भारत सरकार/ Government of India
अंतरिक्ष विभाग/ Department of Space
इसरो जड़त्वीय प्रणाली यूनिट (आईआईएसयू)/ ISRO INERTIAL SYSTEMS UNIT (IISU)
तिरुवनंतपुरम/ Thiruvananthapuram – 695 013

अभिरुचि की अभिव्यक्ति – रैखिक प्रवर्तकों का उत्पादन
EXPRESSION OF INTEREST - PRODUCTION OF LINEAR ACTUATORS

विज्ञा.सं./ सा.नि/विज्ञा/ईओआई/2024 दिनांक 07 नवंबर, 2025
ADVT.NO. IISU /PT/ADVT/EOI/2025 dated November 07, 2025

भारत के राष्ट्रपति के लिए और उनकी ओर से, वरिष्ठ क्रय एवं भंडार अधिकारी, इसरो जड़त्वीय प्रणाली यूनिट (आईआईएसयू), वट्टियूरकावु, तिरुवनंतपुरम, प्रस्ताव हेतु अनुरोध (आरएफपी) जारी करने के लिए लघुसूचीबद्ध किए जाने हेतु प्रतिष्ठित एवं विश्वसनीय विक्रेताओं से **रैखिक प्रवर्तकों के उत्पादन** के लिए अभिरुचि की अभिव्यक्ति (ईओआई) आमंत्रित करते हैं।

For and on behalf of the President of India, Senior Purchase and Stores Officer, ISRO INERTIAL SYSTEMS UNIT (IISU), Vattiyoorkavu, Thiruvananthapuram invites Expression of Interest (EoI) from reputed and reliable vendors, to be shortlisted to issue Request for Proposal (RFP) for the **PRODUCTION OF LINEAR ACTUATORS**.

संभावित एवं विश्वसनीय विक्रेताओं से अनुरोध है कि वे अपनी ईओआई मोहरबंद लिफाफे में, जो वरिष्ठ क्रय एवं भंडार अधिकारी, आईआईएसयू क्रय, वट्टियूरकावु पी.ओ. तिरुवनंतपुरम 695 013 का संबोधन करता है, ऊपर **"ईओआई - रैखिक प्रवर्तकों के उत्पादन के लिए"** लिखकर **10 दिसंबर, 2025 को 14.00 बजे तक** या उससे पहले प्रस्तुत करें।

Potential and reliable vendors are requested to submit their EoI in a sealed cover superscribing " **EOI-FOR PRODUCTION OF LINEAR ACTUATORS** " addressed to Senior Purchase and Stores Officer, IISU Purchase, Vattiyoorkavu P.O, Thiruvananthapuram 695 013 on or **before 10 December, 2025 upto 14.00 hrs.**

विस्तृत निबंधन एवं शर्तें, लघुसूचीबद्ध करने के पात्रता मानदंड, लघुसूचीबद्ध करने हेतु दिशा-निर्देश हमारे वेबसाइट **www.isro.gov.in** पर उपलब्ध हैं। इच्छुक संभावित विक्रेता हमारे संदर्भ संख्या आईआईएसयू/पीटी/एडीवीटी/ईओआई/2025 का उद्धरण करते हुए **10 दिसंबर, 2025 को 14.00 बजे या उससे पहले** वरिष्ठ क्रय एवं भंडार अधिकारी, आईआईएसयू क्रय, वट्टियूरकावु पी.ओ. तिरुवनंतपुरम 695 013 को अपनी अभिरुचि की अभिव्यक्ति प्रस्तुत कर सकते हैं।

Detailed Terms and Conditions, eligibility norms for short-listing, guidelines for short-listing are available in our website **www.isro.gov.in.** Interested prospective vendors can furnish their Expression of Interest quoting our reference No. IISU/PT/ADVT/EOI/2025 **on or before 10 December, 2025 [14:00 Hrs.]** to Senior Purchase and Stores Officer, IISU Purchase, Vattiyoorkavu P.O, Thiruvananthapuram 695 013.

शुद्धिपत्र, यदि कोई हो तो, केवल हमारे वेबसाइट www.isro.gov.in पर प्रकाशित किया जाएगा।
Corrigendum, if any will be published in our website www.isro.gov.in only.

हस्ताक्षरित/Sd/-
वरिष्ठ क्रय एवं भंडार अधिकारी/ Senior Purchase & Stores Officer
दूरभाष सं./ Phone No.0471-2569317/2569547
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EXPRESSION OF INTEREST (EOI)

Realization of Hybrid Stepper Motor Based Linear Actuator

ISRO Inertial Systems Unit

Indian Space Research Organization

Government of India

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02	Document Id.: IISU/TR/6041/2025	03	Issue: 1	Revision:0	Vol:1
04	Title of the Document: Realization of Hybrid Stepper Motor Based Linear Actuator				
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13	Abstract: The objective of this EoI is to solicit proposals from the interested bidders for participation in a bid process for selection of parties for production of LINEAR ACTUATOR for Throttle Flow Control Valve (TFCV). The document includes pre-requisites for undertaking various activities like fabrication, metrology, integration, testing and documentation related to the realization of the actuator.				
14	Key words: Throttling engine, Hybrid Stepper Motor, Chandrayaan 4				

General Terms

1.1 GOALS OF THIS EXPERSSION OF INTEREST (EoI)

The objective of this EoI is to solicit proposals from the interested bidders for participation in a bid process for selection of parties for production of LINEAR ACTUATOR for Throttle Flow Control Valve (TFCV).

1.2 EoI ISSUING AUTHORITY

This Expression of Interest (EoI) is issued by IISU, intended to short-list potential bidders. IISU's decision with regard to the short-listing of bidders through this EoI, shall be final and the IISU reserves the right to reject any or all the bids.

The details of EoI and contact person are given below.

Sl No.	Item	Description
1	Project Title	Production of LINEAR ACTUATOR for TFCV
2	Project Initiator Details	ISRO Inertial Systems Unit
3	Contact Person	M H Ravichandran Group Director, MSTG
5	Contact Details	ISRO Inertial Systems Unit Vattiyoorkavu PO, Thiruvananthapuram – 695 013

1.3 CALENDER OF EVENTS

The last date for receiving the EoI response at IISU from the bidders is 10/12/2025, 14.00 hrs.

1.4 AVAILABILITY OF THE EoI DOCUMENTS

The bidders are expected to examine all instructions, forms, terms, project requirements and other details in the EoI documents. Failure to furnish complete information as mentioned in the EoI documents or submission of a proposal not substantially responsive to the EoI documents in every respect, will be at the bidder's risk and may result in rejection of the proposal.

1.5 PRE-BID DISCUSSION

IISU will host a bidder's Pre-Bid Discussion and the participation in the pre-bid discussion is mandatory for considering the party.

1.6 VENUE & DEADLINE FOR SUBMISSION OF PROPOSALS

Proposals, in its complete form in all respects as specified in the EoI, must be submitted to IISU at the address specified in Section 2.

IISU may, in exceptional circumstances and at its discretion, extend the deadline for submission of proposals by issuing an addendum to be made available, in which case, all rights and obligations of IISU and the bidders previously subject to the original deadline will thereafter be subject to the deadline, as extended.

1.7 REQUIRMENT ON THE PRODUCTION CENTRE

The requirements given in this Expression of Interest are indicative only and IISU will seek inputs from the pre-qualified bidders in further refining the requirements and all aspects of services before finalizing the bidders.

