भारत सरकार/GOVERNMENT OF INDIA
अंतरिक्ष विभाग/DEPARTMENT OF SPACE
द्रव नोदन प्रणाली केंद्र/LIQUID PROPULSION SYSTEMS CENTRE
वलियमला, तिरुवनंतपुरम - 695 547
VALIAMALA, THIRUVANANTHAPURAM – 695 547

भारत के राष्ट्रपति के लिए एवं उनकी ओर से प्रधान, क्रय व भंडार, द्रव नोदन प्रणाली केंद्र, वलियमला, तिरुवनंतपुरम निम्नलिखित सीलबंद रूचि-प्रकटन आमंत्रित करते हैं।
For and on behalf of the President of India, Head, Purchase & Stores, Liquid Propulsion Systems Centre, Valiamala, Thiruvanathapuram invites sealed Expression of Interest (EOI) for the following:

क्र. Sl. No.	रूचि-प्रकटन सं. EOI No.	विवरण Description
1.	TL48 2025040678	अगली पीढ़ी के प्रमोचनयान (एन जी एल वी) के इंजनों के लिए तरल नियंत्रण वाल्वों के उत्पादन हेतु रूचि-प्रकटन (ई ओ आई) Expression of Interest (EOI) for Production of Fluid Control Valves and Modules for Engines of Next Generation Launch Vehicle (NGLV)

रूचि-प्रकटन संबंधी विस्तृत दस्तावेज इसरो की वेबसाइट www.isro.gov.in/ www.lpsc.gov.in पर उपलब्ध है।
Detailed EOI documents are available on ISRO website www.isro.gov.in/ www.lpsc.gov.in

पूर्व- रूचि-प्रकटन संवाद बैठक की तिथि : 19/06/2025 को 10:30 बजे (ऑनलाइन माध्यम से)
Date of pre- EOI Interaction meeting: 19/06/2025 at 10:30 hrs (through online)

[बैठक में भाग लेने हेतु इच्छुक एजेंसियाँ 18/06/2025 के 14:00 बजे तक अपनी इच्छा pso_1@lpsc.gov.in पर मेल के माध्यम से सूचित करें। यदि आवश्यक हो तो संवाद बैठक के बाद स्थल के दौरे की व्यवस्था की जाएगी।]
[Interested agencies may intimate their willingness to participate in the meeting, by email to pso_1@lpsc.gov.in on or before 18/06/2025 by 14:00 hrs. Site visit can be arranged after the interaction meeting, if necessary]

03/07/2025 के 14.00 बजे तक या इससे पहले सीलबंद लिफाफे में उस पर **"अगली पीढ़ी के प्रमोचनयान (एन जी एल वी) के इंजनों के लिए तरल नियंत्रण वाल्वों के उत्पादन हेतु रूचि-प्रकटन" एवं ई ओ आई सं. TL48 2025040678 अंकित कर** जमा कर सकते हैं।
EOI shall be submitted on or before **03/07/2025 at 14.00 hrs.** in a sealed cover superscribing **"EXPRESSION OF INTEREST FOR PRODUCTION OF FLUID CONTROL VALVES AND MODULES FOR ENGINES OF NEXT GENERATION LAUNCH VEHICLE (NGLV)" and EOI No. TL48 2025040678.**

रूचि-प्रकटन खुलने की तिथि : 03/07/2025 को 14:30 बजे से
Date of Opening of EOI: 03/07/2025 at 14:30 hrs

05/06/2025

हस्ताक्षरित/Sd/-
प्रधान, क्रय व भंडार
HEAD, PURCHASE & STORES

Government of India

Department of Space

Liquid Propulsion Systems Centre

Valiamala, Thiruvananthapuram - 695 547

INVITATION FOR EXPRESSION OF INTEREST (EoI) FOR PRODUCTION OF FLUID CONTROL VALVES AND MODULES FOR ENGINES OF NEXT GENERATION LAUNCH VEHICLE

1. Preamble

LPSC, Valiamala, is engaged in the development, realisation and delivery of propulsion systems for the different launch vehicles and spacecraft programmes of ISRO. Among others, engines of these propulsion systems require high- precision and high- reliability elements like electro- pneumatic valves, check valves, motor operated valves and other similar products. These elements are broadly called as fluid control valves and modules.

