**E-5**

**Electrical**

# PROCUREMENT OF GOODS

# UNDER

# NATIONAL SHOPPING

# PROCEDURES

**COEP/TEQIP-II/CoE-SRES/March2016/NS/21**

**For**

**Special Purpose Transverse Flux Machine**

**Bid Price: Nil/-**

**PACKET NO :COEP/TEQIP-II/ CoE-SRES/ March2016 /NS /21**

**INVITATION FOR QUOTATIONS FOR SUPPLY OF**

## Special Purpose Transverse Flux Machine

1. You are invited to submit your most competitive quotation for the following goods: -

| Sr. No | Title /Name of the equipment /System | Brief description [Attach separate annexure if necessary for detailed specifications | Quantity |
|---|---|---|---|
| **1** | **Special Purpose Transverse Flux Machine** | **Please refer to the Annexure A** | **one** |

The schedule is as follows

| | |
|---|---|
| Date of inviting the quotations | 23/03/2016 |
| Last date of submitting the sealed quotation to TEQIP office, COEP | 04/04/2016 [upto 3:00 pm] |
| Opening of the quotations | 04/04/2016 [4:00 pm] |
| Validity of quotation | Min 45 days |
| **Delivery Period** | **4 months from the acceptance of PO** |

2. College of Engineering has received the grants for establishing Center of Excellence in Smart Renewable Energy System under MHRD's Technical Education Quality Improvement Program-Phase II. The said procurement is for this center. This project is World Bank sponsored project. This procurement is being carried out using the National Shopping Process, and will observe the guidelines of Shopping under TEQIP-II.

3. **Bid Price**

a) The contract shall be for the full quantity as described above and in the annexure. Corrections, if any, shall be made by crossing out, initialing, dating and re-writing.

b) All duties, taxes and other levies payable by the contractor under the contract shall be included in the total price. However, break- up of the basic price and taxes/duties shall be indicated clearly.

c) The bidders will be evaluated on the basic price.

d) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

e) The Prices should be quoted **in Indian Rupees** only.

4. Each bidder shall submit only one quotation.

5. **Validity ofQuotation**

Quotation shall remain valid for a period not less than 45 days after the deadline date specified for submission.

6. **Evaluation of Quotations**

The purchaser shall evaluate and compare the quotations determined to be substantially responsive i.e. which

(a) are properly signed ; and

(b) conform to the terms and conditions, and specifications.

**The Quotations would be evaluated considering all items together in this packet.**

7. **Award of contract**

The Purchaser shallaward the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

7.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.

7.2 The bidder whose bid is accepted shall be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.

8. 80 % Payment shall be made immediately after delivery of the goods. Remaining 20 % payment will be made after successful commissioning and testing of the equipment/system.

9. Three years commercial warranty/ guarantee shall be applicable to the supplied goods.

10. You are requested to provide your offer in sealed envelope latest by **04$^{th}$April 2016. Please indicate *"Quotation for* Special Purpose Transverse Flux Machine *CoE-SRES/ March2016 /NS /21" at the right hand corner of the sealed envelope"***

11. The bidder has to supply the material within the prescribed date. A penalty as per norms will be imposed for delayed supply upto 6 weeks. Any further delay will automatically terminate the purchase order/ contract.

12. The supplier requires supplying the store exactly as per the specifications and will be responsible to replace the defective supplies at his risk and cost.

13 The Supplier should submit deviation statement if any. The quotations simply mentioning “asper your specification and cost” shall be rejected.

14. The supplier should arrange for free demo / working trial of equipment (if required) at the Institute / Manufacturers place as the case may be at suppliers cost. The Purchase Order would be placed subject to satisfactory demonstration of the equipment.

15. Commissioning / Installation is at suppliers cost unless otherwise specified.

16. Conditional quotation will not be accepted.

17. We look forward to receiving your quotations and thank you for your interest in this project.

**Name: Prof. B. N. Chaudhari**
Principal Investigator
Center of Excellence-Smart Renewable Energy System

# Annexure A

## Specification and Description for Transverse Flux Machine

### A POLY-PHASE TRANSVERSE FLUX MACHINE

Fig. 1 illustrates the poly phase PMTF machine to be manufactured.