Scope of Services

2.0 BACKGROUND

2.1 About Inertial Systems Unit

ISRO Inertial Systems Unit (IISU) is responsible for the design and development of Inertial Systems for Launch Vehicles and Spacecraft programmes for ISRO. Major Systems like Inertial Navigation Systems based on mechanical gyros and optical gyros, attitude reference systems, Rate Gyro Packages, Accelerometer Packages are developed indigenously and used in various missions of ISRO. IISU also design and develop actuators and mechanisms viz. Solar Array Drive, Reaction wheel, Momentum wheel, Scan mechanisms for spacecraft and allied applications. IISU has crossed major milestones starting from design & development phase, competence building phase and is presently engaged in the process of consolidation and productionisation of the sensors, systems, actuators and mechanisms for a variety of launch vehicle and spacecraft applications. Over the years, IISU has mastered in the development and realisation of sensors, testing and evaluation etc. IISU has also established state of the art facilities for realisation of various types of sensors, actuators, systems and mechanisms.

The orbital accuracies achieved by launch vehicle inertial systems are of world class and at par or better than other launch vehicle missions. Similarly the performance of Inertial Reference Unit and Reaction Wheel for spacecraft missions has significantly contributed in enhancing the spacecraft operation and mission life in number of missions.

The experience and knowledge gained over the years are used for perfecting the present class of sensors and systems. Further, IISU has initiated technology development programme in niche areas to adopt itself as a centre of excellence in inertial sensors and systems. IISU strives to make the systems cost effective, reliable and realizable in tune with global trends.

2.2 Need of the Expression of Interest (EoI)

The aim is to develop parties for production of Hybrid Stepper Motor based linear actuator after due understanding of the technological challenges, risks, investments and returns.

2.3 Scope of Linear Actuator Realization

This section provides a brief description of the system, various stages of realization and scope of activities. Activities related to initial 2 models will be carried out with essential minimal guidance from IISU in order to make the party familiar with the technology. Once the familiarization is complete the party will be responsible of the following activities.

- Procurement of materials and consumables used in the realization of motors
- Realization of 2 actuators for workmanship qualification and functional testing
- Obtain clearance from committee constituted by IISU to proceed with the production and delivery of actuators as per the schedule projected. (Typical number of 100Nos of actuators, with 25 actuators every quarter)

- The following documents shall be provided by the party along with the hardware
    - Material inspection and clearance report of all raw materials
    - Components clearance report of all components fabricated
    - Integration logbook
    - Functional Test results (including environment test vibration, thermo vac etc)

Clearance for actuator delivery shall be obtained after review of all documents and test results by committee constituted at IISU.

2.4 Linear Actuator for TFCV

Throttle flow control valve (TFCV) provides means of throttling propellant flow by mechanically varying the flow area by inserting moving element called pintle into the throat area. By this method the designed TFCV can vary the flow from 100% to 40%. The linear movement of the pintle is achieved using a linear actuator that can actuate in discrete mechanical steps. This linear movement is achieved by a ball screw assembly that converts the rotary motion generated by a hybrid stepper motor into linear motion. The linear motion should be achieved with a resolution of 5µm at a speed of 2.5 mm/s. This resolution is achieved by a 200step hybrid stepper motor coupled to a 1mm pitch ball screw. Under full step mode of operation of the motor, the actuator can achieve a linear resolution of 5µm. The actuator has a bearing units of ABEC5 (Annexure 2) class bearing for achieving reliable operation with low values of friction. The major specifications of the linear actuator designed is shown below.

- Linear Force : 150N (min)
- Speed : 2.5mm/s
- Linear Resolution : 5µm
- Accuracy : ±5µm
- Travel : 8mm±1mm reserve each on both ends
- Drive Motor : 1.8° step Hybrid Stepper Motor with dual redundancy
- Motor Speed : < 150rpm (500 pulse per second)
- Max Current : 1.4A
- Input Voltage : 30V min
- Power : < 20W
- Actuator Mass : < 1.5kg

3.0 FABRICATION AND INSPECTION

3.1 Component Details

The complete actuator components list is shown below.

Sl No	Part Description	Material	Qty/Set	Machining Process	Minimum Tolerances

1.	Potentiometer cover	AA6351-T3	01	Turning, Milling, Fitting	±0.05
2.	Motor shaft Ball screw	Bought Out Item-to be machined	01	EDM, Turning, Milling, Fitting	±0.005, -0.010
3.	Output shaft	AISI 304	01	EDM, Turning, Milling, Fitting	±0.05, [-0.010,-0.005]
4.	Linear Bearing lock	AISI 304	01	Drilling, turning, Fitting	Open
5.	Hex. nut	AISI 304	02	Milling, Turning, Fitting	Open
6.	Stopper bush	PEEK	01	Turning, Fitting	Open
7.	Spacer	PEEK	01	Turning, Drilling, Fitting	Open
8.	Connecting rod	AISI 304	01	EDM, Milling, Drilling, Fitting	±0.05
9.	Linear bearing	PEEK	01	Turning, Milling, Fitting	[+0.005,+0.010]
10.	Stopper pad	PEEK	01	Turning, Drilling, Fitting	Open
11.	Motor housing	Ti6Al4V	01	Turning, Milling, Cylindrical Grinding, Fitting	[+0.005,-0]
12.	Spacer	AISI304	01	Turning, Fitter	[+0.02,+0.05]
13.	Support plate D	Ti6Al4V	01	Turning, Milling, Jig boring, Grinding, Fitting	[+0.1,0.02]
14.	Key	AISI304	01	Milling	[+0.05,0.10]
15.	Support plate-A	Ti6Al4V	01	Turning, Milling, Jig boring, Grinding, Fitting	[+0,0.1]
16.	Outer cover	AA6351-T3	01	Turning, Drilling, Fitting	Open
17.	Stator	Vacoflux -50 laminates 0.5mm	01	Lamination stacking	[+0,-0.005]
18.	Rotor end stack	Vacoflux-50	01	EDM, Turning, Fitting, High temperature Annealing	±0.003
19.	Rotor middle stack	Vacoflux-50	01	EDM, Turning, Fitting, High temperature Annealing	±0.003
20.	Locating pin	AISI304	03	Turning, Fitting	[+0,-0.05]
21.	Rotor lock nut	AISI304	01	Turning, Drilling, Fitting	[+0,-0.1]
22.	Rotor hub	AISI304	01	Turning, Cylindrical Grinding, Milling, Fitting	[-0.002,-0.005]
23.	Shaft nut	Ti6Al4V	02	Turning, Milling, Fitting	[+0,-0.05]
24.	Motor stator assy	Vacoflux -50 Laminates	01	Winding and hard potting	Assembly
25.	Rotor assy.		01	Assembly of Sl no. 18,19,20,21 and 22	Assembly
26.	Ring magnet	Bought out Item	01		Annexure 2
27.	Bearing ø6.36Xø15.875X4.96	Bought Out Item	02		

Table 1. Components List

3.2 Pre-Requisite of Fabrication & Metrology facility

- The party / their vendor shall have well maintained precision fabrication and metrology facility to execute the scope of work without any deviation.
- Party / their vendor shall have skilled mechanical production team to execute the precision fabrication activity.
- Party / their vendor shall have streamlined fabrication set up with maintained quality system including certification

3.3 General Terms and Conditions for Material procurement

- Material should be as per the technical specification provided.
- Material has to be procured from a reputed mill or through trading agency. If it is from trading agency, the details of the material manufacturer or the source mill should be known.
- All material certificates have to be verified and endorsed by a reputed third party agency or by government approved, NABL accredited labs.
- Following tests to be done (as per relevant standard) and reports has to be available with every raw material batch
  - Dimensional inspection
  - Mechanical properties test
  - Chemical composition test
  - Non-destructive testing
- All material properties have to be well within the acceptable limit given in the specification.
- 100% non-destructive test to be conducted on all material and cleared as per AMS 2630 class A1.
- Each of the above report shall contain the information like Material, Heat/Lot No., Size, Quantity, Supply condition etc.

