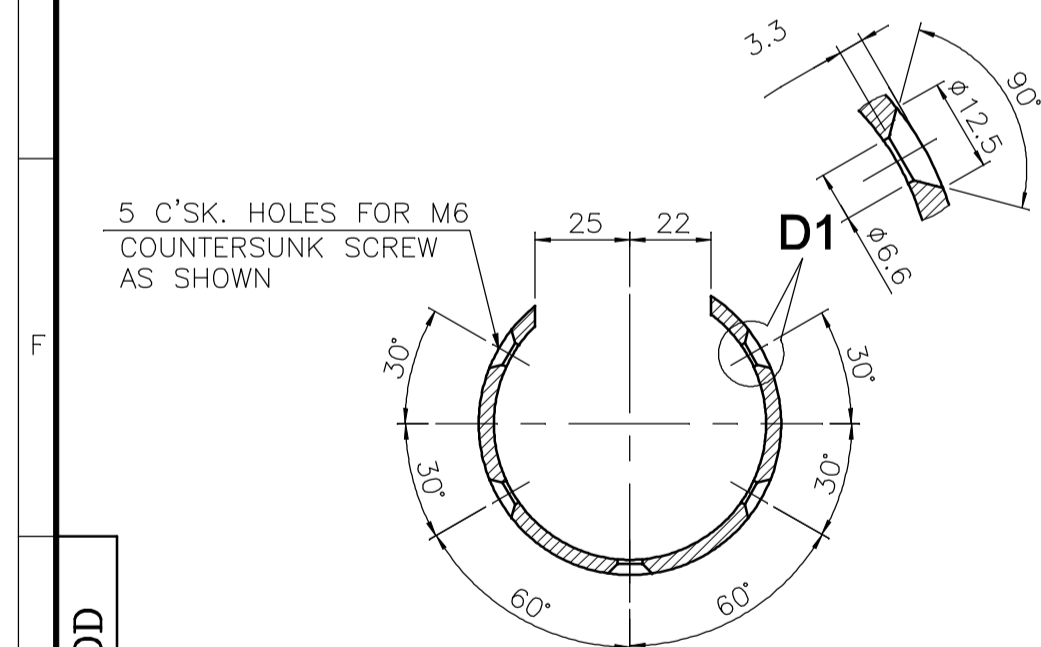
UNLESS OTHERWISE SPECIFIED ELSE WHERE ON THIS DRAWING. TOLERANCES ON LINEAR DIMENSIONS (IS 2102)				RADI AND CHAMFERS TOLERANCE			SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.
DIMENSIONS	TOL.	DIMENSIONS	TOL.	RADI AND CHAMFERS	0.5-3	3-6	
UP TO 3	$\pm 0.1$	120-315	$\pm 0.5$				
3 - 6	$\pm 0.1$	315-1000	$\pm 0.8$				
6 - 30	$\pm 0.2$	1000-2000	$\pm 1.2$				
30-120	$\pm 0.3$	2000-4000	$\pm 2.0$		$\pm 0.2$	$\pm 0.5$	

DRG.NO. **A3-3113-M-4669-SA**  
SCALE- 1:1  
PROJECTION   
SHEET 10F1 REV. NO. 0

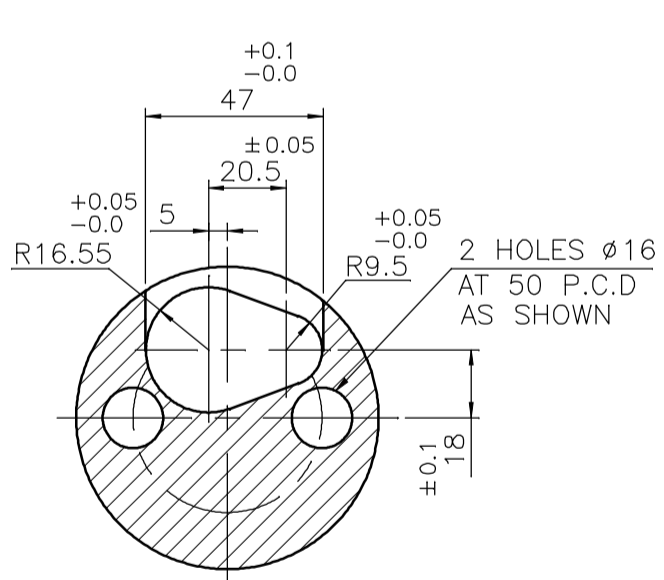




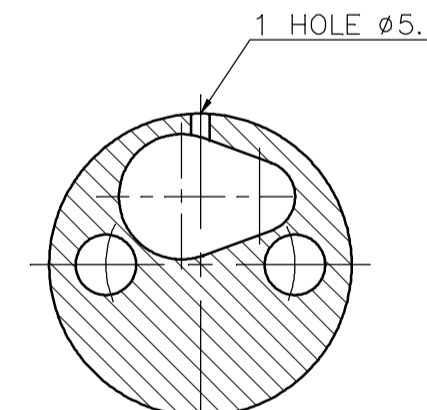
**SECTION S1 - S1**  
**MAIN BODY - 1**  
**PART NO. - 17**  
 MATERIAL - ASTM A276 TYPE 410



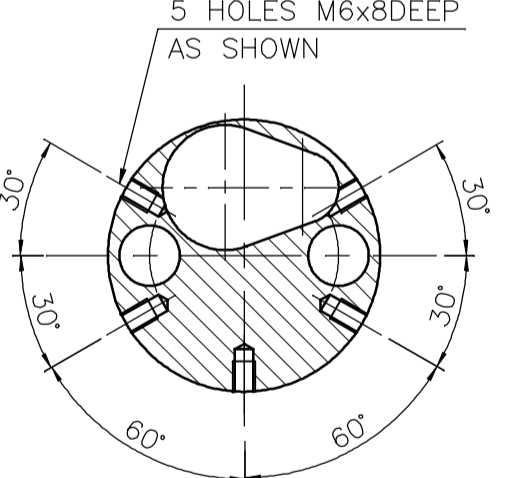
**SECTION S2 - S2**



**SECTION S3 - S3**



**SECTION S4 - S4**



**SECTION S5 - S5**

BILL OF MATERIAL					
PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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**NOTES :-**  
 1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG.NO. A2-3113-M-4670-DD

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REVISIONS	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN & DATE	DRG. CHK'D.	DATE	APP'D.	DATE

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)			
DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	$\pm 0.1$	120-315	$\pm 0.5$
3 - 6	$\pm 0.1$	315-1000	$\pm 0.8$
6 - 30	$\pm 0.2$	1000-2000	$\pm 1.2$
30-120	$\pm 0.3$	2000-4000	$\pm 2.0$
RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	$\pm 0.2$	$\pm 0.5$	$\pm 1.0$

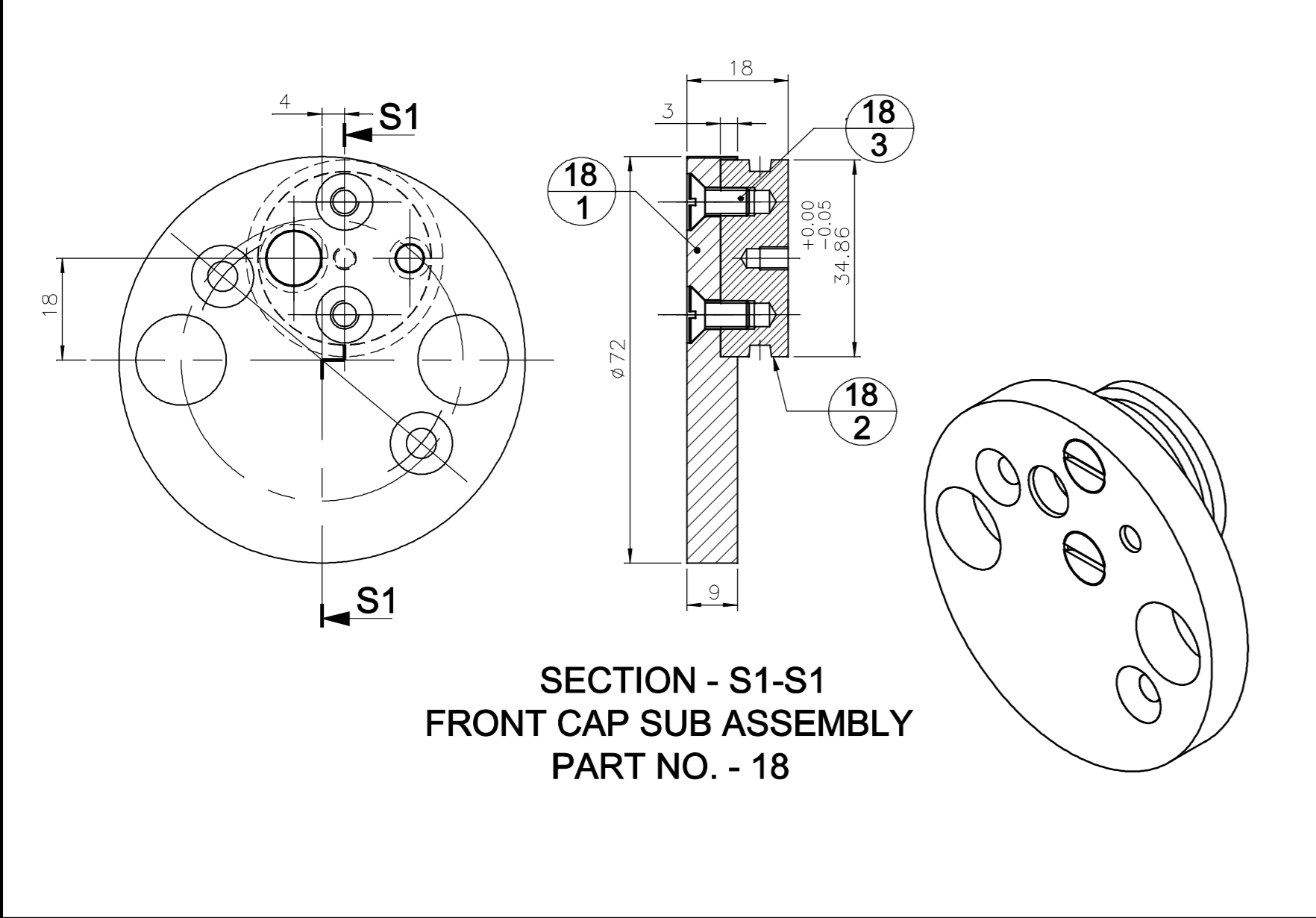
SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
 BHABHA ATOMIC RESEARCH CENTRE

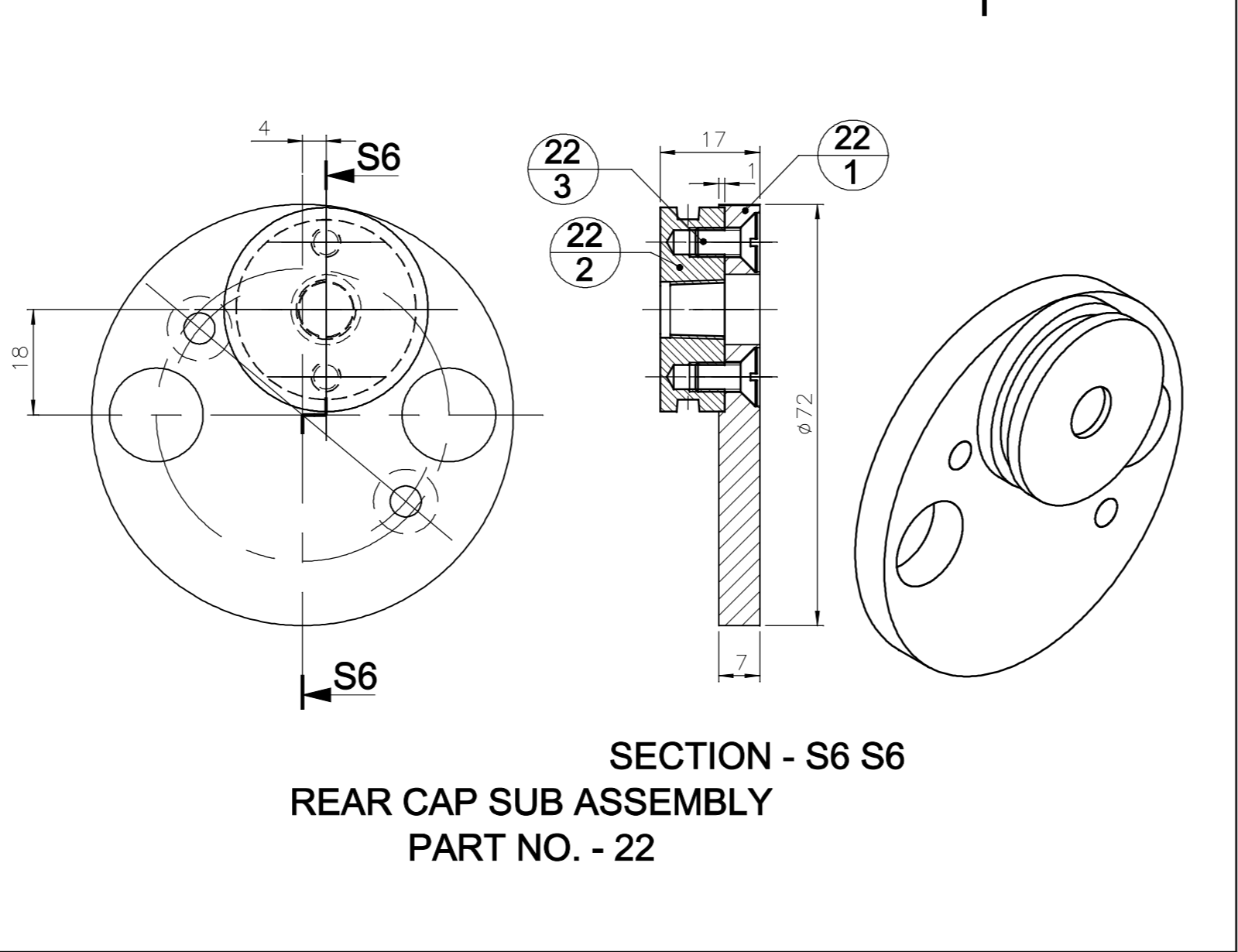
TITLE PHWR  
 REPLICA TOOL FOR  $\phi 103$  PRESSURE TUBE-MARK II  
**MAIN BODY - 1 (PART NO. - 17)**