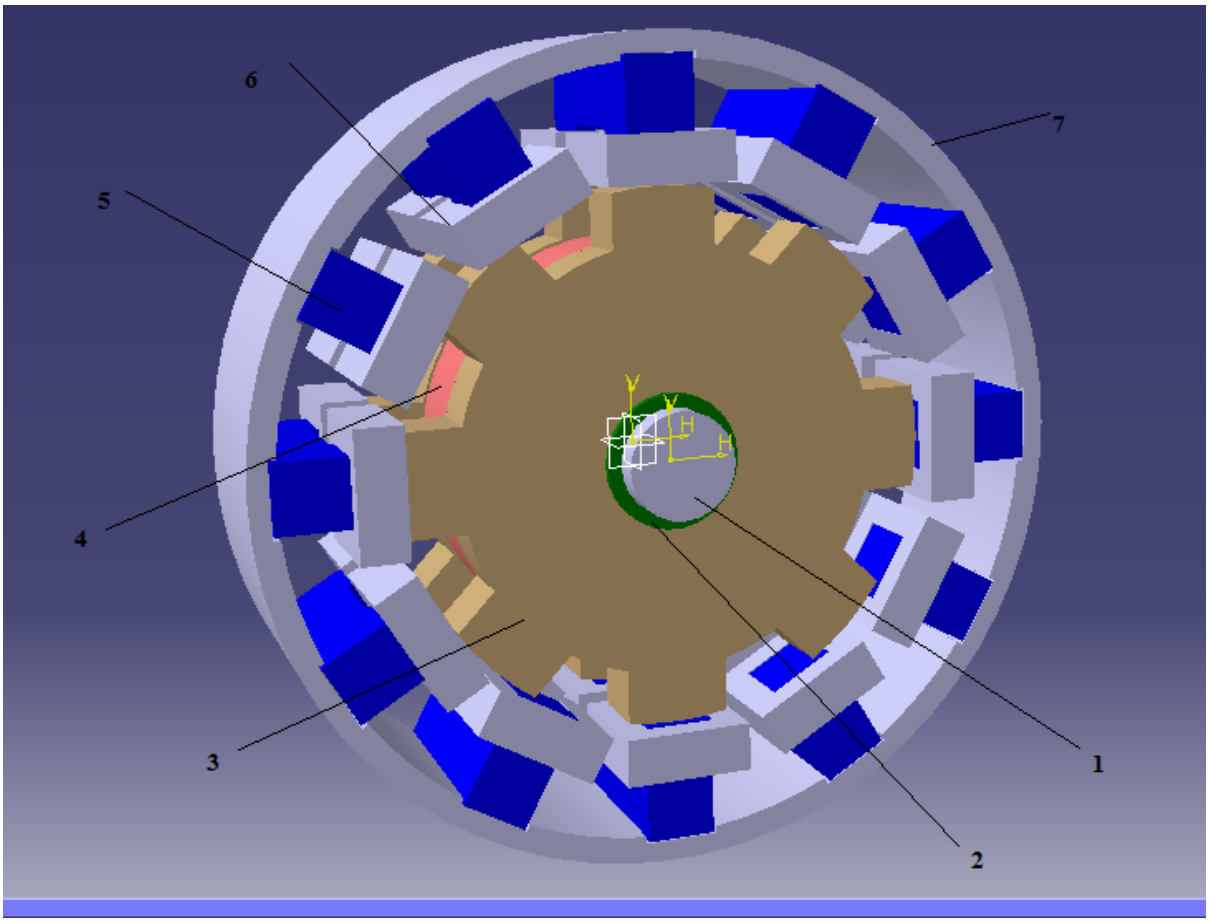



Figure 1

| | |
|---|---|
| 1- Shaft | 5- C-core section of stator |
| 2- Non-magnetic former | 6- Stator windings |
| 3- Iron discs with projections | 7- Non-magnetic stator support |
| 4- Permanent-magnet | |

This is an interior rotor arrangement of the machine, which is suitable for operating both as a motor and a generator. While operating in the generator mode, the

machine works as a poly phase homo-polar field regulated TF generator, while in the motor mode, the machine works as a poly phase field assisted TF motor.