Production of Fluid Control Valves and Modules for Engines of Next Generation Launch Vehicle involves:

- Procurement of raw material and standard parts by CONTRACTOR as per specifications provided by DEPARTMENT.
- Fabrication of parts as per approved drawings provided by DEPARTMENT, by CONTRACTOR in their facility.
- Assembly and testing of fluid control Valves and modules by the CONTRACTOR at DEPARTMENT premises by operating DEPARTMENT's facility under GOCO (Government Owned Company Operated) mode.

Through this Expression of Interest (EoI), LPSC indents to shortlist vendors in the field of aerospace, defense and space sector with suitable experience for executing this contract. In the next stage, RFP will be floated for shortlisted vendors in two part bid format viz. Techno- commercial bid and price bid.

Detailed project synopsis is attached as **Attachment- 1.**

2. Response to EoI

i. Vendors are advised to study all the instructions, Terms and Conditions, Forms, Requirements and other information provided in the EoI documents carefully. The submission of EoI shall be deemed to have been done after careful study and examination of the EoI documents with full understanding of its implications.

ii. DEPARTMENT reserves the right to request for any additional information and also reserves the right to reject the EoI response of any vendor, if in the opinion of DEPARTMENT, the qualification or data is incomplete or if the vendor is found not qualified to satisfactorily execute the work.

iii. Vendor shall bear all costs and expenses associated with preparation and submission of EoI document including post EoI clarification, discussion,

technical and other presentations and LPSC shall in no case be responsible or liable for such costs regardless of the outcome of the EoI process. Also, the vendor shall not be entitled to claim any costs, charges and expenses incidental to or incurred by them in connection with the submission of the EoI.

iv. The response to this EoI should be full and completed in all respects. Failure to furnish all the information required by the EoI document or submission of proposal not substantially responsive to the EoI documents to every respect will be at the risk of the Company/ Firm(s) and may result in rejection of the document.

v. Canvassing in any form in connection with EoI is strictly prohibited and such canvassed EoI submitted by the Agency are liable to be rejected.

vi. This EoI document is not an offer and is issued with no commitment. DEPARTMENT reserves the right to withdraw the invitation to EoI at any stage without assigning any reasons what so ever.

vii. Addendum/ Corrigendum if any, to this EoI, will be hosted in our website, www.isro.gov.in. Vendors shall regularly monitor our website for any updates.

3. Interaction meeting

An interaction meeting shall be arranged at LPSC in order to have a better understanding of the activities involved, clarify doubts if any, and to visit site, if required. The interested vendor(s) are hereby requested to take part in the Pre-EoI meeting scheduled as below:

Date : 19/06/2025
Time : 10:30 AM
Venue : Online
Focal point : Purchase & Stores Officer [Email: pso_1@lpsc.gov.in, Tel: 0471-2567813]

Interested vendor(s) shall provide the details of the representative(s) taking part in the interaction meeting well before 18/06/2025 (14:00 hrs) to the Focal Point.

Please note that any request for advancing/ postponement of Pre-EoI meeting will not be entertained under any circumstance. Attending Pre-EoI meeting is **not an essential requirement** for submitting EoI.

Table I: Schedule

Interaction meeting	19/06/2025 (10:30 AM)
Last date for submission of response to EoI	03/07/2025 (02:00 PM)
Opening date of EoI	03/07/2025 (02:30 PM)

Complete response to EoI must be received at LPSC to the address given below but not later than the date specified above. Response to EoI in the prescribed format as per the terms & conditions mentioned in **Attachment- 1 (Project Synopsis)** shall be submitted in a sealed cover super scribed with our Ref. No. and Due date for EoI. All the pages of the EoI submitted must be numbered and signed by the authorised signatory.

Addressee:

Head, Purchase & Stores,
Liquid Propulsion Systems Centre
Valiamala, Thiruvananthapuram-695 547

Submission of EoI by email will not be accepted. LPSC shall not be responsible for non- receipt of EoI due to any type of delays and it shall be the sole responsibility of the Vendor to ensure delivery of the EoI to LPSC within the time fixed.