DRG.NO. A2-3113-M-4670-DD

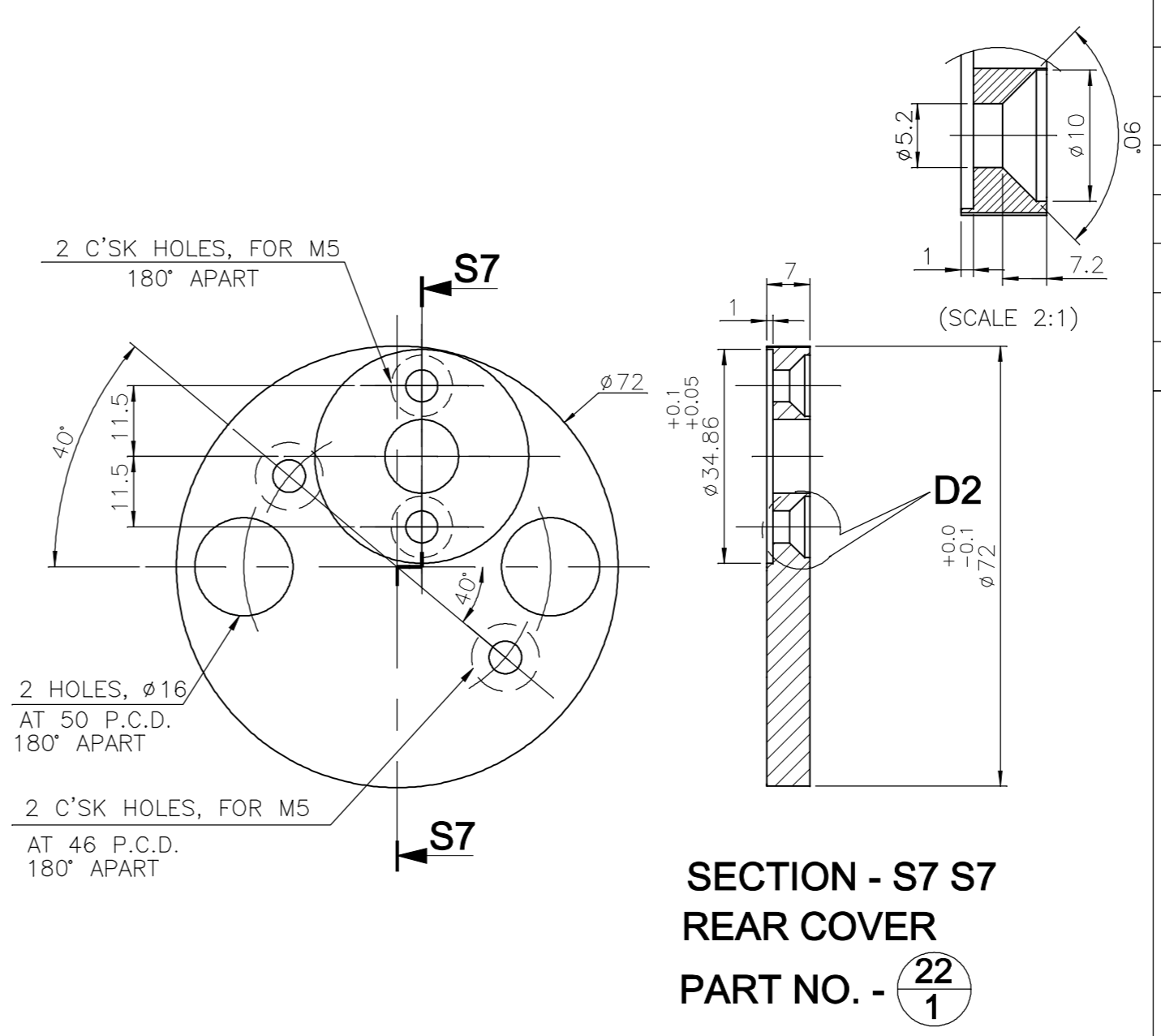
SCALE-- 1:2	PROJECTION
SHEET 10F1	REV. NO. 0



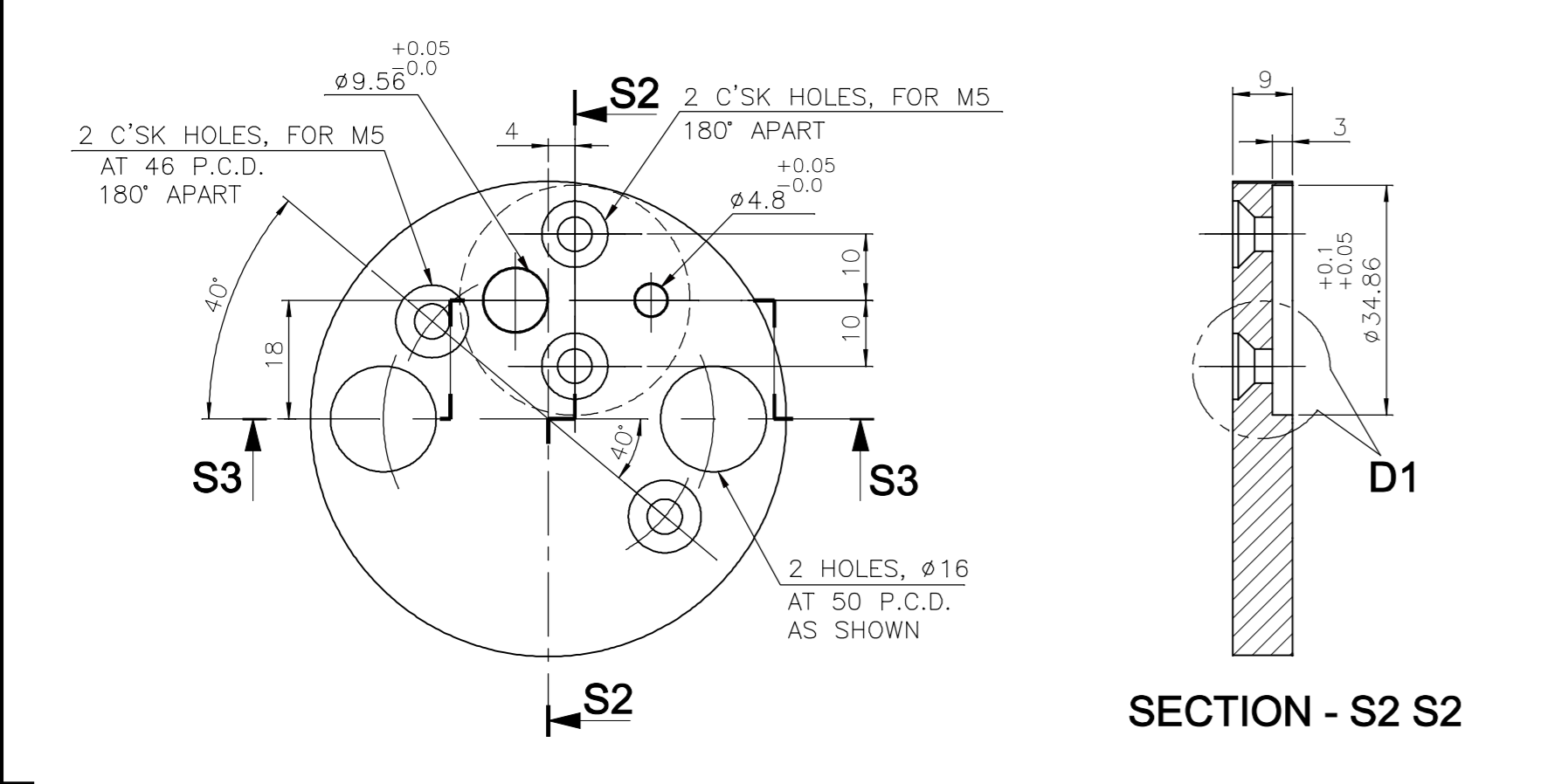
**SECTION - S1-S1**  
**FRONT CAP SUB ASSEMBLY**  
**PART NO. - 18**



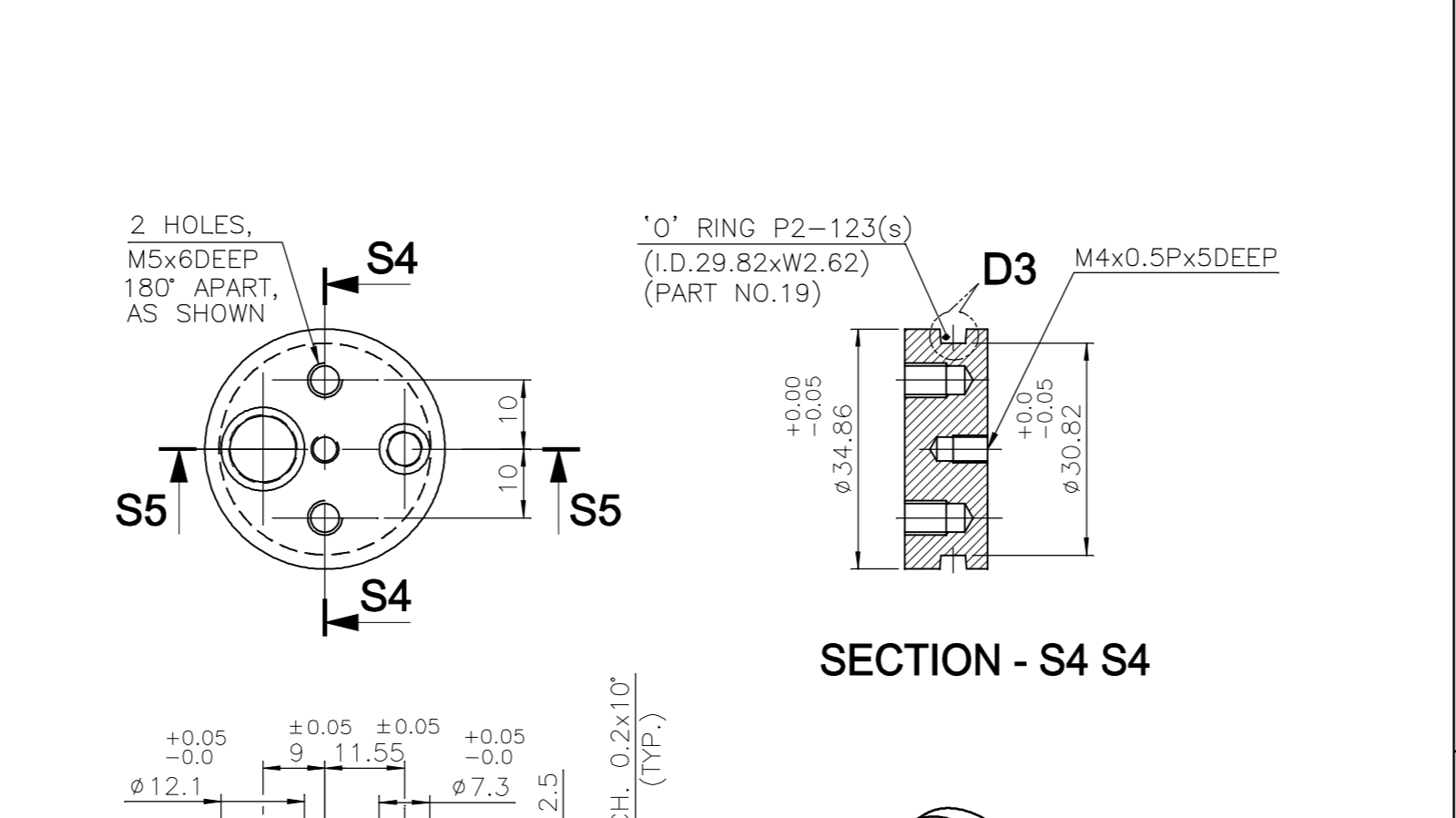
**SECTION - S6-S6**  
**REAR CAP SUB ASSEMBLY**  
**PART NO. - 22**



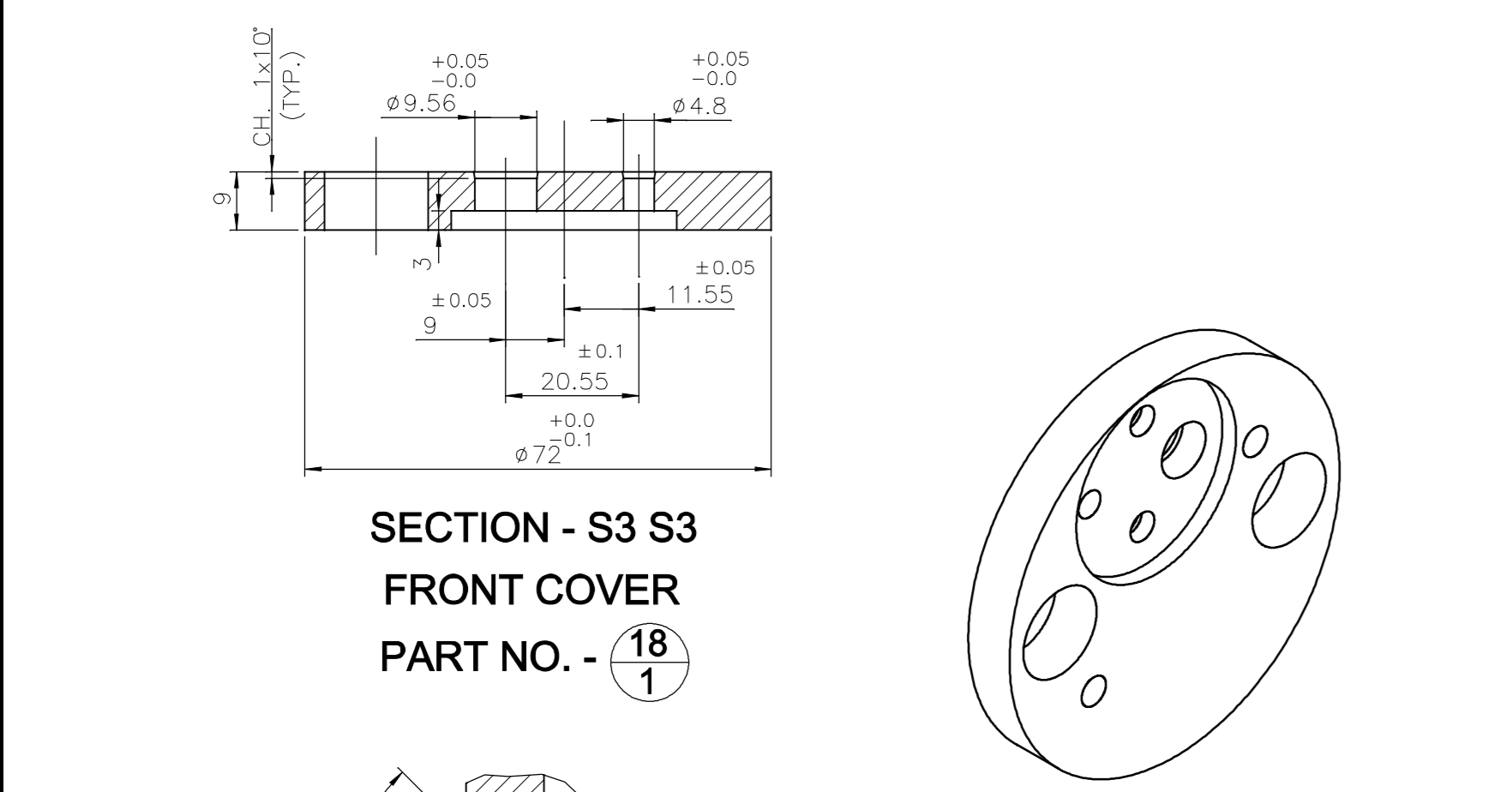
**SECTION - S7-S7**  
**REAR COVER**  
**PART NO. - 22/1**