3.4 Possible Suppliers of Material

1) First source Impex
2) Om Steels
3) Sunflag
4) Umac Avionics
5) Kalapurna Metals & Alloys
6) Sanjay Metal Distributors
7) Rajhans Metal Syndicate

3.5 Guidelines for Fabrication and Inspection of Components

- Detailed study and preparation of fabrication and inspection processsheet for the items and submit to IISU for approval.

- After approval, fabricate the item with the identified materials.
- Party should machine the item in all respects within the tolerance limitsmentioned in the drawings.
- Preparation of all required tooling, fixtures etc for fabrication.
- Party has to maintain a foolproof system to control the material flow toavoid any type of mixing/change of raw material.
- Necessary helicoil for thread inserts, as per standards, should bepurchased by party and helicoil insertion is to be done.
- Identification number has to be neatly engraved on the surface as givenin drawing or surface which has open tolerance.
- Items are to be inspected and complete inspection report has to beprepared in the Inspection format. FCD inspection has to be repeated and separate report to be made available.

3.6 Acceptance Criteria

- After completion of fabrication and inspection process, the component can be used, if all dimensions are meeting the specification with the tolerances.
- In case of components with deviations, if nonconformance (NC) is applicable, clearance shall be obtained from review committee constituted at IISU
- After verification and clearance, the items can be used for assembly.
- The complete inspection report with NCs if applicable and material certificate have to be submitted the consolidated report provided along with each actuator.
- IISU reserves the right to inspect and verify the hardware at any phase at your site.

3.7 Fabrication and Inspection Sequence flow diagram

The fabrication flow chart is shown in Annexure 3.

List of Equipment for Fabrication and Inspection

Sl No	Equipment	Activity
1.	CNC machining centre	Machining
2.	CNC Lathe	Machining
3.	Jig Boring M/c	Machining
4.	EDM M/c	Machining
5.	Grinding M/c	Machining
6.	Manual Milling M/c	Machining
7.	Manual Lathe	Machining
8.	Drilling M/c	Machining
9.	Fitting equipments	Fitting
10.	Vernier Caliper	Inspection

11.	Height Gauge	Inspection
12.	CMM	Inspection
13.	Talyrond	Inspection
14.	3D Microhite	Inspection
15.	Video measuring machine	Inspection

Table 2. Equipment for fabrication and inspection

3.8 Drive Motor Realization

The drive motor used is a 200 step Hybrid stepper motor with a step angle of 1.8˚. The teeth profile is trapezoidal having a tooth thickness to tooth pitch ratio of 0.4 and 0.38 for rotor and stator respectively. The stator is realized from Silicon steel/Permendur laminations (0.35mm approx. lamination thickness). The rotor is configured as single stack with a disc type axially magnetized Samarium Cobalt (Sm_2Co_{17}, 28MGOe), sandwiched between the rotor stacks. The drive motor is operated under full step mode under all operating conditions with a maximum output step frequency of 900steps per second.

3.8.1 Motor Specifications

The major motor specifications are shown below.

Sl No	Parameter	Specification
1	Motor Type	Hybrid Stepper Motor
2	Operating speed	500pps, 150rpm
3	Operating Voltage	28-42V
4	Torque Constant	0.62Nm/A
5	Detent Torque	<0.01Nm
6	Maximum Operating Current	<0.6A
9	Winding Wire	28 AWG
10	No of turns/pole	80 turns
11	Winding Type	2 phase bipolar
12	Envelope	Ø 56mm X 23mm
13	Mass	< 600gm
14	Redundancy	Yes
15	Lead Wire	4 wire per channel
16	Stator Material	Vacoflux 50 laminates, 0.5mm thick

Table 3. Motor Specification

3.8.2 Winding Sequence

The 8 pole motor stator houses a two phase bipolar winding with 40 turns per pole. 24AWG enameled copper wire is used for winding. Detailed winding layout is shown in Annexure 4.

3.8.3 Consumables for motor realization

Sl No	Item	Part No	QC certification/Exp Date	Preferred Source

1	Winding Wire	28AWG	Nema Specification MW1000/16C	Sanghvi Aerosapce/MWS USA
2	Adhesive	Dobeckot 605	Manufacturer COC	Elantas Beck , India
4	Insulation Paper	Kapton 100micron	Manufacturer COC	3M
5	Liquid Flux	RMA	MIL-F-14256	
6	Solder		Manufacturer COC	BT solders Pvt Ltd
7	Connection leads	22AWG Spec55	Manufacturer COC	Raychem
8	Polyester Lacing Tape	LC162 Black	Manufacturer COC	Alpha Wire
9	Potting Compound	P80C	Manufacturer COC	Bacon Industries
10	IsoPropoyl Alcohol	Propan-2-ol	Manufacturer COC	Nice Chemicals

Table 4. Consumables for motor realization

3.8.4 Equipment required for motor realization

Sl No	Instrument/Equipment	Preferred Brand
1	Multimeter	Keysight 34461A 61/2 Digit Multimeter
2	LCR Meter	Keysight E4980AL LCR meter
3	High Resistance meter	Agilent 4339B High Resistance Meter
4	Gaussmeter	Model 6010 LaboratorionElettrofisico LDJ Scientific
5	Fume Extractor	Zero Smog TL
6	Thermal Chamber	Votsch VT 4021
7	Humidity Chamber	Super Dry (<10% humidity)
8	Hot Tweezers	M-20 Meisei Corporation
9	Sodering Iron Station	Weller
10	Power Supply	Lambda

Table 5. Equipment for motor realization

4.0 SYSTEM INTEGRATION

4.1 Parts list of fabricated and brought out components

Refer Table 1

4.2 Mechanical Integration workflow

See Annexure 5

4.3 Pre-Requisites for Assembly/Integration

All fabricated mechanical parts, brought out elements are to be cleared by inhouse QC. In case of any deviation, the party has to take it to Non-conformance review board at IISU. Only QC/NCRB cleared components are to be used for the integration and assembly of Qualification model(QM) and Flight models (FM).

Before integration, component clearance certificates to be verified thoroughly for any action suggested by NCRB and make sure that all actions are closed. Check for any deviations specifically on FCD dimensions in reports. All the QC clearances and NCRB report if any, has to compiled and submitted along with the actuator during the time of delivery.

4.4 Incoming Inspection of mechanical elements

After thorough cleaning with Iso Propyl Alcohol (IPA) all fabricated parts are to be visually inspected under 10x magnification.100% inspection is to be carried out for all the critical areas.

- Parts should be free from burrs, dent marks and scratch marks.
- Thread should be free from dent marks and burrs.

4.5 Brought out/Standard Components

Brought Out Components

Sl. No.	Item	Part no.	Suggested Manufacturer
1	Ball screw	R-08-F1-0216/0266-T1-P1	Rodriguez, Germany
2	Bearings	FR4,ABEC7P	Myonic/ADR
3	Potentiometer	SP15021A (provided as FIM)	Excelia

Table 6. Incoming Inspection for brought out components

Fasteners and Washers

All mechanical fasteners used should be aerospace grade and with a minimum strength meeting A2 class (UTS 700MPa). Material should be AISI304 in passivated condition. Ensure that test certificates for material composition and mechanical properties are available for all types of fasteners.