PROJECT SYNOPSIS

PRODUCTION OF FLUID CONTROL VALVES AND MODULES FOR ENGINES OF NEXT GENERATION LAUNCH VEHICLE

INDEX

Sl.No.	Details	Page No.

1. Abbreviations

ISRO	Indian Space Research Organisation
LPSC	Liquid Propulsion Systems Centre, Valiamala
Fluid control valves	Device employed in the propulsion systems to control flow, as well as regulate pressure of liquids and gases employed in liquid engines and stages consisting of valves, regulators etc.
Modules	One or more fluid control valves mounted on a common base plate and interlinked through plumbing
NGLV	Next Generation Launch Vehicle
NS1, NS2 & NS3	First, second & third stages of NGLV respectively
C32	Cryogenic stage with 32T propellant loading
NFAT	NGLV Flow control valves Assembly & Test Facility
A & T	Assembly & Testing

2. Definitions

Wherever used hereinafter, the following expressions shall have the following meanings:

1. **'Expression of Interest'** is the document specifying requirements of systems to be realised, scope of work involved, eligibility criteria/ conditions for short-listing of Bidders and details of credentials to be submitted for evaluation.
2. **'ISRO'** means the Indian Space Research Organisation under the DEPARTMENT OF SPACE.
3. **'LPSC' means** Liquid Propulsion Systems Centre, Valiamala, Thiruvananthapuram- 695 547
4. **'DEPARTMENT'** means the President of India or his successors, representatives or assigns, in this case, THE DIRECTOR, LIQUID PROPULSION SYSTEMS CENTRE (LPSC), THIRUVANANTHAPURAM- 695 547.
5. **'CONTRACTOR'** means the vendor who will finally be assigned this work
6. **'AEROSPACE'** is collectively referred to the atmosphere and outer space.
7. **'CONTRACT'** means an agreement that will be entered with the CONTRACTOR.
8. **'FABRICATED PART'** means individual pieces manufactured as per the supplied drawings, processes and procedures.
9. **'STANDARD PART'** means finished product that can be used directly in the assembly.
10. **'TESTING'** is a demonstration by test, that a hardware can meet performance requirements when exposed to specified environments.
11. **'TOOLING'** means any hardware that is necessary for realizing individual parts or assemblies.
12. **'FIXTURE'** means any hardware that is necessary for holding parts or Valves/ modules at any stage of manufacture or for containing the testing media during testing.
13. **'MANUFACTURING'** means gamut of all those processes and activities that converts the parts into valves/ modules or assemblies.
14. **'INSPECTION'** means all those processes that confirm by physical measurements, visual assessment and other means to verify that parts have been made to specifications.
15. **'RAW MATERIAL** 'means a material that has to undergo change in form before it can be used as a part.
16. **'APPROVAL'** means documents in the approval category require approval from the 'DEPARTMENT' prior to implementation by the CONTRACTOR. Approval is understood to mean permission to proceed unless otherwise specified.
17. **'PQR'** means Procedure Qualification Records, which documents the elaborate experimentation attempted to qualify the variables encountered during a process. In this CONTRACT it will primarily refer to welding.
18. **'WPS'**, means Weld Procedure Specification, which essentially defines the set of qualified parameters to be used in welding.
19. **'FCD'**, means Functionally Critical Dimension, deviations to which will seriously hamper the rated performance of any hardware.
20. **'PCD'**, means Process Critical Dimension, which essentially controls the conformity of a process to specification.

21. **'NCR'**, means Non- Conformance Report, which essentially reports the non-conformance to specification in each part, assembly or in process.
22. **'LSC'**, means Local Salvage Committee, which will be the first level committee to analyse and decide on NCRs.
23. **'DOCUMENTS',** means all those data held as hard copy and soft copy
24. **RFP** - Request for proposal
25. **PQC** - Pre- Qualification Criteria.

3. Introduction

LPSC proposes to contract out End to End Realisation and delivery of fluid control valves and modules of engines of NGLV from raw material to final product and deliver for the project. CONTRACTOR is expected to procure the material, fabricate the parts and procure the standard parts. Also, final assembly and testing of these valves and modules shall be carried out inside LPSC campus by operating LPSC facility under GOCO mode (Government Owned Company Operated). In GOCO mode operation, CONTRACTOR need to deploy his manpower to carry out assembly and testing including operation of the facility and deliver fluid control valves and modules for above stages as per requirement.