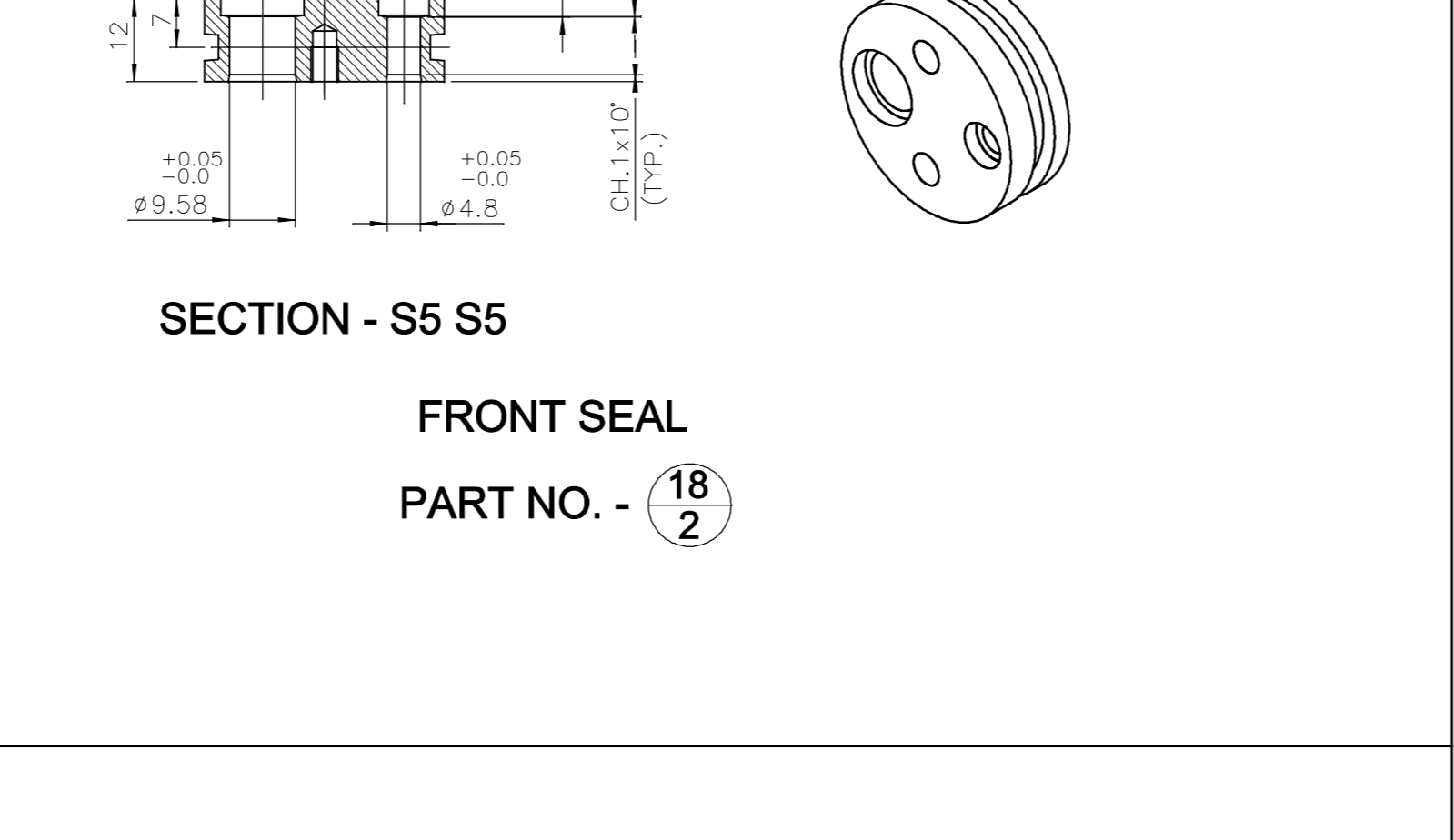
**SECTION - S2-S2**



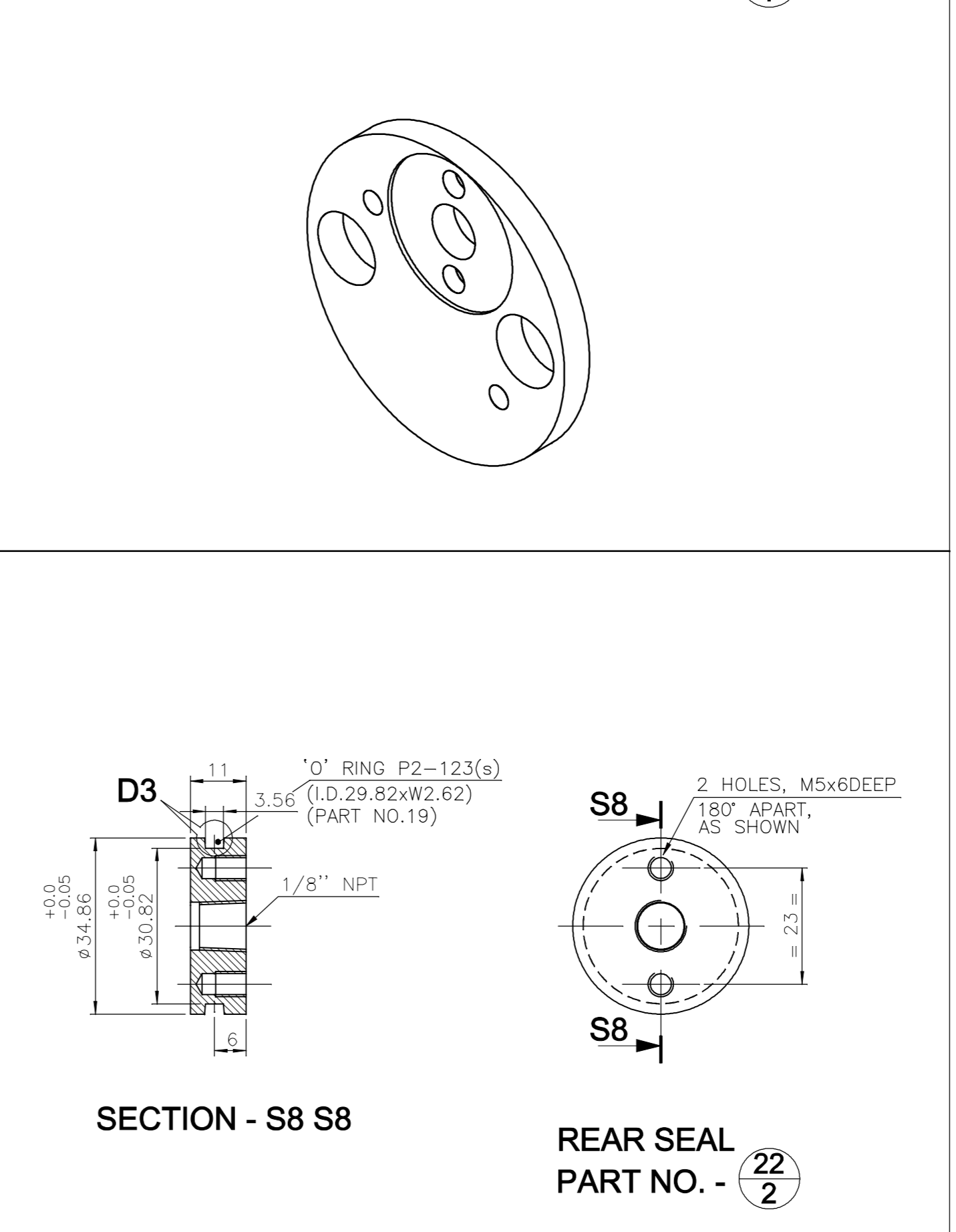
**SECTION - S4-S4**



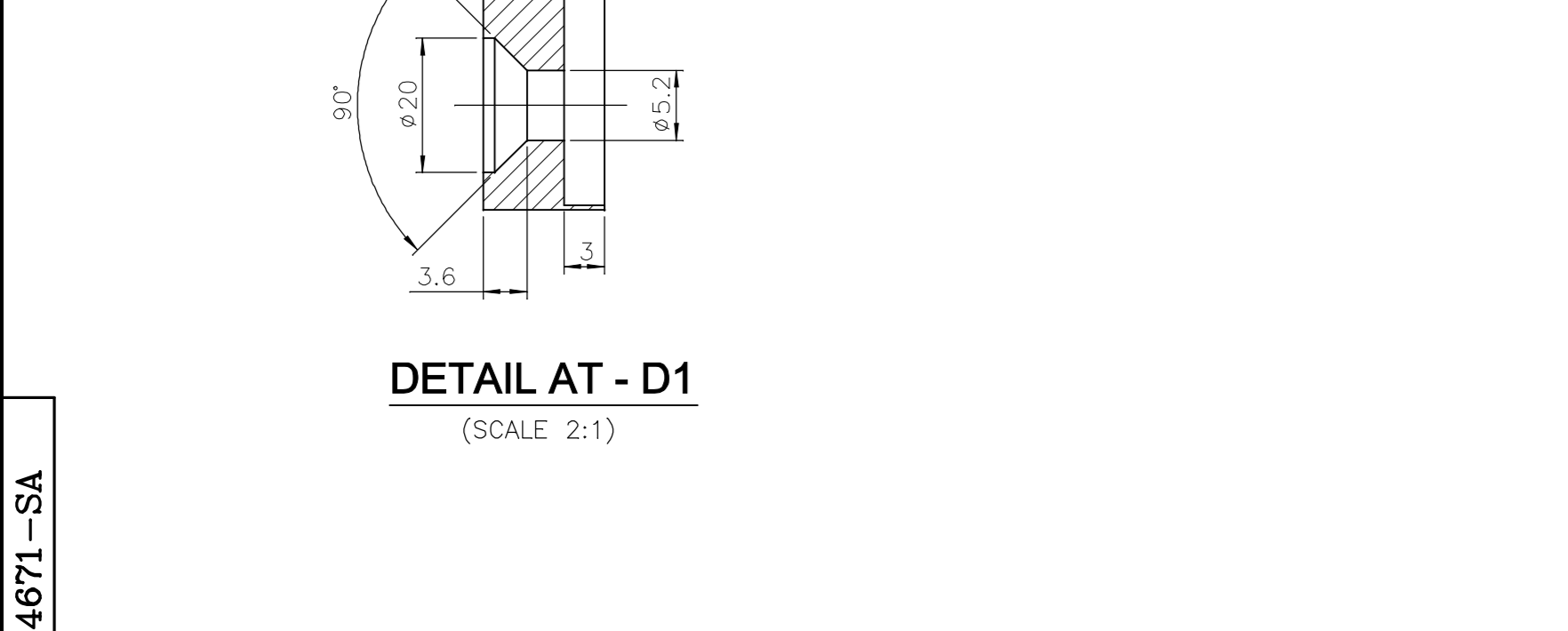
**SECTION - S3-S3**  
**FRONT COVER**  
**PART NO. - 18/1**