Sl No	Description	Material	Qty per package
1	M2.5x8	AISI304-(A2-70)	10
2	M2.5x6	AISI304-(A2-70)	4
3	M3x6	AISI304-(A2-70)	4
4	M3x8	AISI304-(A2-70)	20
5	M3x10	AISI304-(A2-70)	4
6	M4x10	AISI304-(A2-70)	4
7	M4x14	AISI304-(A2-70)	4
8	M4x14	AISI304-(A2-70)	4
9	M5x12	AISI304-(A2-70)	4

Table 7. List of Standard Fasteners Used

4.6 List of Equipment and Consumables required

Sl No	Equipment/Consumables
Work Table and Storage Systems	
1	Class 10000 clean room facility
2	Laminar flow table for integration
3	Humidity controlled chamber for storage
4	Storage Bins for hardware and fasteners

Assembly Tools	
1	Assembly tools
2	Torque Wrench
3	Allen Key sets
Electrical Integration	
1	Soldering Station
2	Multimeters
3	High Resistance meter
4	Hot Tweezer for stripping
5	Hot Air Gun
6	Smoke absorber
7	Crimping tools and locators
8	Solder, Flux and Alcohol
9	Tweezers, Cutter, pliers and bending tools
10	Wax coated threads
11	Brushes and wipers
12	Cotton waste
13	Connectors and wires
14	Magnifiers
Consumables	
15	RTV
16	Loctite
17	Iso Propyl Alcohol (IPA)
18	Lint free cloth
19	Wax coated thread

Table 8. List of Equipment & Consumables

5..0 FUNCTIONAL TESTING

Functional tests have to be carried out on the actuator during different stages of integration and the final assembly, inorder to ensure the performance of the subassembly and the actuator as a whole.

- Holding and detent torque test on the drive motor after motor integration
- Performance testing of the actuators as per the test matrix provided by IISU
- Environmental tests – Thermovacuum and Vibration for as per the specified levels mentioned in the test matrix

The tests results have to compiled and the report has to be presented to committee constituted at IISU level to obtain clearance. The fixtures required for assembly and testing of the actuator are to be prepared by the party.

5.1 List of Equipment required

Sl No	Instrument/Equipment	Function
1	Torque Dynamometer	Motor level static torque measurements

2	Force measurement system	For Sub assembly level and actuator level force measurement
3	Stepper Motor Checkout	For driving the stepper motor for carrying out the tests
4	Vibration Shaker	For undertaking environmental testing of the system
5	Themo vacuum facility	

Table 9.List of Facilities required for testing

5.2 Documentation

The party shall present all documentation in a manner consistent with good commercial practice in content and quality of material. The party shall maintain the following documents during realization and shall be submitted to IISU for clearance.

- Process documents for verification
- Hardware clearances
- Part log book
- Checklist for various critical activities
- Mechanical and electrical reports
- Non-conformance report
- Inspection & deviation report
- Test Report

Bidding Terms & Pre-Qualification Criteria

6.0 Conditions under which this EOI is Issued

I. This EoI is not an offer and is issued with no commitment. IISU reserves the right to withdraw the EoI and change or vary any part thereof at any stage. IISU also reserves the right to disqualify any bidder, should it be so necessary at any stage.

II. IISU reserves the right to withdraw this EoI if IISU determines that such action is in the best interest of the Government of India.

III. Short-listed bidders would be issued formal tender enquiry / Request for proposal inviting their technical and commercial bids.

IV. Timing and sequence of events resulting from this EoI shall ultimately be determined by IISU.

V. No oral conversations or agreements with any official, agent or employee of IISU shall affect or modify any terms of this EoI and any alleged oral agreement or arrangement made by a bidder with any Department, agency, official or employee of IISU shall be superseded by the definitive agreement that results from this EoI process. Oral communications by IISU to bidders shall not be considered binding on IISU, nor shall any written materials provided by any person other than IISU.

VI. Neither the bidder nor any of the bidder's representatives shall have any claims whatsoever against IISU or any of their respective officials, agents, or employees arising out of, or relating to this EoI or these procedures (other than those arising under a definitive service agreement with the bidder in accordance with the terms thereof).

VII. Applicants who are found to canvass or attempt to influence in any manner the qualification or selection process, including without limitation, by offering bribes or other illegal gratification, shall be disqualified from the process at any stage.

VIII. Each applicant shall submit only one pre-qualification requirements proposal.

7.0 Rights to the Content of the Proposal

For all the bids received before the last date and time of bid submission, the proposals and accompanying documentation of the pre-qualification proposal will become the property of IISU and will not be returned after opening of the pre-qualification proposals. IISU is not restricted in its rights to use or disclose any or all of the information contained in the proposal and can do so without compensation to the bidders. IISU shall not be bound by any language in the proposal indicating the confidentiality of the proposal or any other restriction on its use or disclosure.

8.0 Acknowledgement of Understanding of Terms

By submitting a proposal, each bidder shall be deemed to acknowledge that it has carefully read all sections of this EoI, including all forms, schedules and annexure hereto, and has fully informed itself as to all existing conditions and limitations.

9.0 Evaluation of Prequalification Proposal

The bidders' pre-qualification proposal in the bid document will be evaluated as per the requirements specified in the EoI and adopting the pre-qualification criteria spelt out in this EoI. The bidders are required to submit all required documentation in support of the pre-qualification criteria specified (eg. detailed project citations and completion certificates, client contact information for verification and all others) as required for evaluation.

10.0 Language of Proposals

The proposal and all correspondence and documents shall be written in English

11.0 Pre-Qualification Criteria

This invitation for bids is open to all entities registered in India who fulfil prequalification criteria as specified below.

a) IISU reserves its right to subject the bidders to security clearances as it deems necessary.

b) The participation is restricted to companies registered in India under THE COMPANIES ACT 2013.

Notes:

1. In case of bidders where the ISO certification is under renewal, the bidders shall provide the details of the previous ISO certification and current assessment details.
2. In respect of the cited projects, the bidder should have been directly responsible for the implementation of the projects and not just a member of a consortium.
3. Only project citations completed/started in the last 5 financial years (2016-2021) will be considered for the evaluation.

12.0 Response Requirements

I. The Response to the pre-qualification requirements shall be prepared in accordance with the requirements specified in this EoI and in the format prescribed in this document for each of the above mentioned qualifying criteria as proof of having the minimum requirements.

II. Proposals must be direct, concise and complete. All information not directly relevant to this EoI should be omitted.

III. The pre-qualification proposal shall be sealed and superscribed "Response to pre-qualification requirements – TFCV Actuator Production" on the top right hand corner and addressed to IISU at the address specified in this document.

IV. The pre-qualification proposal should be submitted with two printed copies of the entire proposal, one marked ORIGINAL and the second one as DUPLICATE with all the contents of the pre-qualification proposal. The Hard copy shall be signed by the authorised signatory on all the pages before being put in the envelope and sealed.

V. The proposal should contain the copies of references and other documents as specified in the EoI.

VI. A board resolution authorising the Bidder to sign/execute the proposal as a binding document and also to execute all relevant agreements forming part of EoI shall be included in this envelope.

VII. IISU will not accept delivery of proposal in any manner other than that specified in this EoI. Proposal delivered in any other manner shall be treated as defective, invalid and rejected.

13.0 Prequalification requirements proposal

The pre-qualification proposal should be submitted in the sealed envelope with the following details. Bidders are requested to submit their responses for the pre-qualification requirements in four (4) parts, clearly labelled according to the following categories.

Part I. **Covering Letter and Board Resolution**

- Covering Letter from the Bidder as per the format provided in Annexure – Form 1
- Board Resolution authorising the bidder to sign/execute the proposal as a binding document and also to execute all relevant agreements forming part of EoI.
- Note explaining the strengths of the bidder and motivating factors for the bidding.