This 'Project Synopsis' document gives the overall scope of work, description, pre-qualification criteria and other details.

The respondent of this EoI shall submit the following documents:

- Expression of Interest as per the format given in **FORM I**
- Non- Disclosure Agreement (NDA) (to be executed on INR 100 stamp paper) as per the format given in **FORM II** to the effect of maintaining confidentiality of the documents to be provided in the Request For Proposal (RFP) by the Department.
- Respondent's profile to be filled up as per **FORM III** of the EoI. Also, scanned copies of necessary supporting documentary evidence to be attached. (Do not leave any cell blank; fill up as **'Not applicable'** if necessary)
- Respondent shall submit the Compliance Statement as per the format provided in **FORM X**

Based on the Respondent's profile and other details, the Department will evaluate their capability and shortlist the Capable Bidders based on Pre- Qualification Criteria given in Section 9 of this Project Synopsis. The Department will issue the RFP document giving detailed technical specification, scope of work, commercial terms and conditions to the qualified vendors based on this EoI. The shortlisted bidders shall submit the bid in 2 parts viz. (i) Techno commercial (non- priced) bid and (ii) Price bid. Upon evaluation of Techno- commercial bid and post- bid techno-commercial meeting, if necessary, the Department will shortlist the 'Suitable Bidders' and place them on equal footing. The Department will open the price bids of the Suitable Bidders, hold post- bid price negotiation meeting, if necessary, and award the contract based on lowest- priced bid.

4. Scope of work

Scope of the work is **end to end production** of fluid control valves and modules for the Engines of Various stages of NGLV which involves:

- Procurement of raw material and standard parts by CONTRACTOR as per specifications provided by DEPARTMENT.
- Fabrication of parts as per approved drawings provided by DEPARTMENT.
- Assembly and testing of fluid control valves and modules shall be carried out by the CONTRACTOR at DEPARTMENT premises by operating DEPARTMENT's facility under GOCO mode (Government Owned Company Operated) as per approved documents provided by DEPARTMENT.

The fluid control valves proposed to be realised through this contract include Check Valves, Pneumatic valves, Solenoid valves, Motor operated valves, Electro pneumatic valves, relief valves and modules.

The materials of construction include Stainless steels, Aluminum alloys, Titanium alloys, copper alloys and plastics like PTFE, PCTFE, polycarbonate etc.

The functional requirements of fluid control valves proposed to be manufactured fall within the specification given below:

Sl.No.	Parameter	Specification
1	Operating pressure	4 to 370 bar
2	Operating temperature	20 to 800 Kelvin
3	Response time	10 to 1000 milli second
4	Internal leakage	$\leq 1x10^{-3}$scc/s
5	External leakage	$\leq 1x10^{-6}$scc/s
6	Flow rates	3kg/s of GN2 (max.) 12 kg/s of GHe (max.)
7	Test medium	DM Water, Gaseous Nitrogen, Gaseous Helium, Liquid Nitrogen

The above parameters may vary from hardware to hardware. To meet the above requirement, workmanship of the highest skill, discipline and dedication with a penchant to follow laid down procedures are expected from the CONTRACTOR.

Typical Fluid control valves

Typical Module

Size of Fluid Control Valves	Ø 35 mm x 70 mm (Min.) Ø 350 mm x 680 mm (Max.)
Size of Modules	350mm (l) x 200 mm (b) x 170mm (h)
Total Quantity of Fluid Control valves and Modules for 4 flights	2052 Nos.

a) Types and quantity of fluid control valves and modules to be realised is given as **Annexure 1**
b) An additional set of selected valves and modules shall first undergo qualification testing prior to clearance for production lot. The details will be provided in RFP.
c) The requisite assembly and test fixtures shall also be realised by the CONTRACTOR using the drawings and specifications given by the DEPARTMENT.
d) The CONTRACTOR shall also implement necessary Production Monitoring System (PMS) software for tracking and archiving the total process end to end.