The rotor is rigidly fixed on a shaft and the stator is concentrically attached to the shaft through a stator frame placed on bearings. The machine as described herein has a stator with a poly phase winding, which includes solenoid coils wound around the tips of a stator C/U core. Further, the rotor consists of a source of field excitation which is a permanent magnet.

**Rotor construction**: The rotor is a bobbin like structure, whose internal former portion and the cheek plates are made up of a non-magnetic material 2. The whole bobbin fits onto a magnetic/non-magnetic shaft 1 like a sleeve. The bobbin holds in place an axially magnetized permanent magnet 4 having the shape of a cylindrical annulus positioned symmetrically about the non-magnetic bobbin. The permanent magnet 4 has at two ends, two-multiple toothed discs 3 made of ferromagnetic material, which makes the whole structure a tight fit between the cheek plates of the bobbin. The number of teeth on the rotor discs and the teeth on the stator disc are unequal. However, the teeth on ferromagnetic disc at the two ends of the permanent magnet 4 are axially aligned. Such arrangement makes the rotor homo polar with radial flux across the air gap and flux loops closing axially. Thus, an overall length of the rotor is equal to the axial length of the cylindrical magnet plus axial thickness of ferromagnetic discs attached to the ends of the cylindrical magnet 4.

**Stator construction**: A stator frame of the poly phase PMTF machine is a non-magnetic cylinder having an axial length greater than the “overall length” of the rotor. The stator core has multiple stacks of C/U laminations 5, which are placed uniformly inside the stator frame 7 in a peripheral direction. The axial length of the C/U laminations is kept equal to the “overall length” of the rotor. Further, the axial width of the radial projections of the C/U stacks is kept equal to an axial thickness of the magnetic discs mounted at the ends of cylindrical magnet 4 of the rotor. The stator has a poly phase winding, which includes solenoid coils wound (10 turns of wire of diameter capable of carrying 30 Amp current) around the tips of a stator C/U

core. The radial ends of the C/U laminations stacks 5 act as effective pole faces. The phase windings are distributed spatially on the C/U lamination stacks 6 of the stator core. A class insulation can be used for windings, as current density assumed is $2.8A/mm^2$ .

**Winding Connections and Excitation**: The machine has 3 phases. The 3-phase winding is distributed over 12 stator poles. The windings placed on the two limbs of the same C-core section belong to the same phase and are connected in series. Also, the windings corresponding to each phase are connected in series (there is one parallel path in the winding).

**Flux Path**: The C/U lamination stacks of the stator are placed such that there is no axial displacement between the stator tooth projections and the rotor tooth projections. The flux emerging out of the teeth of ferromagnetic disc attached to the north pole of the permanent magnet 4 crosses the air gap, enters the stator pole, and traverses through the C/U lamination stacks 5 parallel to the axis of the machine and the enters the teeth of the disc attached to the south pole of the permanent magnet 4.

**Materials to be used**:

| Sr.No. | Geometry | Material property | Specific Materials used |
|---|---|---|---|
| 1 | Shaft | Non-magnetic | Aluminium |
| 2 | Sleeve | Non-magnetic | PVC/mouldable non-magnetic material |
| 3 | Tooth disc | Ferromagnetic | Laminations of CRNGO Si-Fe/ non-laminated Si-Fe (cast) |
| 4 | Magnet | Permanent magnet | Ferrite |
| 5 | C-core section of stator | Ferromagnetic | Laminations of CRGO Si-Fe |
| 6 | Stator winding | Conductive | Copper |
| 7 | Stator support ring | Non-magnetic | Aluminium |

**Instrumentation required in the machine:**

1) Flux density search coil: Two search coils would be required, [SC1]one to measure flux density in radial direction and other [SC2] to measure flux density in axial direction. SC1 would be wound on the radial limb of the C-core section. While, SC2 would be wound on the axial limb of the C-core section.