Part II. **Details of the Organization**

- This part must include a general background of the respondent organisation (limited to 400 words) along with other details of the organisation as per the format provided in the EoI (Annexure – Form II). Enclose the mandatory supporting documents listed in format.
- The bidder must also provide the financial details of the organisation as per format provided in the EoI(Annexure – Form III). Enclose the mandatory supporting documents listed in format.

Part III. **Relevant project experience**

- Respondents must provide details (Client organisation, nature/scope of the project, project value) of precision fabrication and system integration services experience. The experience mentioned here should match with the experience quoted by the respondent. Enclose the mandatory supporting documents.

Part IV. **Proof of Fulltime Technical Personnel in the Bidders Organization**

- The bidder must enclose certified copy by Statutory Auditor or Company secretary of the bidder's organisation with the number of full time professionals in the bidder's organization.

14.0 Purchase Preference Policy – Make in India (divisible items Class I & II Local Suppliers)

In line with Public Procurement (Preference to Make in India), Order 2017 & its amendments issued by Govt. of India from time to time with a view to support the Indian industries, ISRO has implemented "Purchase Preference Policy". The "Purchase Preference" is applicable for the "Class-I Local Supplier" for the goods/ services/ works covered in this EOI, subject to the following terms & conditions:

1. The Public Procurement (Preference to Make in India), Order 2017 issued by Govt. of India indicates that if there are any general or specific restrictive clauses to restrict participation of Indian companies in those countries procurement EOIs, reciprocity clause need to be invoked as per the order. Hence, if ISRO or Govt. of India come across that Indian suppliers of an item are not allowed to participate and / or compete in procurement by your government, the bid submitted by you will not be considered and excluded from eligibility for procurement. Please note this point.
2. **Purchase Preference Policy: Goods/Works which are not divisible (ie., required quantity is 1 or as a package) and Services:**
    a) If L1 is from a 'Class-I local supplier, the contract will be awarded to L1 bidder.
    b) If L1 is not from a 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price subject to local supplier's quoted price falling within the margin of purchase preference (i.e. 20%) and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price (inclusive of duties, taxes and freight & insurance).
    c) In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on, and order/contract shall be awarded accordingly. In case where none of the 'Class-I local supplier' within the margin of purchase preference agree to match the L1 price, then the order/contract shall be awarded to the originalL1 Bidder.
3. Work means all works as per Rule 130 of GFR-2017, and will also include ‘turnkey works’ Works include Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.
4. 'L1' means the lowest technically accepted tender / bid / quotation (i.e. lowest landed cost including duties, taxes and freight & Insurance).
5. 'Margin of purchase preference' means the maximum extent to which the price quoted by the "Class-I local supplier" above the L1 (landed cost).
6. The margin of Purchase Preference shall be upto 20%.
7. 'Local content' means the amount of value added in India (i.e. indigenous items/services added in the offered products/ services/ works) be the total value of the item offered

(excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties/IGST) as a proportion of the total value (excluding net domestic indirect taxes), in percent.

8. Definitions: A supplier or service provider, whose goods, services or works offered for procurement, has local content: i. Equal to or more than 50%: Class-I local supplier. ii. More than 20% but less than 50%: Class-II local supplier. iii. Less than or equal to 20%: Non-local supplier.
9. The 'Class-I & II local supplier' should provide a "Self Certification" along with technical offer indicating that the item offered meets the minimum local content [as per SI. No.(3)] as called for in the EOI and provide the percentage of local content along with details of the location(s) at which the local value addition is made. In case of two bid tenders, it is mandatory to indicate compliance to MLC (minimum Local Content) in technical bid zone.
10. The ink-signed certificate shall be provided on vendors letter head along with the offer (, copy of ink-signed certificate shall be attached along with your offer under concerned tab. Original in Hard copy shall be produced on request). In case of non-submission of certificate, the purchase preference shall not apply.
11. In cases the quoted price is in excess of Rs.1000 Lakhs (including duties, taxes and freight & Insurance) the 'Class-I & II local supplier shall provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in case of suppliers other than companies) giving thepercentage of local content.
12. A committee (with an external expert from a practicing cost accountant or practicing chartered accountant, if required) constituted for independent verification shall verify the self-declarations & auditor's / accountant's certificates on random basis, as per the requirements.
13. In case of a complaint received from any local supplier indicating a need for review / verification of Local content of successful vendor / awarded vendor, for accepting a complaint from such complainant (w.r.t the false declaration given by the successful vendor on the local content), a complaint fee of Rs.2Lakhs or 1% of the locally manufactured items being procured (subject to a maximum Rs. 5Lakhs), whichever was higher, to be paid by demand draft by the complainant. In case, the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, deposited fee of the complainant would be refunded without any interest.
14. False declarations will be in breach of code of the integrity for which a bidder or its successor's will not be eligible/debarred for purchase preference from further tenders / pending tenders for two years along with other actions as may be applicable.

15.0 Conditions for Bidder from a country which shares land border with India

1. Any party from a country which shares a land border with India will be eligible to respond against this EOI, only if the party is registered with the Competent Authority. Competent Authority for the purpose of registration shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT).

2. Validity of Registration: Registration should be valid at the time of submission of EOI and should be valid at the time of placement of order.

3. Any false declaration and non-compliance of the above would be a ground for immediate rejection of offer / termination of the contract and further legal action in accordance with the laws.

ANNEXURES

ANNEXURE 1. RESPONSE FORMAT

FORM I: COVERING LETTER

(Company Letterhead)

(Date)

To

Sr. Purchase and Stores Officer
ISRO Inertial Systems Unit (IISU)
Vattiyoorkavu P O
Trivandrum 695 013

Ref: Expression of Interest Notice for 1Nms Reaction Wheel Production

Sir

Having examine the Expression of Interest (EoI), the receipt of which ishereby acknowledged we the undersigned, intent to submit a prequalification requirements proposal in response to the Expression ofInterest (EoI) for 1Nms Reaction Wheel Production.

Attach here to the response as required by the EoI, which constitutes ourproposal.Primary and Secondary contacts for our company are

	Primary Contact	Secondary Contact
Name		
Title		
Company Name		
Address		
Phone		
Mobile		
Fax		
E Mail		

We confirm that the information contained in this response or any partthereof, including its exhibits, and other documents and instrumentsdelivered or to be delivered to IISU is true, accurate, verifiable and complete. This response includes all information necessary to ensure thatthe statements therein do not in whole or in part mislead the department inits short - listing process.

We fully understand and agree to comply that on verification if any of theinformation provided here is found to be misleading the short listingprocess, we are liable to be dismissed from the selection process ortermination of the contract during the project, if selected to do so, forproviding 1Nms Reaction Wheel Production.

We agree for unconditional acceptance of all the terms and conditions setout in the EoI document.

It is hereby confirmed that I/We are entitled to act on behalf of ourcompany/corporation/firm/organisation and empowered to sign thisdocument as well as such other documents, which may be required in thisconnection.

Dated this Day of 202

(Signature) (In the capacity of)

(Name)

Duly authorized to sign the Tender Response for and on behalf of:

(Name and Address of Company) Seal/Stamp of Bidder

Witness Signature:

Witness Name:

Witness Address:

CERTIFICATE AS TO AUTHORISED SIGNATORIES

I,……. The company Secretary of ……..certify that …….. who signed the above Bid is authorized to do so and bind the company by authority of its board/governing body.