The process of realisation of fluid control valves and modules are generally as follows:

4.1. Procurement of Metallic and non- metallic raw material

Metallic and non- metallic raw material shall be procured by the CONTRACTOR from the approved list of vendors of the DEPARTMENT. List of approved and qualified Vendors will be provided by the DEPARTMENT in RFP. Metallic materials include stainless steels, Aluminium alloys, copper alloys etc. Non-metallic materials include plastic materials and rubber materials.

4.2. Procurement of Standard parts

Standard parts (O- rings, bellows, filters, springs, fasteners and electrical items etc.) shall be procured from approved vendors of the DEPARTMENT. List of approved and qualified Vendors will be provided by the DEPARTMENT in RFP.

4.3. Fabrication of parts

CONTRACTOR shall fabricate parts in his own facility or with limited sub-contracting.

Sub- contracting shall be agreed and approved by the DEPARTMENT subject to the capability of the Sub- Contractor and scope. Sub- contracting shall be between the CONTRACTOR and the sub- contractor/ suppliers.

Any sub- contracting agreed by the DEPARTMENT shall not absolve the obligations and responsibilities of the CONTRACTOR.

4.4. Assembly & testing of fluid control valves and modules.

CONTRACTOR shall carry out assembly and testing in LPSC Valiamala through GOCO mode (Government Owned Company Operated) using LPSC facilities. For this, human resource with adequate knowledge in the areas of manufacturing,

metrology, non- destructive inspection and quality control, assembly and testing shall be deployed to GOCO facility by the CONTRACTOR. (List of labs in GOCO facility is attached as **Annexure- 2).**

LPSC will be providing the facilities and equipment to the CONTRACTOR. The operation of these facilities for production of valves/ modules shall be carried out by CONTRACTOR. Also, necessary consumables such as nitrogen gas, helium gas, liquid nitrogen etc. shall be procured by the CONTRACTOR. Maintenance of these equipment and systems installed by the DEPARTMENT shall be carried out by DEPARTMENT. Consumables for the operation of facility and fluids and chemicals required for assembly and testing shall be procured by the CONTRATOR.

5. Overall Realisation plan

Industry qualification shall be completed within 18 months from date of signing the contract.

Production shall be completed within 30 months from date of completion of qualification.

Detailed realisation plan will be provided in RFP document.

6. Hardware Realisation

The CONTRACTOR shall follow the following procedure for hardware realisation and clearance:

- Procurement of raw material and standard parts by CONTRACTOR as per specifications provided by DEPARTMENT.
- Fabrication of parts as per approved drawings provided by DEPARTMENT at CONTRACTOR's facility or through limited sub- contracting by the CONTRACTOR.
- Assembly and testing of fluid control valves and modules shall be carried out by the CONTRACTOR at DEPARTMENT premises by operating DEPARTMENT's facility under GOCO mode (Government Owned Company Operated) as per approved documents provided by DEPARTMENT.

The assembly operation as well as the functional tests shall be carried out as per the respective documents. An assembly checklist shall be maintained to make sure that the processes proceed as per the plan and that all the operations have been carried out. All the activities on a valve or module shall be entered in the respective assembly logbook.

The functional test reports along with the assembly checklist and assembly logbook shall be handed over to the CONTRACTOR's QA who shall confirm that only cleared parts have gone into the assembly and that the assembly and functional tests have been carried out as per the approved procedures.

The CONTRACTOR's QA, on screening, shall summarily reject valves & modules with major deviations and at the same time accept valves & modules with no deviations. For salvageable valves & modules, the CONTRACTOR's QA shall raise an NCR and refer the same to the Local Salvage Committee (LSC) that shall give its disposition.

The CONTRACTOR shall be bound to abide by the decision of the LSC. Depending on the disposition, the CONTRACTOR's QA shall clear the valves & modules for further processing. All rejections and failures shall be reported to the contract manager.

The CONTRACTOR's QA shall then present a summary of results and the delivery documentation to the Test Results Review Committee (TRRC), which shall give the final stamp of acceptance for the valves & modules.

End to End QC surveillance is the responsibility of the Contractor.