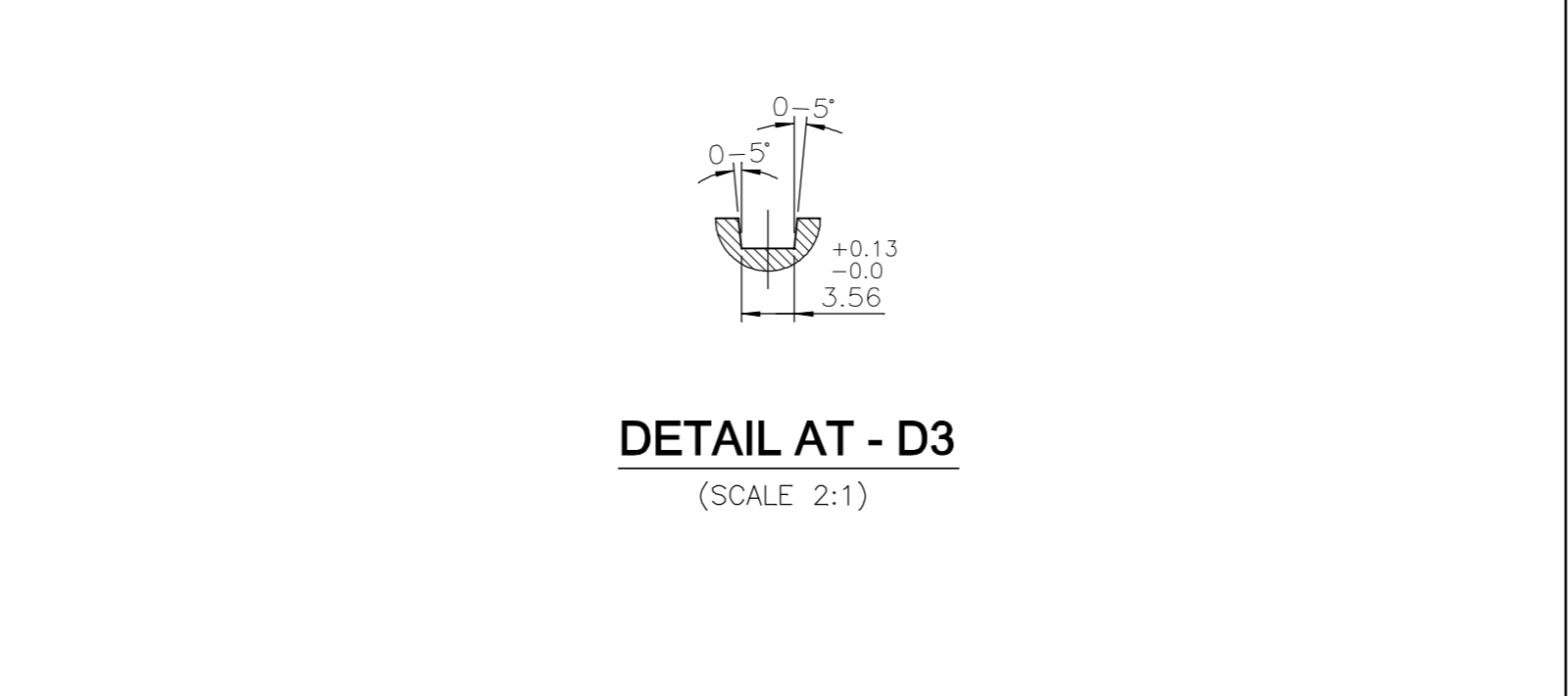
**SECTION - S5-S5**  
**FRONT SEAL**  
**PART NO. - 18/2**



**SECTION - S8-S8**  
**REAR SEAL**  
**PART NO. - 22/2**



**DETAIL AT - D1**  
**(SCALE 2:1)**



**DETAIL AT - D3**  
**(SCALE 2:1)**

BILL OF MATERIAL					
PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO.	REMARKS
18	FRONT COVER	ASTM A276 TYPE 304	01		
18	FRONT SEAL	ASTM A276 TYPE 304	01		
18/3	COUNTERSUNK HD. SCREW M5 X 12 LG.	ASTM A276 TYPE 304	02		
22	REAR COVER	ASTM A276 TYPE 304	01		
22	REAR SEAL	ASTM A276 TYPE 304	01		
22	COUNTERSUNK HD. SCREW M5 X 12 LG.	ASTM A276 TYPE 304	02		

**NOTES :-**  
1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG.NO. AI-3113-M-4671-SA

GROUP	COMMENTS	SIGN.	DATE	REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE	NO.	LOC.	DESCRIPTION	DES'D.	CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE	NO.	LOC.	DESCRIPTION

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)			
DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3-6	± 0.1	315-1000	± 0.8
6-30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0
RADI AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED.  
REMOVE ALL BURRS.  
ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
**BHABHA ATOMIC RESEARCH CENTRE**

TITLE: PHWR  
**REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II**  
**FRONT & REAR CAP SUB ASSEMBLY (PART NO.- 18 & 22)**

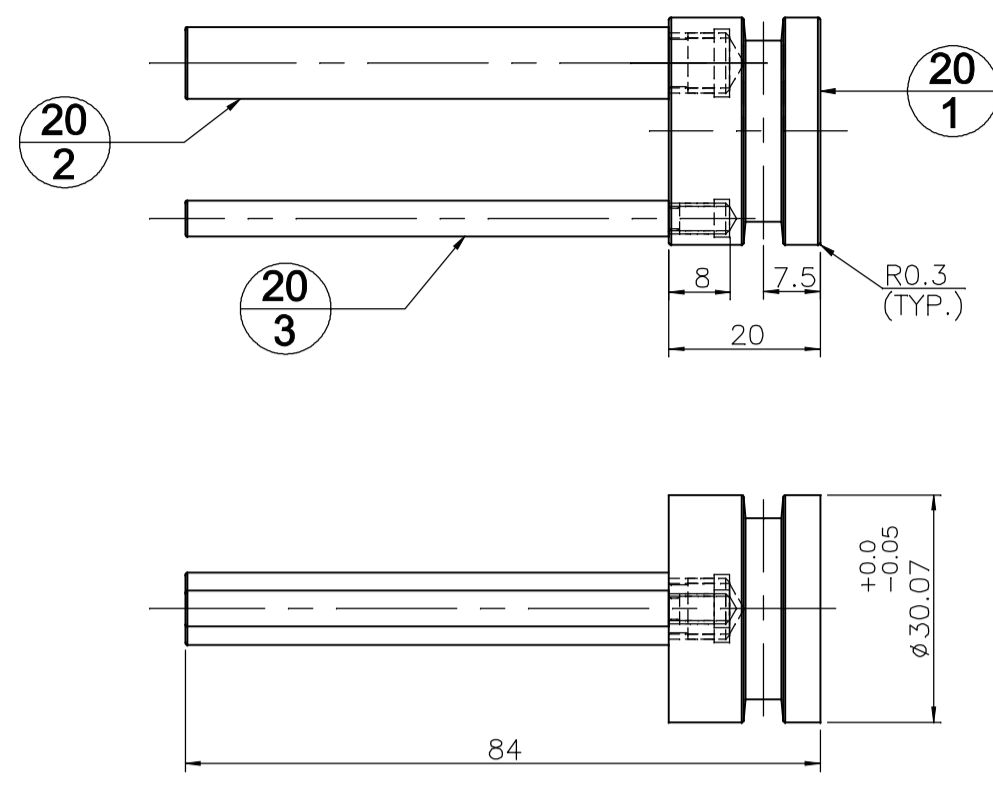
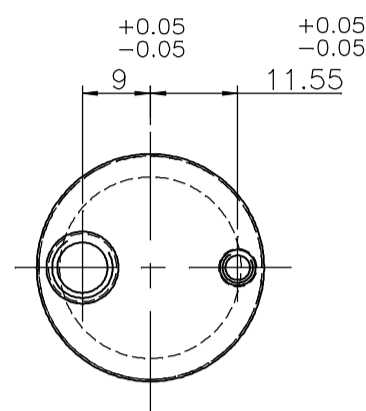
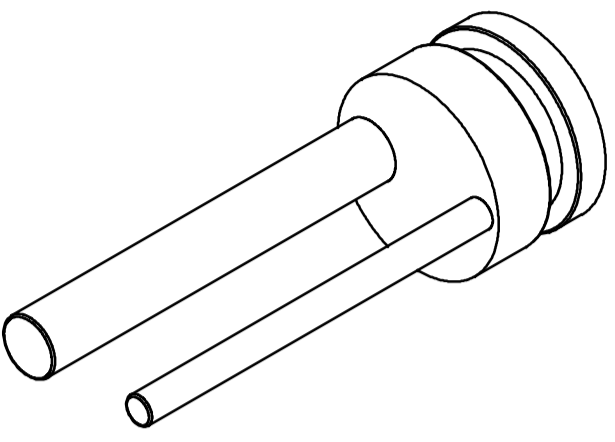
SCALE: 1:1

PROJECTION:

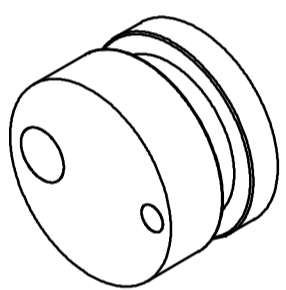
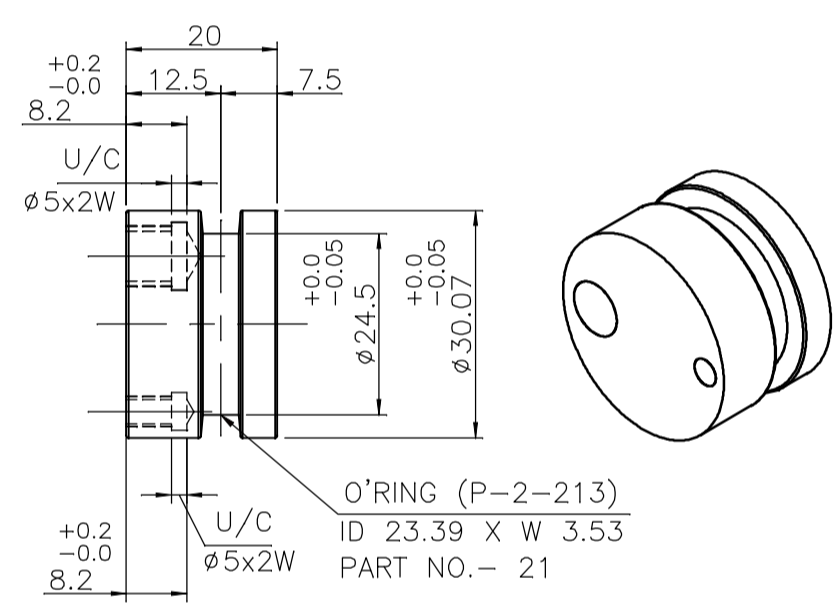
DRG.NO. AI-3113-M-4671-SA

SHEET: 01 OF 01  
REV. NO.: 0

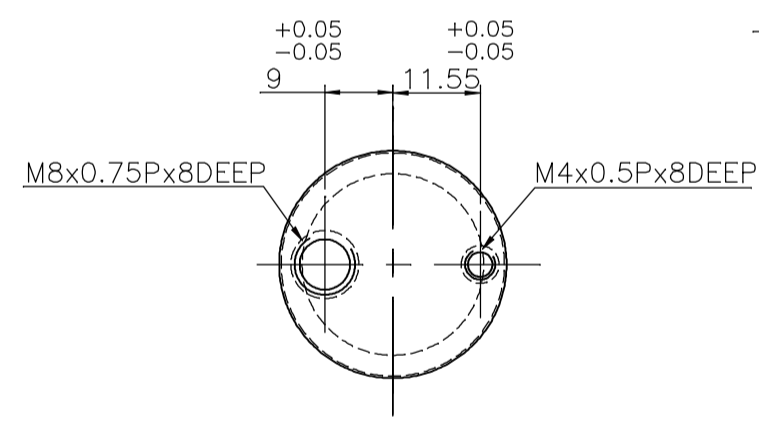
1 2 3 4 5 6 7 8 9 10 11 12



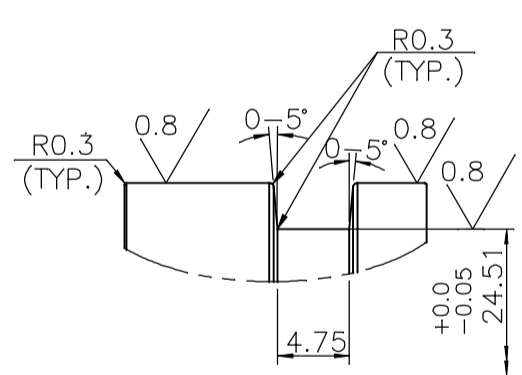
**PISTON - 1 SUB ASSEMBLY  
PART NO. - 20**



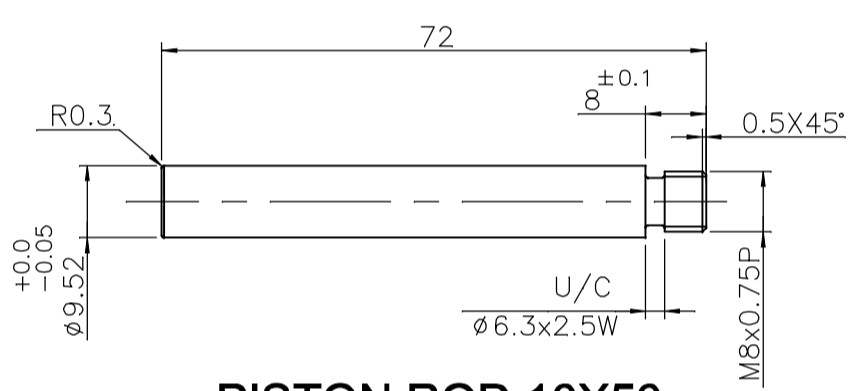
O'RING (P-2-213)  
ID 23.39 X W 3.53  
PART NO.- 21



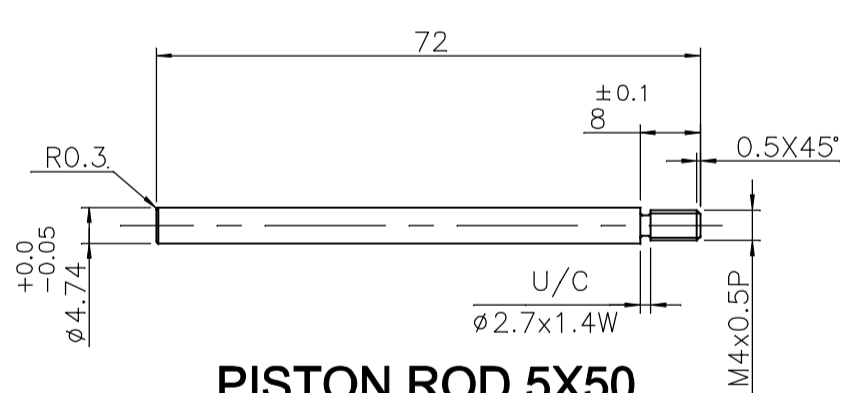
**PISTON HEAD  
PART NO. - 20**



**DETAIL - D1  
(SCALE 2:1)**



**PISTON ROD 10X50  
PART NO. - 20**



**PISTON ROD 5X50  
PART NO. - 20**

**BILL OF MATERIAL**

PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO.	REMARKS
20/1	PISTON HEAD	ASTM A276 SS 304	01		
20/2	PISTON ROD 10X50	ASTM A276 SS 304	01		
20/3	PISTON ROD 5X50	ASTM A276 SS 304	01		