Date

Signature

(Company Seal)

(Name)

2. FORM II. GENERAL DETAILS OF THE ORGANISATION

Details of Organization
Name of the Organisation
Nature of the legal status in India
Legal Status Reference details
Nature of Business of India
Date of Incorporation
Date of Commencement of Business
Address of the Headquarters
Address of the Registered Office in India
Other Relevant Information
Mandatory Supporting Documents: a. Certificate of Incorporation from Registrar of Companies (ROC) b. Relevant sections of Memorandum of Association of the company or filings to the stock exchanges to indicate the nature of business of the company.

3. FORM III. FINANCIAL DETAILS OF THE ORGANISATION

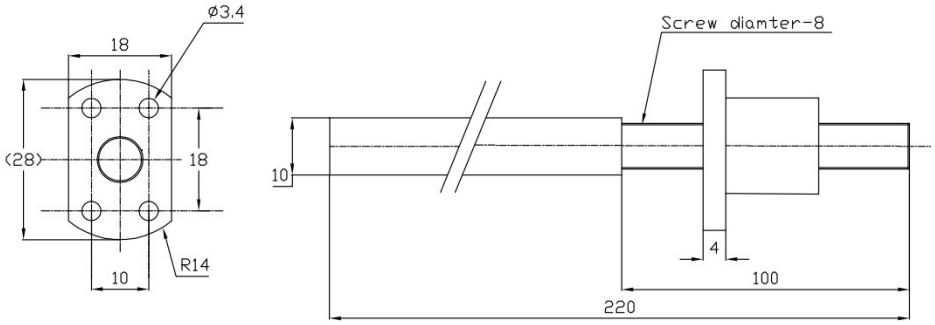
Financial Information					
Revenue (in INR Crores) Profit Before Tax (in INR Crores)	FY2020-21	FY2021-22	FY2022-23	FY2023-24	FY2024-25
Other Relevant Information					

Mandatory Supporting Documents

a. Auditor Certificate financial statements for the Last three financial years: 2023-24, 2022-23,2021-22 (Please include only the sections on P&L, revenue and the assets, not the entire balance sheet).
b. Unaudited financial statements certified by the company auditor for the latest year (2023-24) (in case the auditor certified statement for 2022-23 is not available)
c. Certification by the company auditors supporting the revenue break up for precision production and system integration services.

ANNEXURE 2. BROUGHT OUT ITEMS

Specification for Precision Ball Screw



Sl No.	Parameter	Type-A
1	Screw shaft Outer diameter	8 mm
2	Lead	1 mm
3	Number of loaded circuits	3
4	Basic dynamic load rating	800 N min.
5	Basic static load rating	1100 N min.
6	Overall length	220 mm min.
7	Total working length	100 mm min.
8	Unmachined shaft dimensions one end	ϕ10 mm dia x 120 mm length (min.)
10	Nut dimensions	ϕ28 mm outer dia x 4 mm flange thickness. Across flat 18mm, ϕ3.4 thorugh holes 4 nos.at 18x10 sq
11	Ball diameter	0.8 mm
12	Precision class	IT1
13	Preload (preferred)	Light preload
14	Axial clearance	< 5µ (*preferred is zero clearance*)
15	Screw and nut material	Cf53 steel/ 100Cr6
16	Screw hardness	Surface hardness of threads: HRC 58 min.
		Hardness of screw shaft end:
		HRC 30-35
17	Ball material	Chrome steel
18	Ball hardness	HRC 58 min.
19	Lubrication	Nut and screw to be grease plated with Braycote 601EF grease
20	Packing of ball screws	With excess lubrication, suitable for long term storage

Specifications for Bearings

1. TYPE

- Angular Contact with Flange; Inner ring relieved; Non-separable; Cotton phenolic cage
- ABEC – 7P standard

2. MATERIALS

Rings, balls : AISI 440C CEVM as per AMS 5618

Surface hardness : > 58 HRC

Race and ball surface finish : 0.05 microns

Cage : Cotton Phenolic

3. DIMENSIONAL AND ENGINEERING DATA

With respect to different bearing sizes the corresponding load rating, ball size and number of balls given in Table-1. This is for the purpose of reference and the manufacturer has to specify their load rating, number of balls and ball size.

Type	Bore Dia inch	Outer Dia inch	Widthinch	Load Rating, N			Ball Size inch	No of balls	Qty
				Radial Dynamic	Radial Static	Axial Static			
K	0.25	0.625	0.196	680	190	310	3 / 32	8	30

Flange Diameter : 0.690 inch

Flange Thickness : 0.042 inch

Table 1: Dimensional and Engineering Data

* Static Axial Capacity *is defined as minimum of the axial loads at which :*

a) ball- race contact stress at either inner race or outer race exceeds 4 GPa.

b) elliptical contact formed at ball- race contact truncates.

** Static Radial Capacity *is defined as minimum of the radial loads which results in :*

a) ball- race contact stress at either inner race or outer race exceeding 4 GPa.

b) permanent deformation of 0.0001 times ball diameter in either inner or outer race.

4. CAGE

One piece machined, outer ring land riding.

5. CONTACT ANGLE

Contact angle should be 15 ± 2 º.

6. RADIAL RUN OUT

The radial run out of the assembled bearing under stipulated axial pre-load should be as per ABEC 7 standards

7. TOLERANCES

Ring : ABEC-7P as per ABMA 12.1

Balls : Grade 5 AFBMA standard

8. LUBRICATION

The cotton phenolic cage of bearing to be vacuum impregnated with Braycote 815 Z oil and the bearing races to be grease plated with Braycote 601EF grease.

Specifications of Linear Bearing

The inner land of the fabricated linear bush bearing (Component 9 from table 1) is to be grease plated with Braycote 601EF grease.