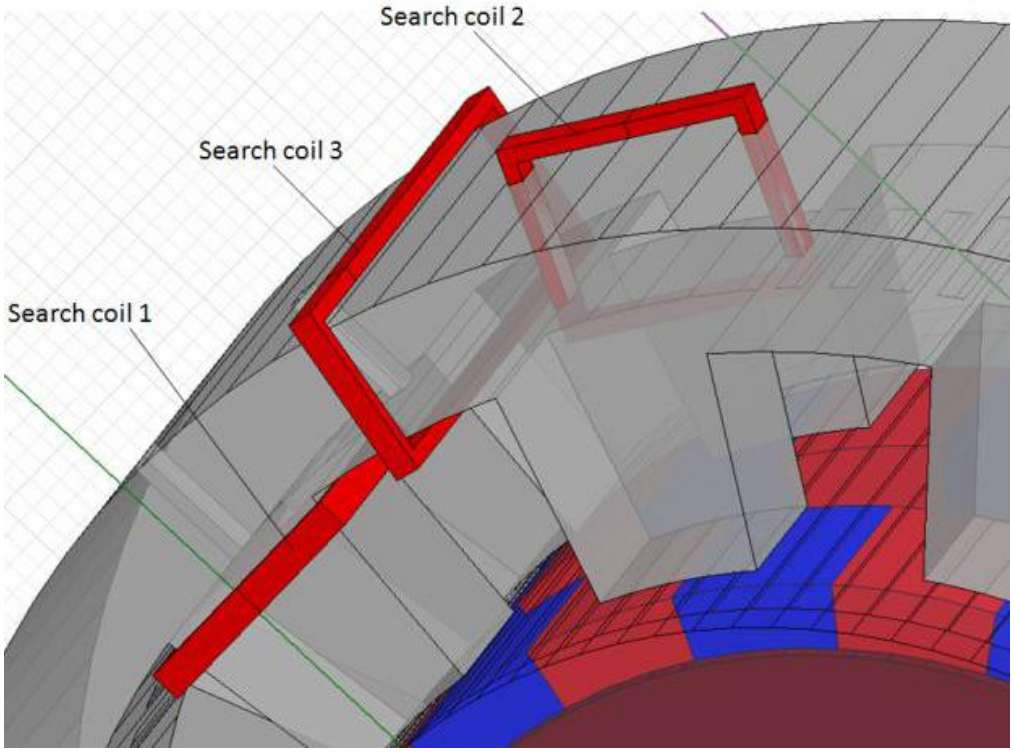



Figure: Position of search coils

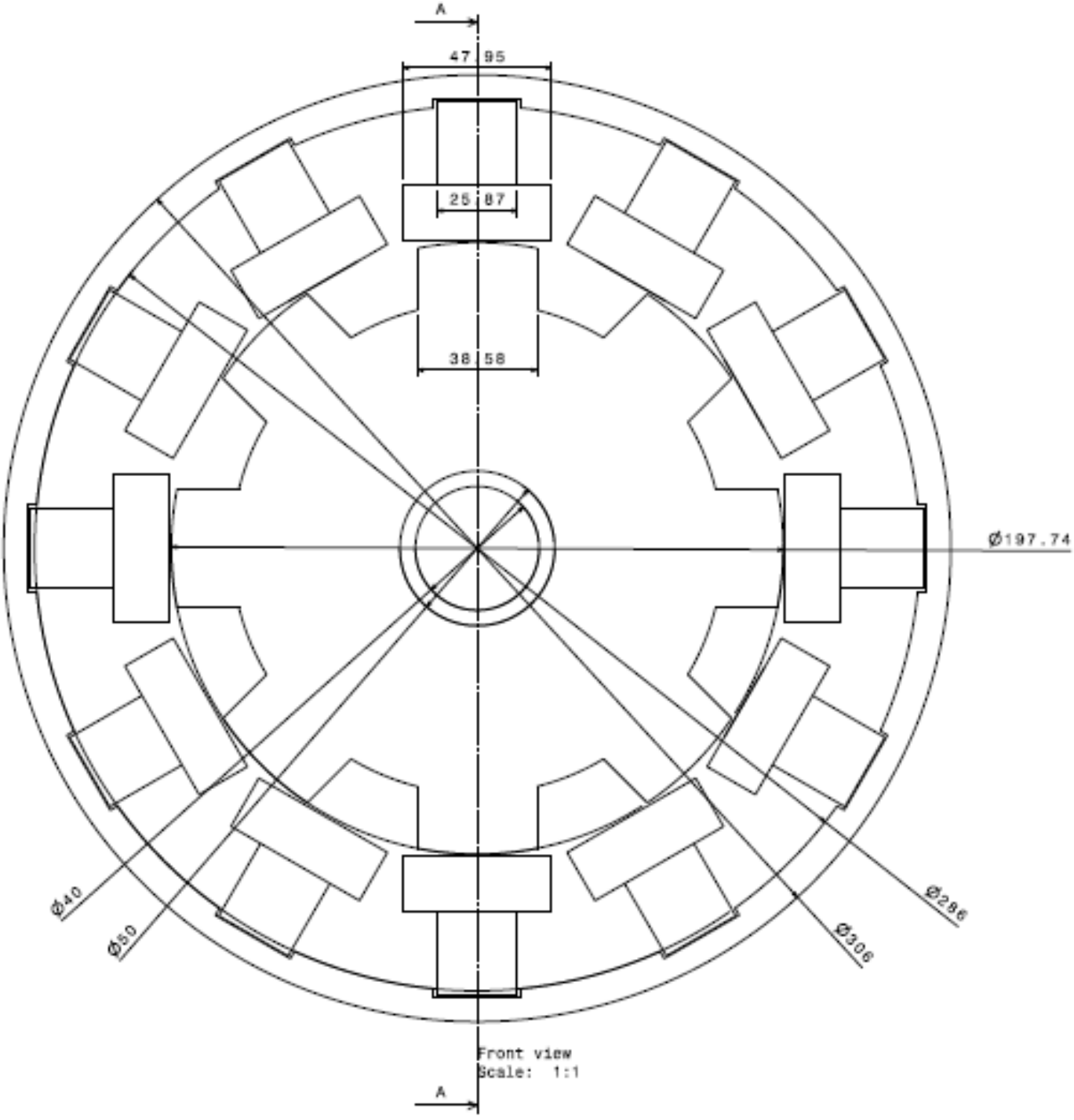
2) Flux leakage search coil: One search coil [SC3] would be required to measure flux density in circumferential direction. The flux calculated from data of this coil would give the value of leakage flux, as main flux should not be travelling in circumferential direction.
3) Temperature sensors: 3 Temperature sensors are to be used to measure temperature of stator and different positions. Temperature sensor 1 [T1] would be used to measure temperature on stator core just below the windings i.e the stator tooth. Temperature sensors 2 [T2] and 3 [T3] would be used to measure temperature on axial limb of the C-core section one on the inner surface and one at the stator support.

One temperature sensor should be used to measure rotor magnet temperature [T4].

4) Hall Effect sensors: 3 Hall effect sensors are to be used to detect the position of the rotor. The signals from the hall effect sensors have to be used for deciding the firing sequence of the switches.

**Dimensions:**

| Sr.No | Geometry | Dimension(mm) |
|---|---|---|
| 1 | No. of stator C-core sections | 12 |
| 2 | No. of projections on rotor iron disc | 8 |
| 3 | Shaft diameter | 40 |
| 4 | Thickness of non-magnetic former | 5 |
| 5 | Rotor diameter at air-gap | 197.74 |
| 6 | Air-gap thickness | 0.75 |
| 7 | Stator diameter at air-gap | 199.24 |
| 8 | Stator outer diameter | 306 |
| 9 | Axial length of the machine | 83.82 |
| 10 | Axial width of stator tooth | 25 |
| 11 | Radial height of the stator C-section | 43 |
| 12 | Height of stator slot | 18 |
| 13 | Back-iron thickness | 25 |
| 14 | Height of rotor pole | 20 |
| 15 | Radial height of magnet ring | 53.87 |
| 16 | Axial length of magnet ring | 33.82 |