**NOTES :-**

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG.NO. A2-3113-M-4672-SA

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NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
TOLERANCES ON LINEAR DIMENSIONS (IS 2102)									
DIMENSIONS		TOL.	DIMENSIONS		TOL.				
UP TO 3		± 0.1	120-315		± 0.5				
3 - 6		± 0.1	315-1000		± 0.8				
6 - 30		± 0.2	1000-2000		± 1.2				
30-120		± 0.3	2000-4000		± 2.0				
RADI AND CHAMFERS		0.5-3	3-6		6-30				
TOLERANCE		+/-0.2	+/-0.5		+/-1.0				
SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.									
REFERENCE DRAWINGS: PHWR ASSEMBLY, REPLICA TOOL FOR #103 PRESSURE TUBE-MARK II ASSEMBLY, A1-3113-M-4662-GA									

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

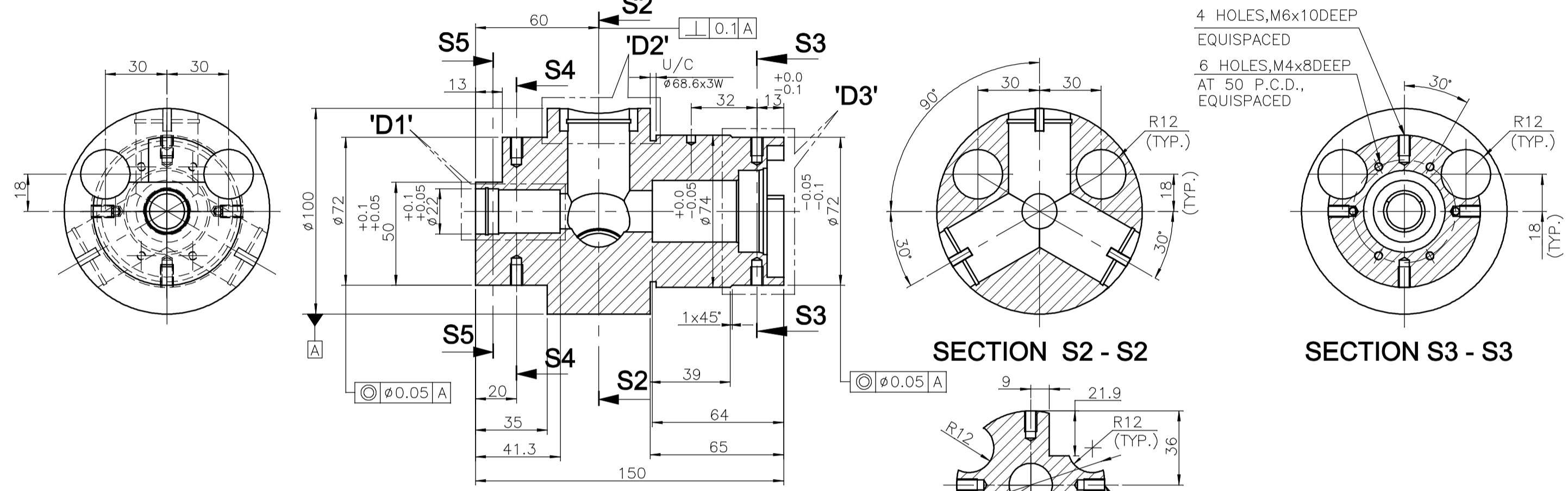
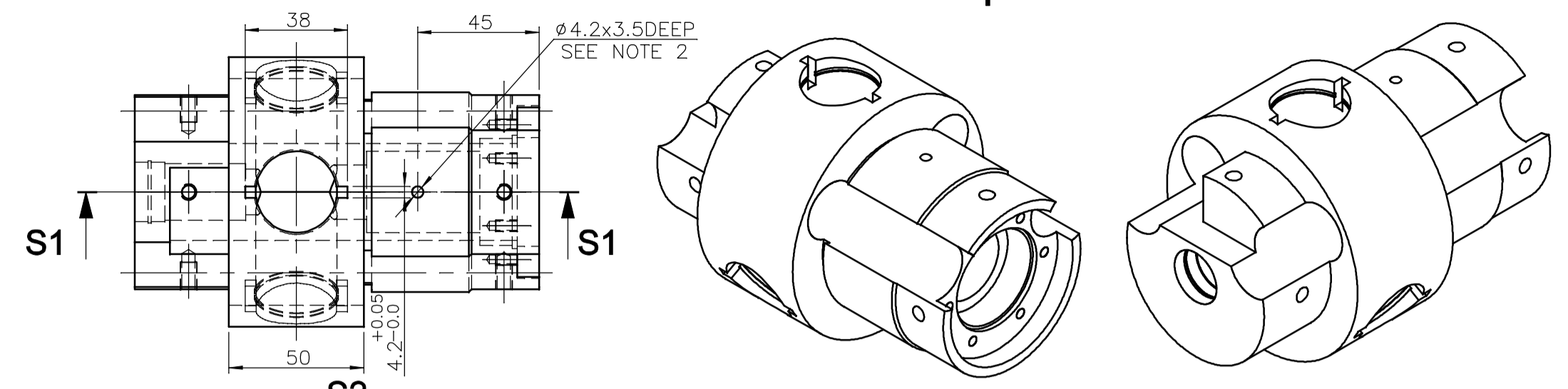
TITLE: PHWR  
REPLICA TOOL FOR #103 PRESSURE TUBE-MARK II  
**PISTON - 1 SUB ASSEMBLY (PART NO.- 20)**

SCALE-- 1:1 PROJECTION DRG.NO. A2-3113-M-4672-SA SHEET 10F1 REV. NO. 0

1 2 3 4 5 6 7 8 9 10 11 12

BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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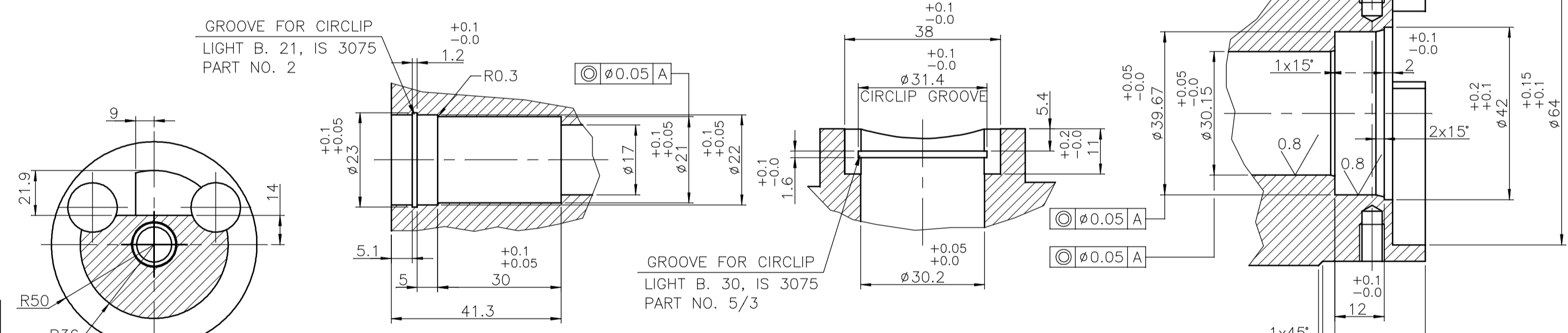


**SECTION S1 - S1  
REAR CYLINDER  
PART NO.- 23**  
MATERIAL - ASTM A276 TYPE 410

**SECTION S2 - S2**

**SECTION S3 - S3**

**SECTION S4 - S4**



**SECTION S5 - S5**

**DETAIL - D1  
SCALE : 1:1**

**DETAIL - D2  
SCALE : 1:1**

**DETAIL - D3  
SCALE : 1:1**

**NOTES :-**

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
- TO BE MADE AFTER ASSEMBLY WITH PART NO.26 (REAR SIDE BEARING). (A2-3113-M-4680-DD)

DRG.NO. A2-3113-M-4673-DD

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DES.N. CHK'D.	DRN.& CHK'D.	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR PRESSURE TUBE-MARK II ASSEMBLY	A1-3113-M-4662-GA										
REVISIONS											

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0
RADI AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

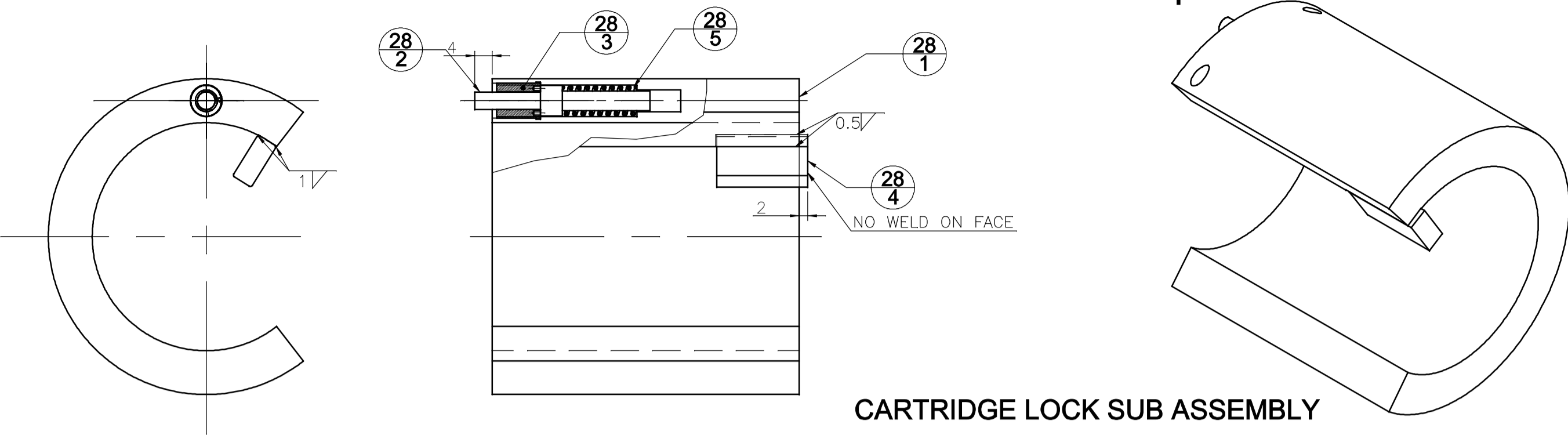
TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
REAR CYLINDER (PART NO.- 23)

DRG.NO. A2-3113-M-4673-DD

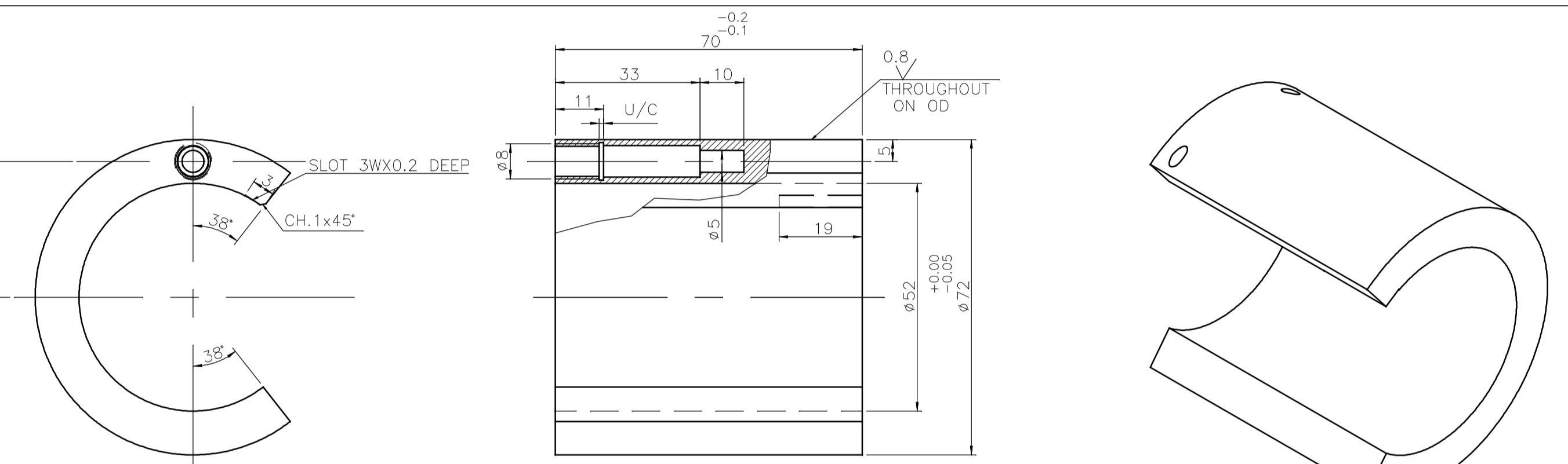
SCALE-- 1:2	PROJECTION
SHEET 10F1	REV. NO. 0