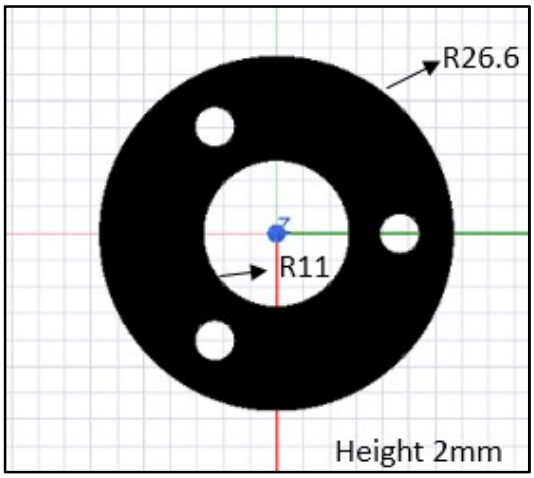
Specification of Potentiometer

Make and Model: Excellia SP15021A

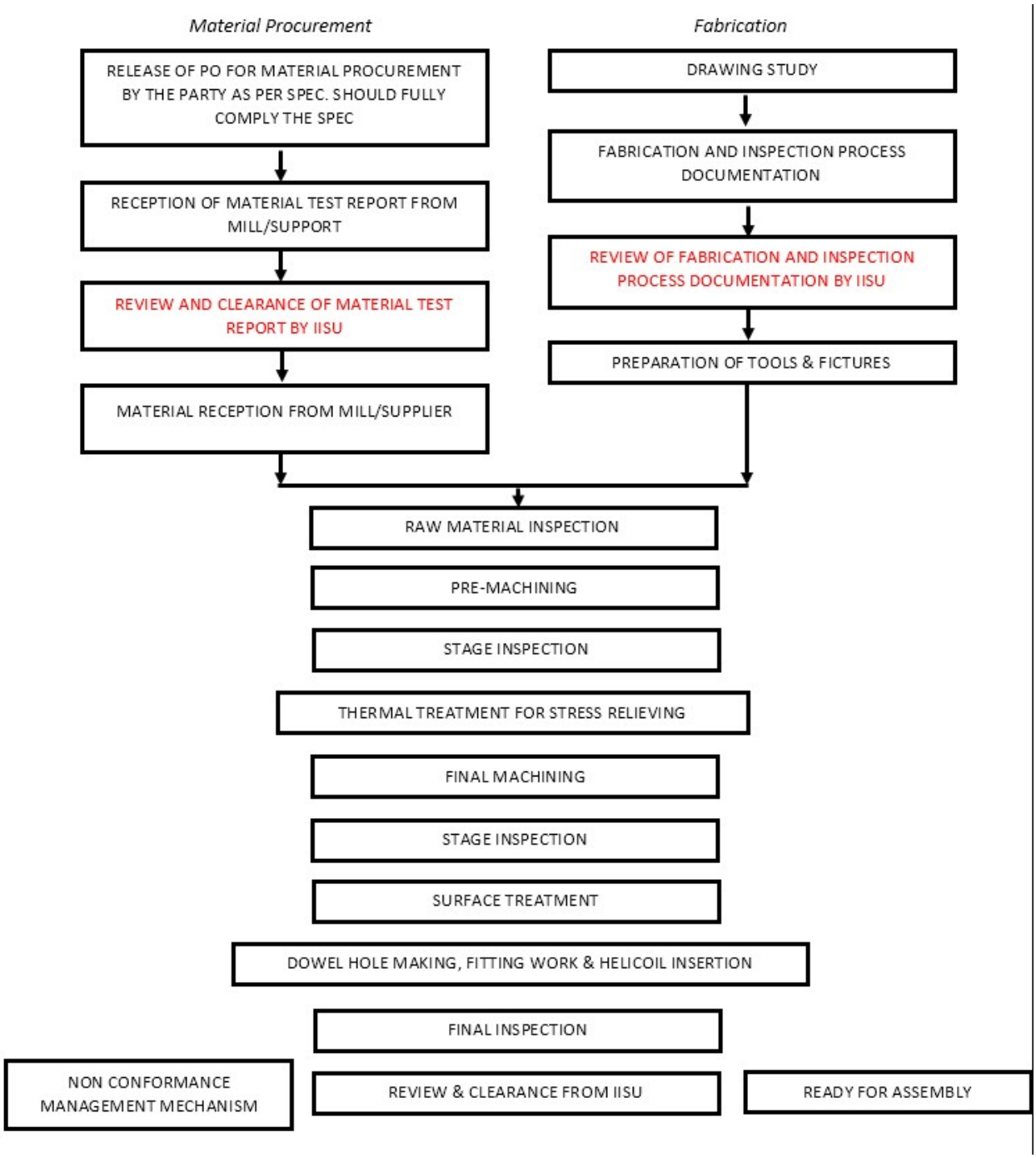
Sl No	Parameters	Specifications
1.	Electrical Charachteristics	
a.	Resistance	2.2 kΩ
b.	Independent Linearity	± 0.1%
c.	Linearity measurement step	10µm
d.	Backlash	10µm
e.	Output smoothness	< 0.1%
f.	Nominal dissipation	0.3W
g.	Insulation resistance (100V)	≥ 100MΩ
h.	Withstand Voltage	500V, 50Hz, 1min
i.	Power Supply	5V
2.	Mechanical Characteristics	
a.	Effective electrical travel	Nominal position ±4mm
b.	Total electrical travel	Nominal position ±5mm
c.	Mechanical travel	Nominal position ±6.5mm
d.	Shaft return force • Full retracted position • Full extended position	 ≥ 10N ≤6N
e.	Operating Speed	≤ 0.2mm/s
3.	Environmental Conditions	
a.	Operating temperature	-20°C to +125°C
b.	Vibration	According to MIL-STD-202 method 204D test condition G(30g pk)
c.	Shock	According to MIL-STD-202 method 213D test condition I (100g pk)
d.	Vacuum level	10^{-7} mbar or better

Permanent Magnet for Motor

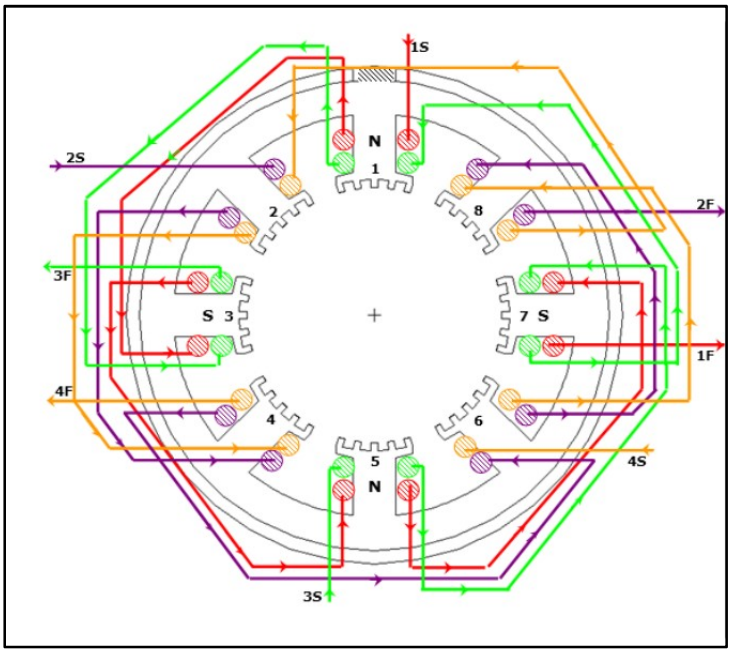
Sl No	Parameter	Specification
1	Magnet	Sm_2Co_{17}
2	Energy Product	28MGOe
3	Shape	Disc
4	Magnetization	Axial