A
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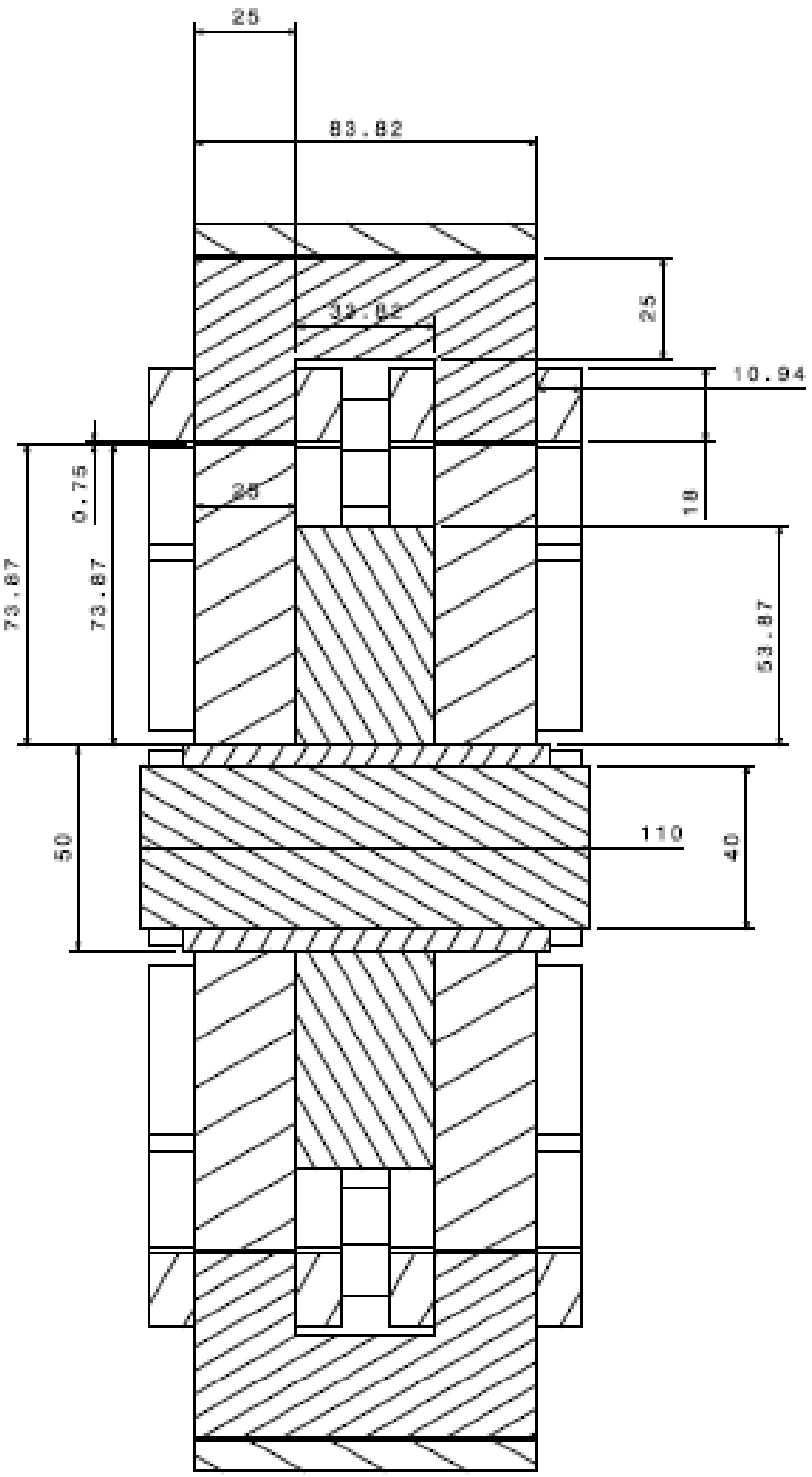
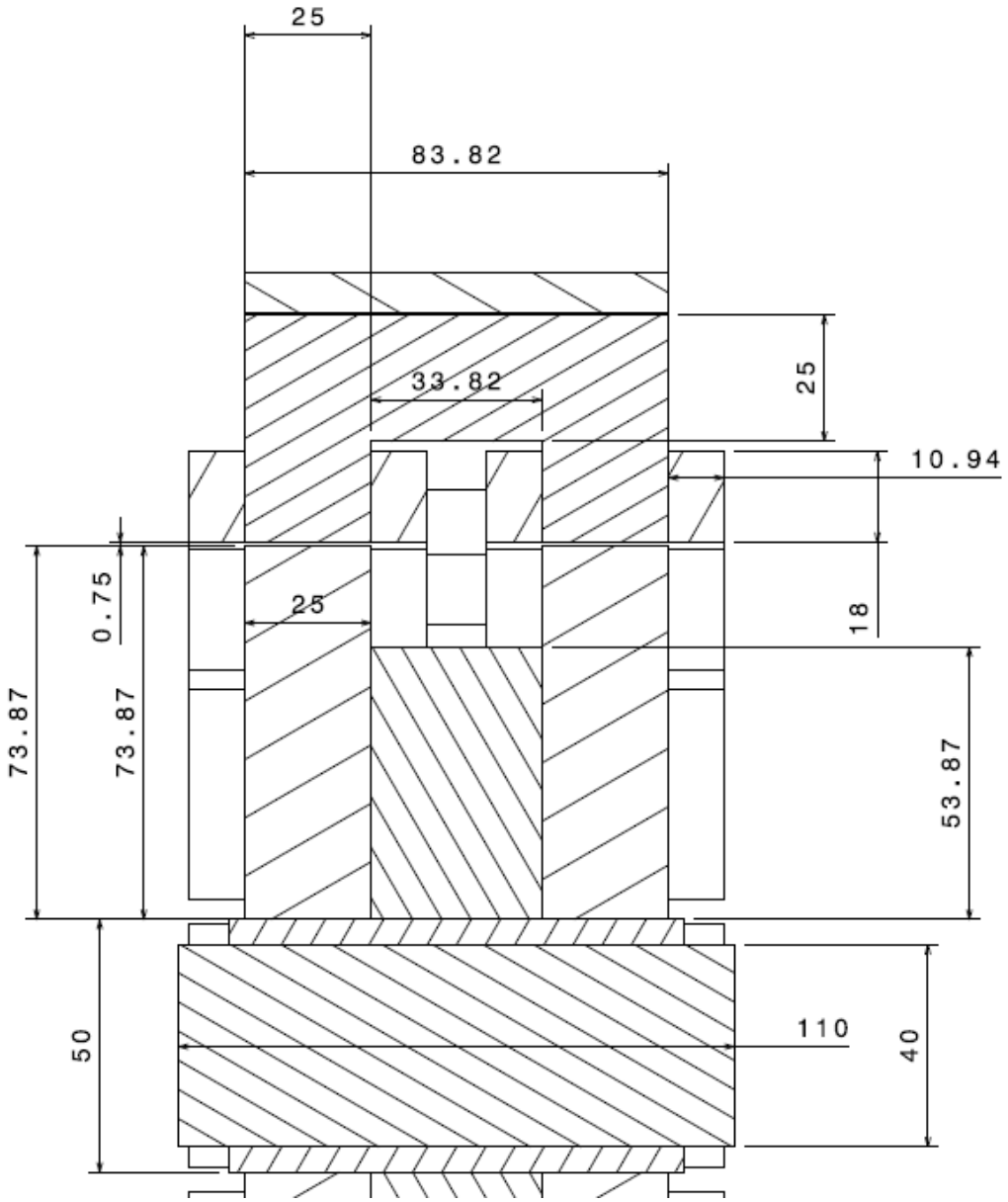
38.58
Ø197.74
Ø40
Ø50
Ø286
Ø306
Front view
Scale: 1:1
A




Section view A-A
Scale: 1:1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10.94
0.75
25
18
73.87
73.87
53.87
50
110
40