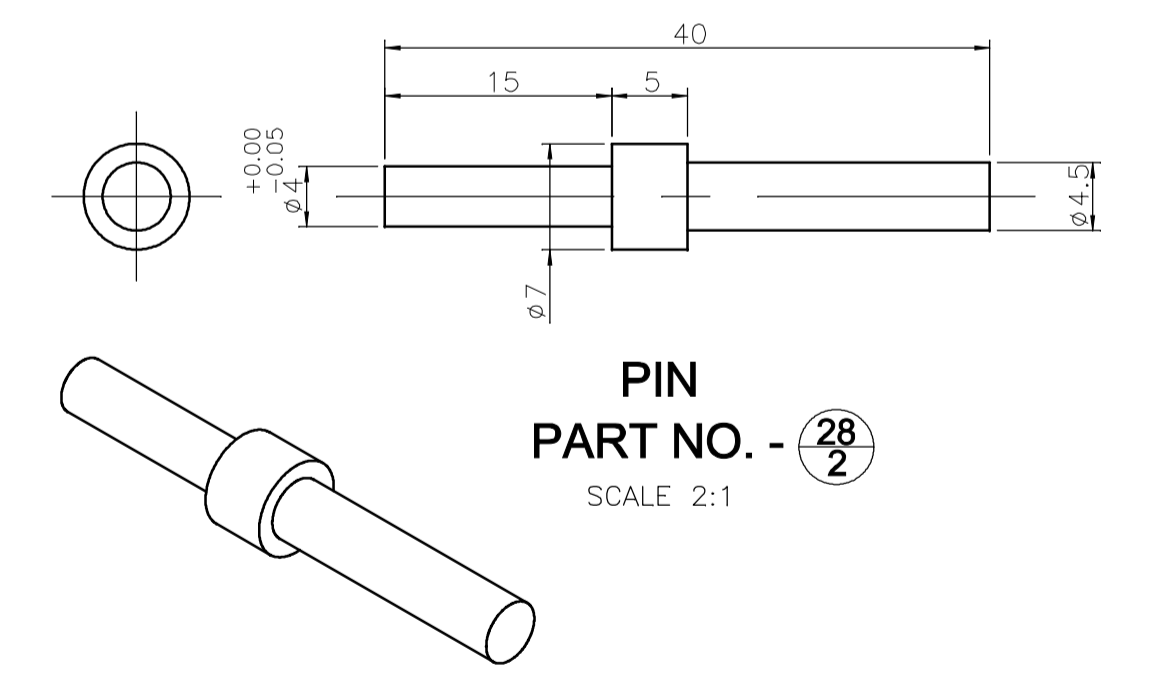




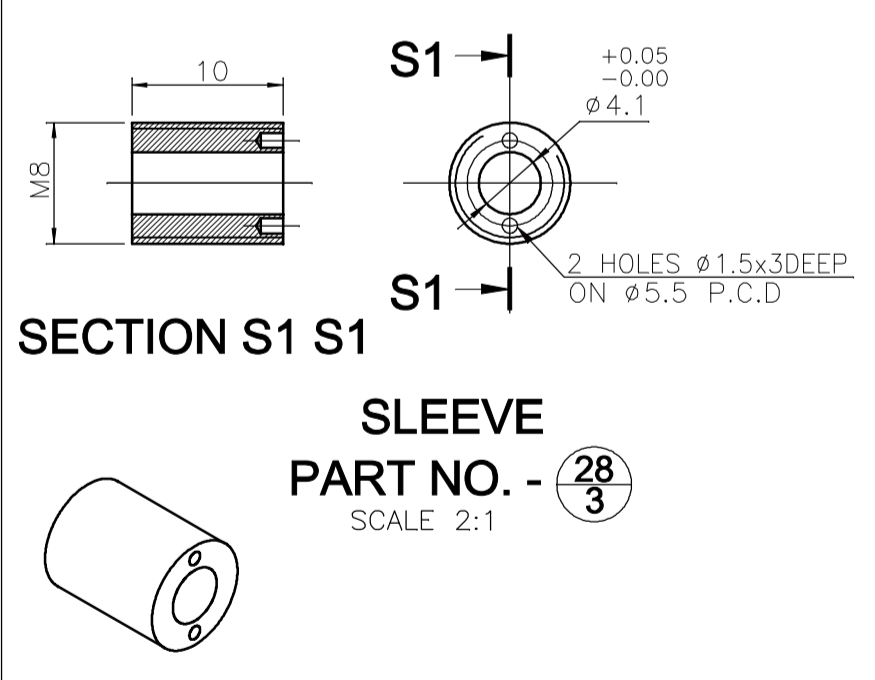
**CARTRIDGE LOCK SUB ASSEMBLY  
PART NO. - 28**



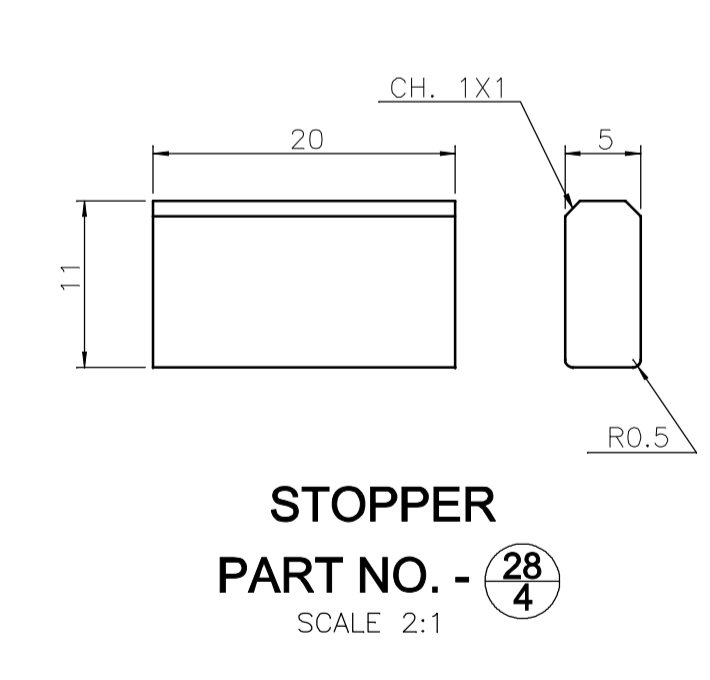
**CARTRIDGE LOCK  
PART NO. - 28/1**



**PIN  
PART NO. - 28/2  
SCALE 2:1**



**SECTION S1 S1  
SLEEVE  
PART NO. - 28/3  
SCALE 2:1**



**STOPPER  
PART NO. - 28/4  
SCALE 2:1**

**BILL OF MATERIAL**

PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO.	REMARKS
28/1	CARTRIDGE LOCK	ASTM A276 TYPE 304	01		
28/2	PIN	ASTM A276 TYPE 304	01		
28/3	SLEEVE	ASTM A276 TYPE 304	01		
28/4	STOPPER	ASTM A276 TYPE 304	01		
28/5	HELICAL COMPRESSION SPRING	ASTM A313 TYPE 302	01		SEE NOTE 2

**NOTES :-**

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
- SPRING SPECIFICATION

**PART No. 28/5**

DESCRIPTION	
COIL OD.	6.8 mm
WIRE DIA.	1 mm
TOTAL No. OF TURNS	10
STIFFNESS	0.5 Kg/mm
FREE LENGTH	20 mm
END	SQUARED & GROUND
MATERIAL	ASTM A313 TYPE 302

DRG.NO. A2-3113-M-4676-SA

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN & DATE	DRG. CHK'D.	DATE	APP'D.	DATE
REPLICA TOOL FOR PHWR PRESSURE TUBE-MARK II ASSEMBLY	A1-3113-M-4662-GA										
REVISIONS											

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0

RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

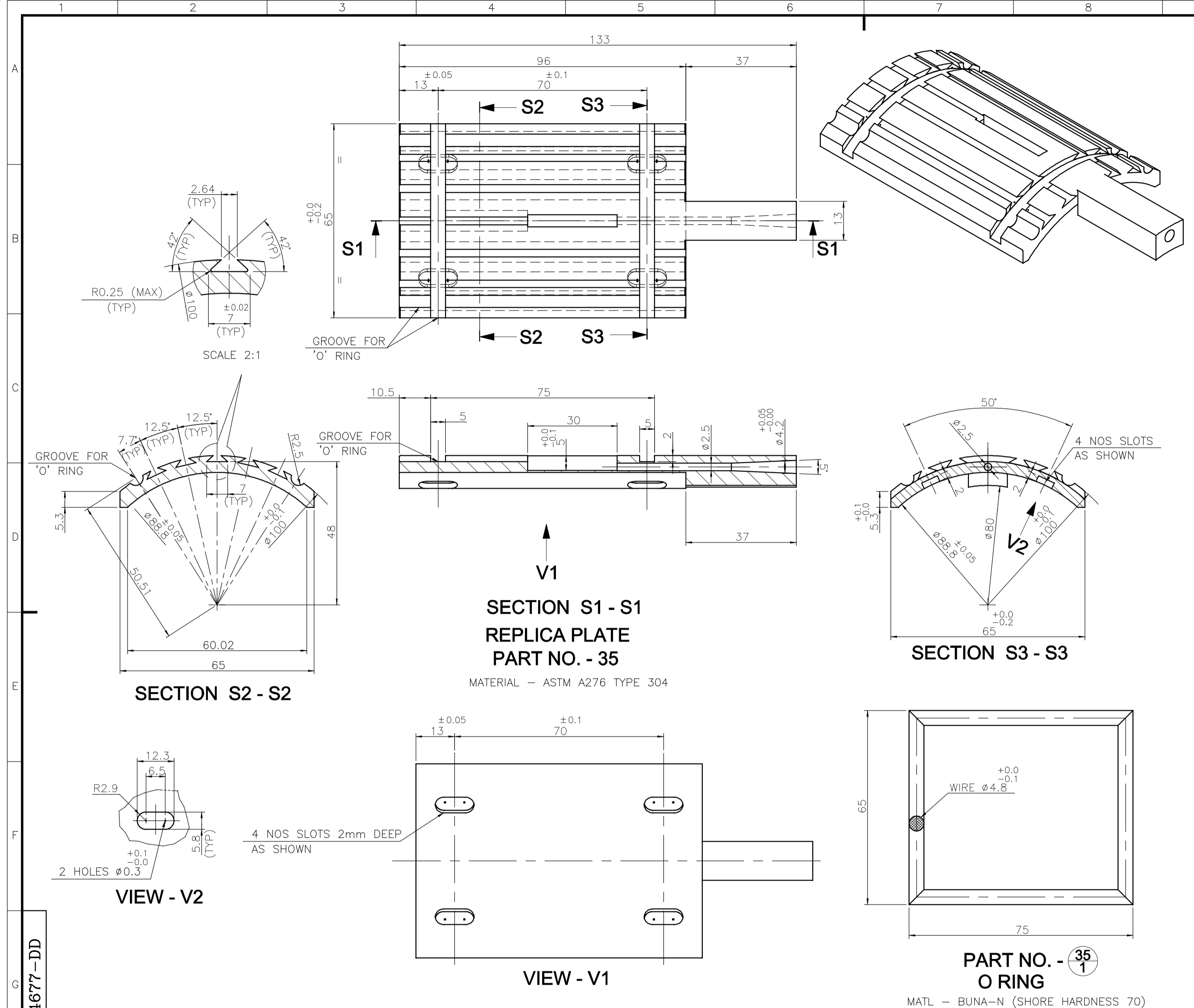
GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
**CARTRIDGE LOCK SUB ASSEMBLY (PART NO. - 28)**

SCALE-- 1:1 PROJECTION

DRG.NO. A2-3113-M-4676-SA

SHEET 10F1	REV. NO. 0
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BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY. NO.	REF. DRG. NO.	REMARKS
35	O RING	BUNA-N	01	A2-3113-M-4511-GA	SHORE HARDNESS 70

**NOTES :-**

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG. NO. A2-3113-M-4677-DD

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN & DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR ASSEMBLY	A1-3113-M-4662-GA										

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0

RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
**REPLICA PLATE (PART NO. - 35)**

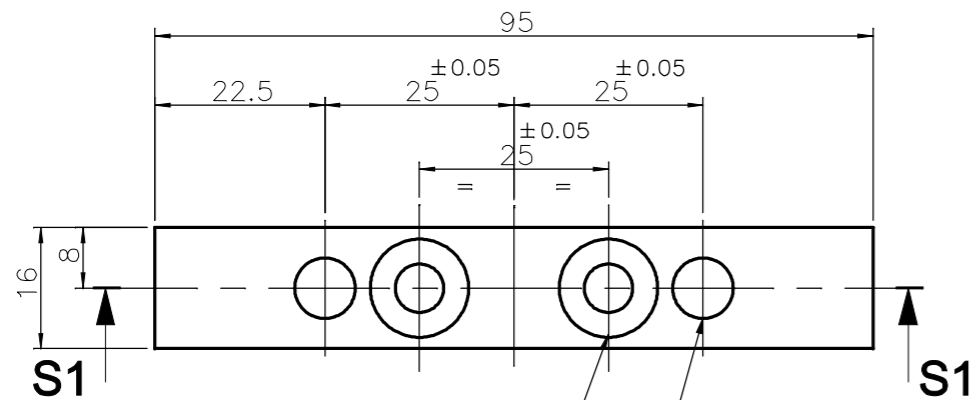
SCALE-- 1:1      PROJECTION

**DRG. NO. A2-3113-M-4677-DD**

SHEET	REV. NO.
10F1	0

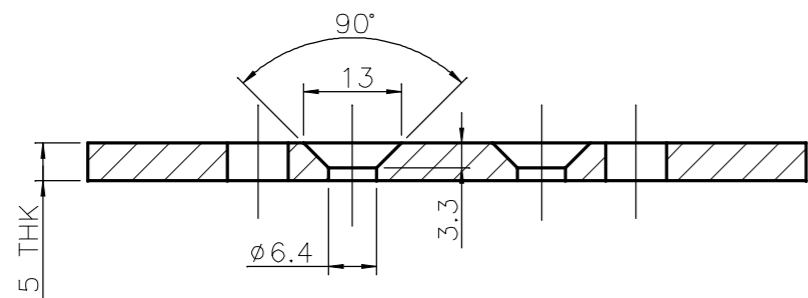


THIS DESIGN AND DRAWING IS THE PROPERTY OF THE BHABHA ATOMIC RESEARCH CENTRE AND MUST BE RETURNED WITH QUOTATION OR UPON DELIVERY OF MATERIAL AND EQUIPMENT AND MUST NOT BE USED EXCEPT BY PERMISSION OF THE OWNER.