R26.6
R11
Height 2mm

ANNEXURE 3: FABRICATION AND INSPECTION SEQUENCE



ANNEXURE 4. WINDING SEQUENCE



Prime Phase 1 – $P1^{+}$ $P1^{-}$: 1-2

Prime Phase 2 – $P2^{+}$ $P2^{-}$: 3-4

Rednt Phase 1 – $R1^{+}R1^{-}$: 5-6

Rednt Phase 2 – $R2^{+}R2^{-}$: 7-8

Poles marked when Prime phase1 is excited in +ve direction

No of poles : 8

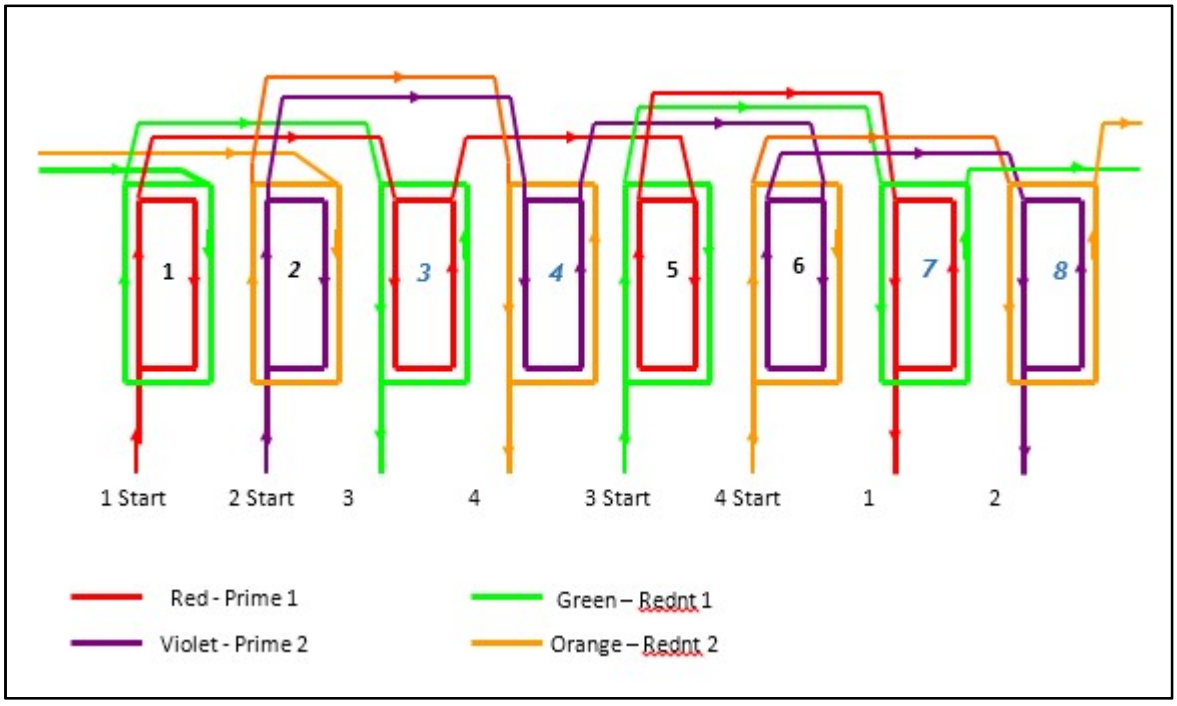
No of coils/pole : 2 (1 Prime+1 Rednt)

Coils in series/phase : 4

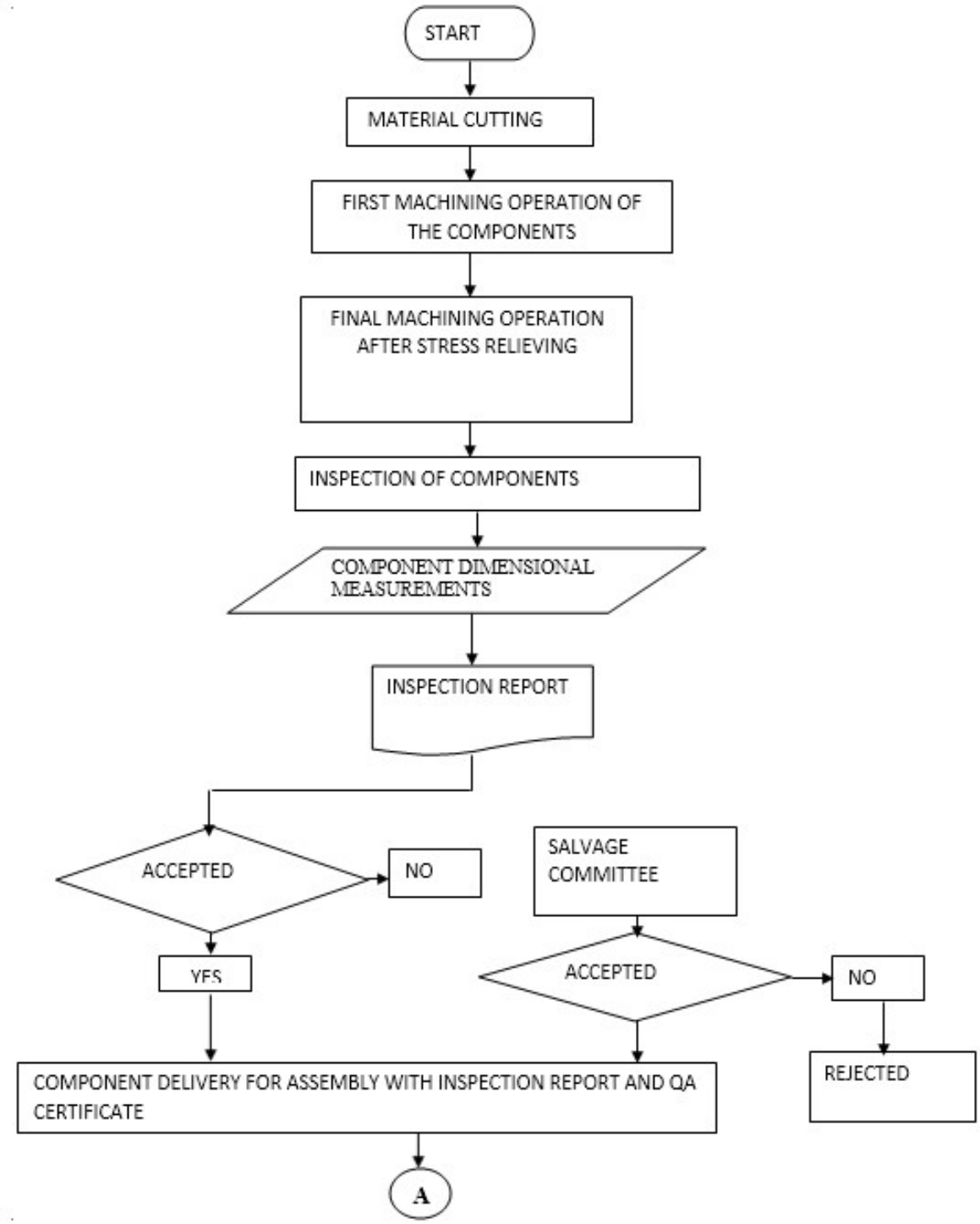
No of phases : 4 (2 Prime+2 Rednt)

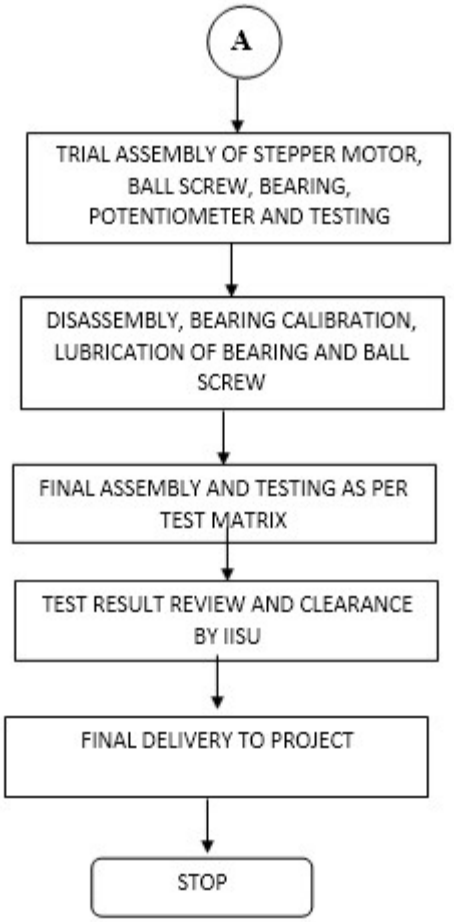
Tunrs /Coil : 40

Wire Guage : 24 AWG



ANNEXURE 6: MECHANICAL INTEGRATION SEQUENCE




A
TRIAL ASSEMBLY OF STEPPER MOTOR, BALL SCREW, BEARING, POTENTIOMETER AND TESTING
DISASSEMBLY, BEARING CALIBRATION, LUBRICATION OF BEARING AND BALL SCREW
FINAL ASSEMBLY AND TESTING AS PER TEST MATRIX
TEST RESULT REVIEW AND CLEARANCE BY IISU
FINAL DELIVERY TO PROJECT
STOP