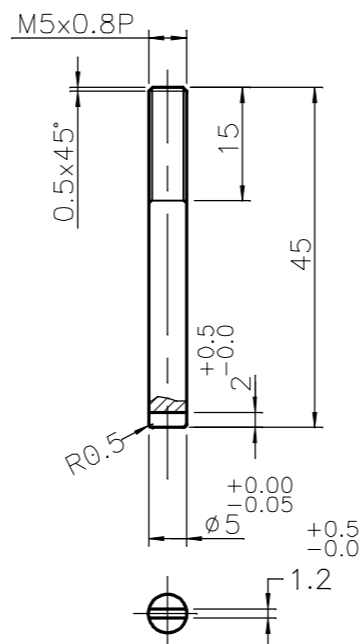
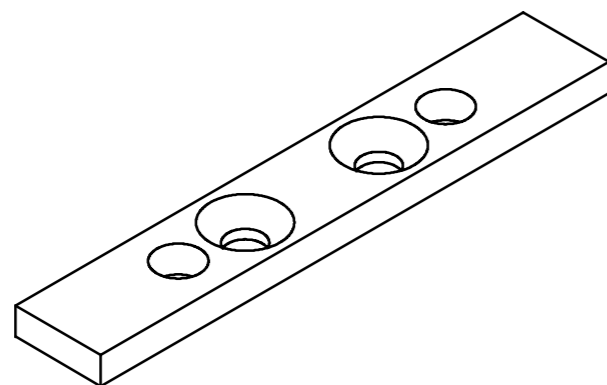
2 C'SK. HOLES FOR M6 COUNTERSUNK SCREW

2 HOLES Ø8



**SECTION S1 - S1  
SPACER PLATE  
PART NO. - 36**

TO BE JOINT WITH PART NO.-8  
MATERIAL - ASTM A276 TYPE 304



**GUIDE ROD  
PART NO. - 37**

TO BE CONNECTED PART NO.-13  
MATERIAL - ASTM A276 TYPE 304

**NOTES :-**

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
SPACER PLATE & GUIDE ROD(PART NO. - 36 & 37)

SCALE- 1:1

PROJECTION

DRG.NO. A3-3113-M-4678-DD

SHEET	REV. NO.
10F1	0

REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR ASSEMBLY REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II	A1-3113-M-4662-GA										

UNLESS OTHERWISE SPECIFIED ELSE WHERE ON THIS DRAWING. TOLERANCES ON LINEAR DIMENSIONS (IS 2102)				RADI AND CHAMFERS TOLERANCE			SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.
DIMENSIONS	TOL.	DIMENSIONS	TOL.	0.5-3	3-6	6-30	
UP TO 3	± 0.1	120-315	± 0.5	± 0.2	± 0.5	± 1.0	
3 - 6	± 0.1	315-1000	± 0.8				
6 -30	± 0.2	1000-2000	± 1.2				
30-120	± 0.3	2000-4000	± 2.0				

1 2 3 4 5 6 7 8

A

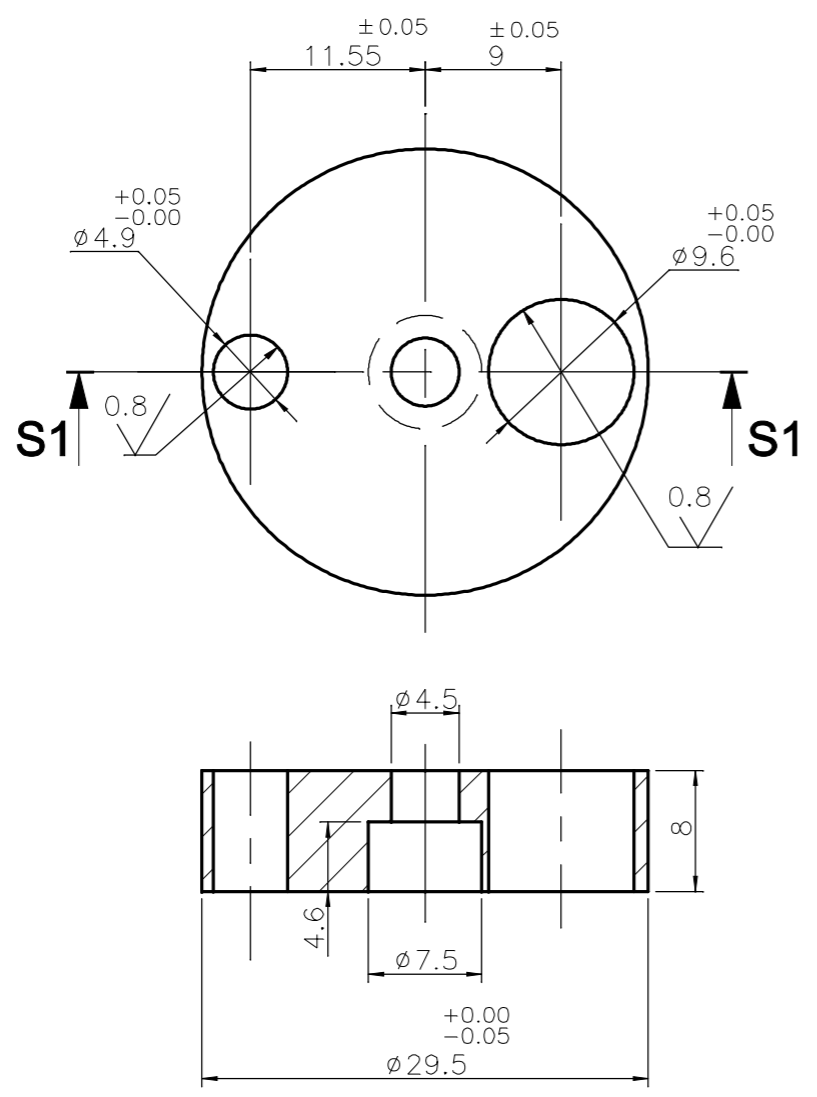
B

C

D

F

F



**SECTION - S1 S1**

**SPACER  
PART NO. - 40**

MATERIAL - ASTM A276 TYPE 304

**NOTES :-**

- 1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
REPLICA TOOL FOR  $\phi 103$  PRESSURE TUBE-MARK II  
**SPACER (PART NO. 40)**

SCALE- 2:1 PROJECTION SHEET 10F1 REV. NO. 0

**DRG.NO. A3-3113-M-4679-DD**

THIS DESIGN AND DRAWING IS THE PROPERTY OF THE BHABHA ATOMIC RESEARCH CENTRE AND MUST BE RETURNED WITH QUOTATION OR UPON DELIVERY OF MATERIAL AND EQUIPMENT AND MUST NOT BE USED EXCEPT BY PERMISSION OF THE OWNER.

REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
	A1-3113-M-4662-GA										

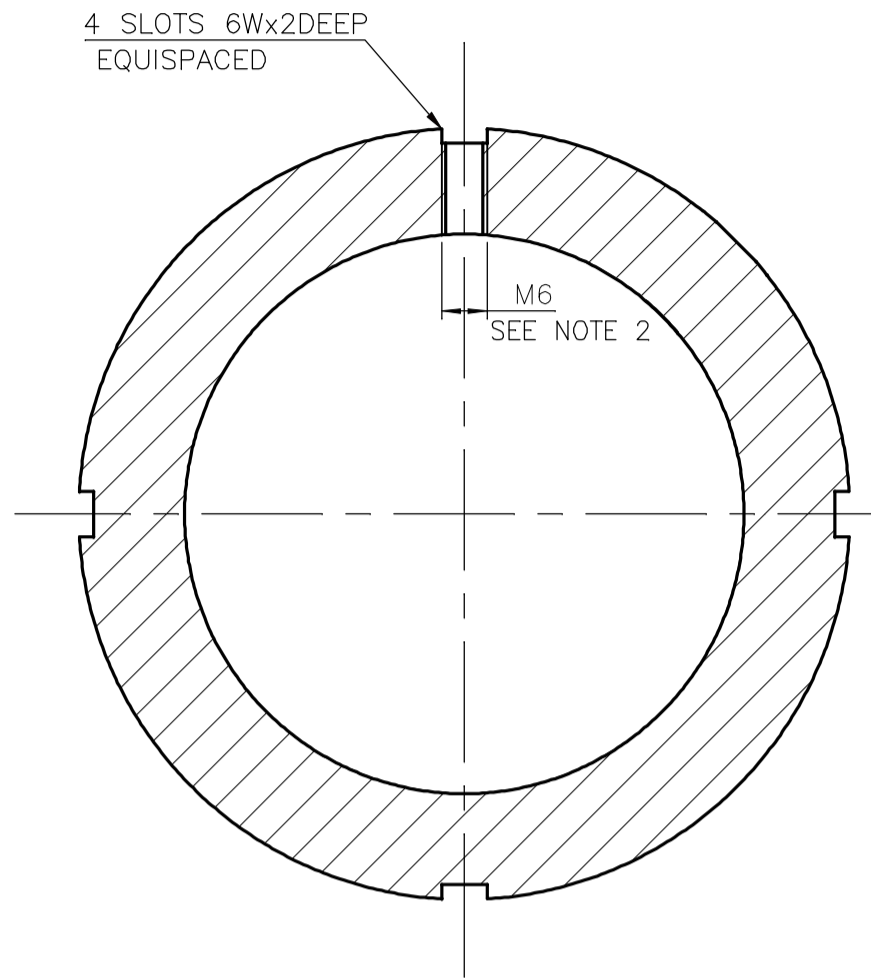
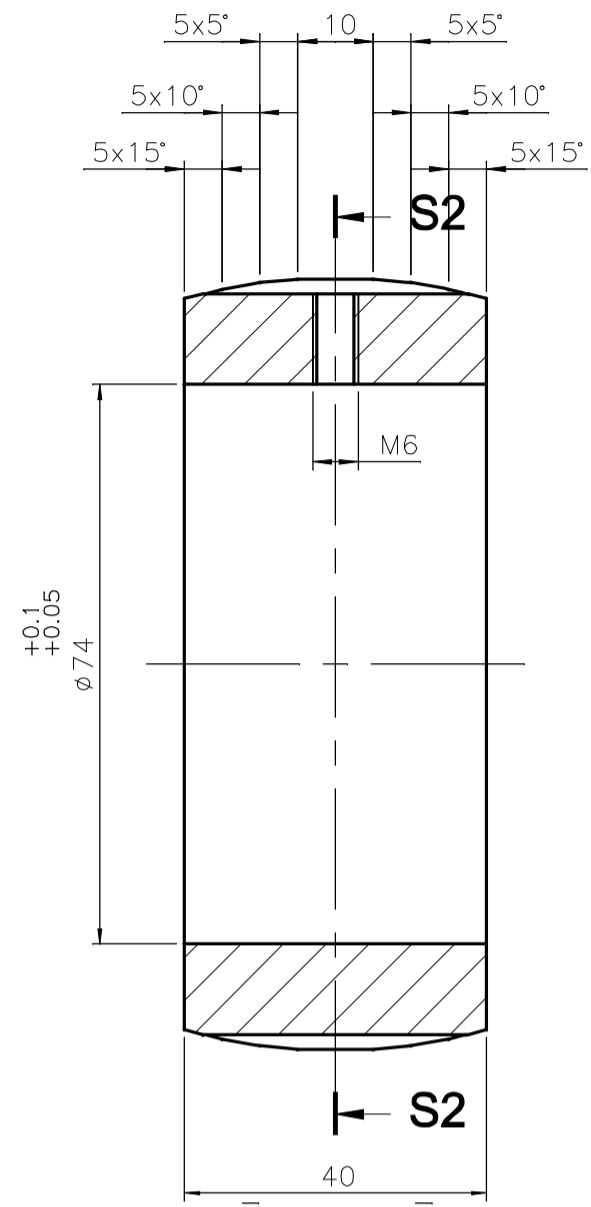
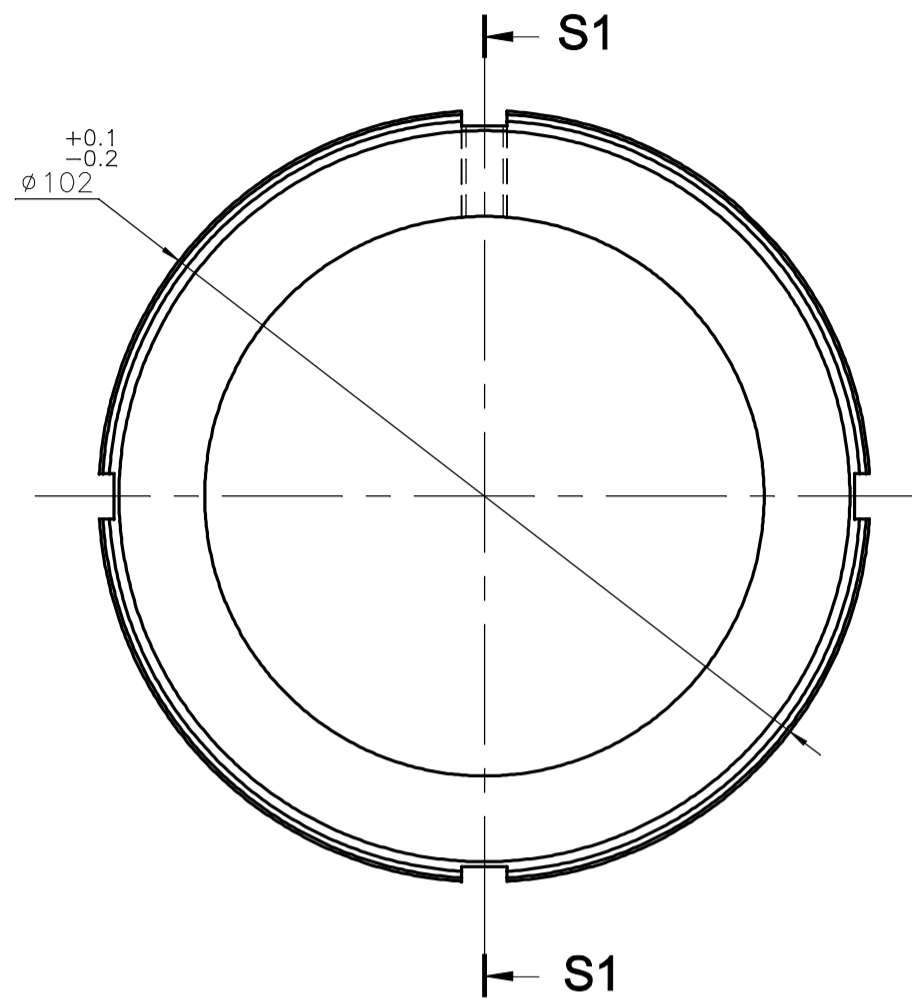
UNLESS OTHERWISE SPECIFIED ELSE WHERE ON THIS DRAWING.  
TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 -30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0

RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	± 0.2	± 0.5	± 1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED.  
REMOVE ALL BURRS.  
ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

1 2 3 4 5 6 7 8

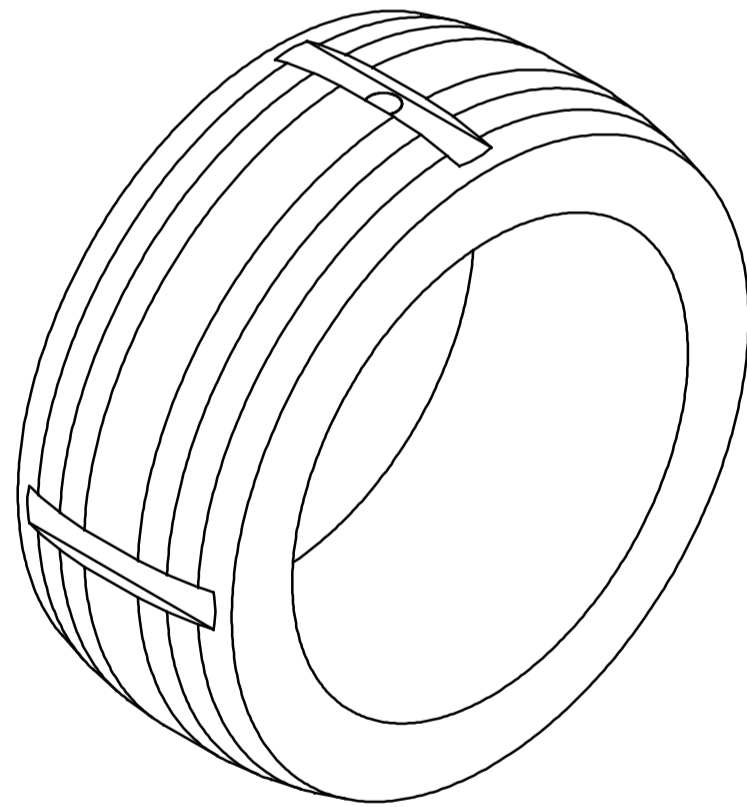


SECTION S1 - S1

SECTION S2 - S2

**REAR SIDE BEARING  
PART NO. - 26**

(MATERIAL - AL. BRONZE (BS 1400 Gr. AB2))



BILL OF MATERIAL

PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS
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**NOTES :-**

- ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.
- TO BE MADE AFTER ASSEMBLY WITH PART NO.23 (REAR CYLINDER).  
(A2-3113-M-4673-DD)

DRG.NO. A2-3113-M-4680-DD

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PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II ASSEMBLY

A1-3113-M-4662-GA

REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DES.N. CHK'D.	DRN.& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
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TOLERANCES ON LINEAR DIMENSIONS (IS 2102)

DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	± 0.1	120-315	± 0.5
3 - 6	± 0.1	315-1000	± 0.8
6 - 30	± 0.2	1000-2000	± 1.2
30-120	± 0.3	2000-4000	± 2.0
RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

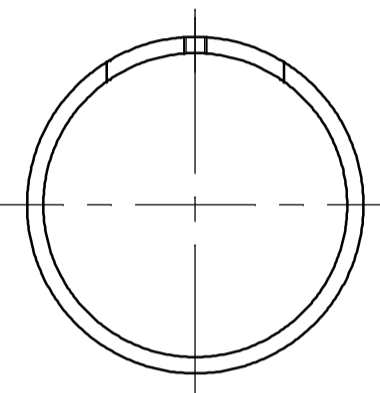
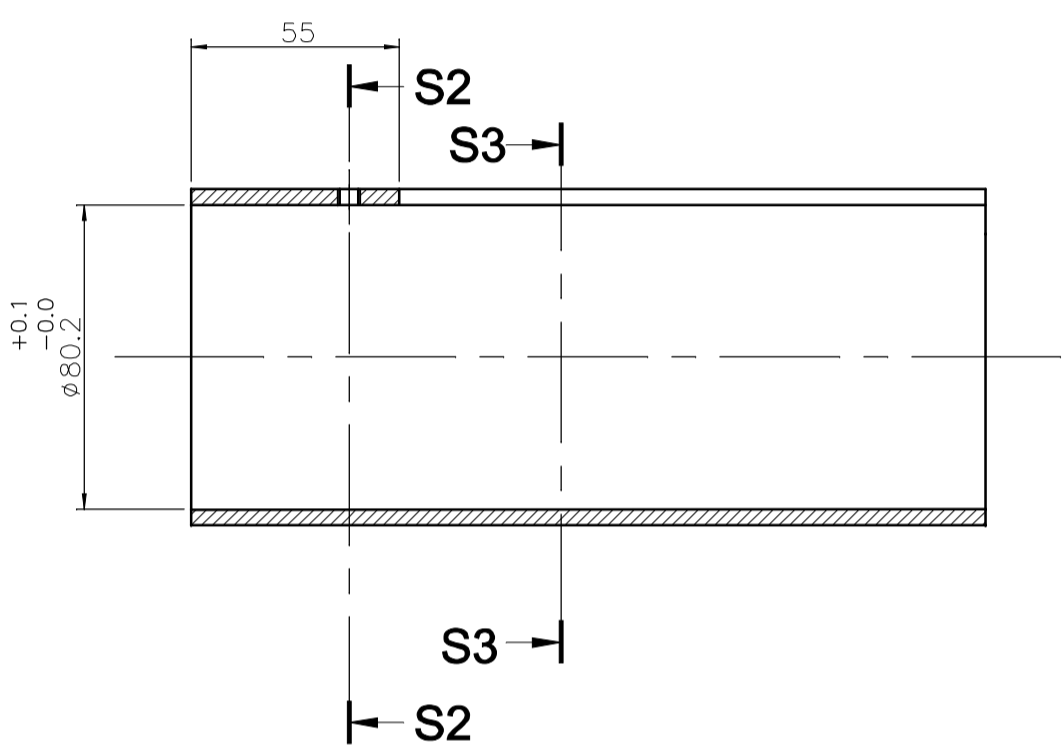
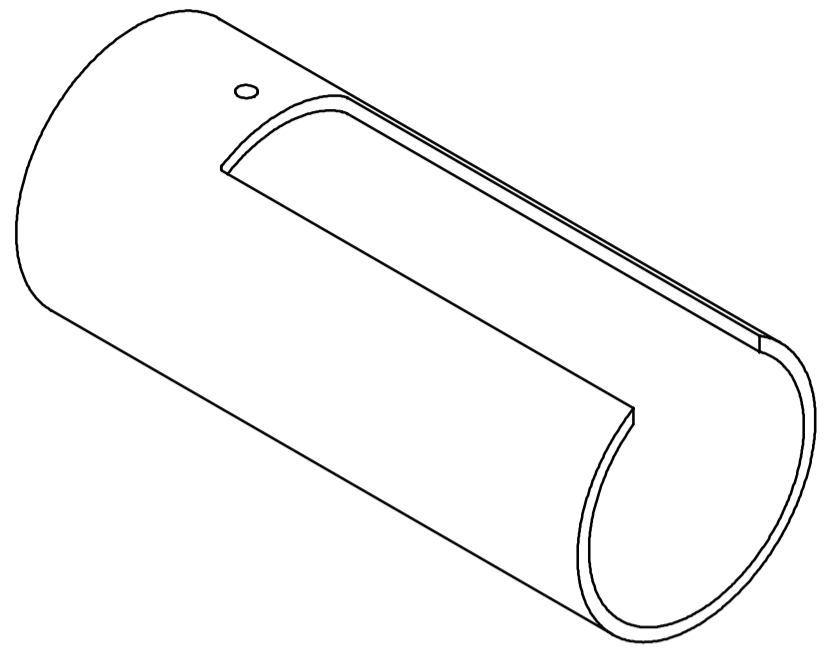
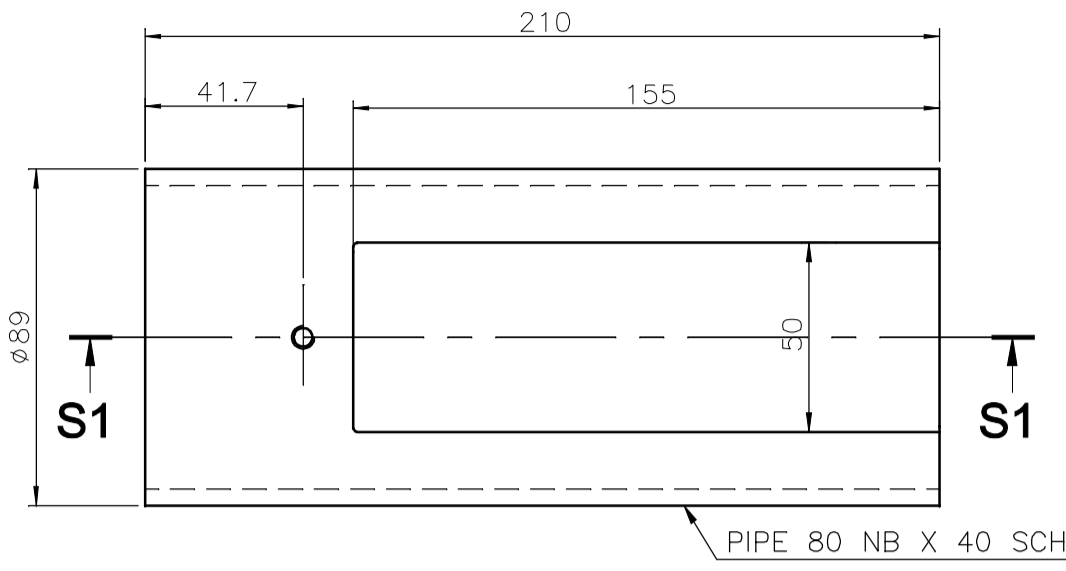
GOVERNMENT OF INDIA  
BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
REPLICA TOOL FOR Ø103 PRESSURE TUBE-MARK II  
**REAR SIDE BEARING (PART NO. - 26)**

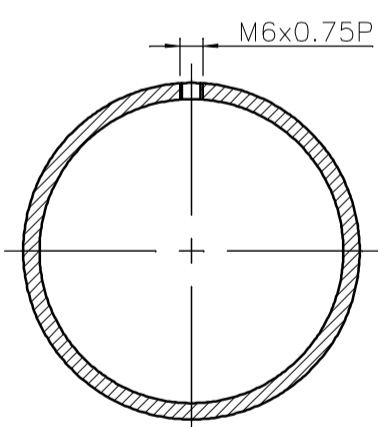
SCALE-- 1:1 PROJECTION

DRG.NO. A2-3113-M-4680-DD

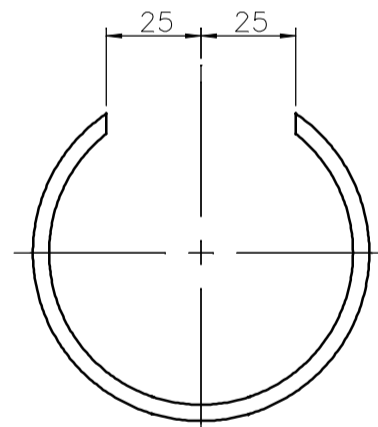
SHEET 10F1 REV. NO. 0



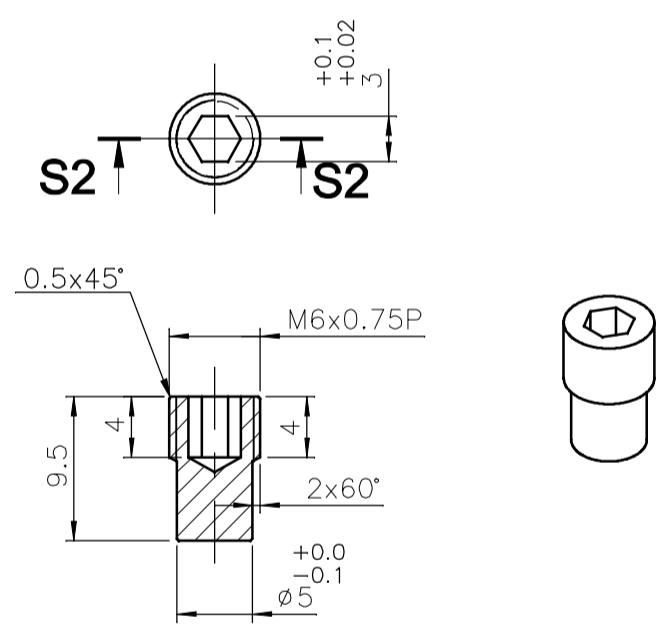
**SECTION S1 - S1**  
**PEOTECTIVE SLEEVE**  
**PART NO. - 34**  
 MATERIAL - ASTM A312 TYPE 304



**SECTION S2 S2**



**SECTION S3 S3**



**SECTION S2 S2**  
**GRUB SCREW**  
**PART NO. - 41**  
 SCALE 2:1

BILL OF MATERIAL					
PART NO.	DESCRIPTION	MATERIAL	QTY.	REF. DRG. NO.	REMARKS

**NOTES :-**

1. ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE SPECIFIED.

DRG.NO. A2-3113-M-4681-DD

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REFERENCE DRAWINGS	DRAWING NO.	NO.	LOC.	DESCRIPTION	DES'D.	DESN. CHK'D.	DRN& DATE	DRG. CHK'D.	DATE	APP'D.	DATE
PHWR ASSEMBLY REPLICA TOOL FOR <math>\phi 103</math> PRESSURE TUBE-MARK II	A1-3113-M-4662-GA	1									

TOLERANCES ON LINEAR DIMENSIONS (IS 2102)			
DIMENSIONS	TOL.	DIMENSIONS	TOL.
UP TO 3	$\pm 0.1$	120-315	$\pm 0.5$
3 - 6	$\pm 0.1$	315-1000	$\pm 0.8$
6 - 30	$\pm 0.2$	1000-2000	$\pm 1.2$
30-120	$\pm 0.3$	2000-4000	$\pm 2.0$
RADII AND CHAMFERS	0.5-3	3-6	6-30
TOLERANCE	+/-0.2	+/-0.5	+/-1.0

SURFACE FINISH TO BE 3.2 MICRONS OR BETTER UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS. ROUND SHARP CORNERS & EDGES TO R=0.3 MAX.

GOVERNMENT OF INDIA  
 BHABHA ATOMIC RESEARCH CENTRE

TITLE PHWR  
 REPLICA TOOL FOR <math>\phi 103</math> PRESSURE TUBE-MARK II  
**PEOTECTIVE SLEEVE & GRUB SCREW (PART NO. 34 & 41)**

DRG.NO. A2-3113-M-4681-DD

SCALE-- 1:2	PROJECTION
SHEET 10F1	REV. NO. 1