7. Process Flow

7.1. Procurement of Raw material

Raw materials for the fabrication of parts of fluid control valves and modules and A & T fixtures shall be procured by the CONTRACTOR.

a) Placing purchase order with vendors
b) Testing of raw material samples as per QAP.
c) In situ inspection along with Quality team of LPSC as per QAP.
d) Consolidation & Verification of following test certificates as mentioned in the Material specification document & QAP
   - Visual & Dimensional inspection certificates
   - Chemical composition certificates
   - Heat treatment report
   - Mechanical property report
   - Metallurgical analysis report
   - Non- Destructive Test (NDT) report
e) Generation of NCR and ratification in the appropriate committee of Department.

7.2. Fabrication of parts

Parts of valves/ modules shall be fabricated by the CONTRACTOR at their own facility or with limited sub- contracting. Fabrication of parts include following activities:

a) Preparation of fabrication process document and inspection plan document of each part. Document shall be submitted to LPSC and clearance shall be obtained. QC plan document also shall be submitted.
b) Preparation of WPS, PQR & NDT plan and obtain clearance from LPSC.
c) Ensure that RMCC (Raw Material Clearance Certificate) is available for raw materials.
d) Machining and finishing operations of parts in an air- conditioned room with environmental conditions of temperature 20 $\pm$1°C, Relative Humidity 50 $\pm$5%, illumination 500 LUX. Fabrication process includes cutting, milling, EDM, drilling, turning, thread cutting, polishing, lapping, suiting etc.
e) Other additional operations like heat treatment, surface treatment, Welding (EB & TIG), crimping etc. as per LPSC approved documents, if applicable.
f) Dimensional inspection of fabricated parts shall be in an Air conditioned room with environmental condition of temperature 20 $\pm$1°C, relative

humidity 50 ±5%, illumination 500 LUX & dust level 5 micron (abs). The inspection shall be carried out strictly as per this approved inspection plan.

g) Engrave/ tag the parts with unique identification number as instructed in the drawing.
h) Traceability from raw materials to fabricated parts shall be ensured in every stage.
i) Generation of NCR and clearance of these deviations from LSC/ NCRB.
j) Preparation of following documents & reports related to fabricated parts:
    - Raw Material Clearance Certificate (RMCC)
    - Dimensional inspection report
    - Surface treatment report (if applicable)
    - Heat treatment report & hardness measurement report (if applicable)
    - Welding Report (if applicable)
    - Crimping Report (if applicable)
    - Suiting list of mating parts as per drawing
    - NC clearance report
k) Generation of bonding clearance based on above documents (checklist) and submission for bonding clearance of fabricated parts for audit by LPSC QA.

7.3. Procurement of standard parts & Assembly consumables

Standard parts of valves/ modules shall be purchased by the CONTRACTOR based on the specification provided by the DEPARTMENT. Standard parts include fasteners, filter, spring, Bellows, C- rings, O- rings, electrical items etc. Following are the activities included in this process:

a) Procurement of standard parts & assembly consumables as per specifications provided by the DEPARTMENT.
b) Testing & Batch qualification of standard parts/ assembly consumables as per specification & Qualification document provided by the DEPARTMENT.
c) Generation of NCs and clearance of these deviations from LSC fabrication/ NCRB.
d) Compilation of certificates like Material certificates, Dimensional inspection certificates, Surface treatment certificates, Batch qualification certificates, NC clearance certificates etc.
e) Generation of bonding clearance based on above documents (checklist) and submission of bonding clearance for audit by LPSC QA.
f) Engrave/ tagging the parts with unique identification number as instructed by LPSC.
g) Storage & handling of cleared parts shall be carried out as per document provided by the DEPARTMENT.

7.4. Assembly & testing

a) Assembly & testing of the valves/ Modules shall be carried out at LPSC facility by the manpower deployed by the CONTRACTOR.
b) Detailed assembly & test procedure will be provided by LPSC and checklist document shall be prepared by CONTRACTOR for each deliverable. CONTRACTOR shall ensure that all points mentioned in the document are followed.

c) If any kind of Non- conformances arises at any stage of Assembly & testing, CONTRACTOR shall generate NC report and get clearance from LSC/ NCRB.
d) Process flow for Assembly & testing is detailed below:

7.4.1 Pre- assembly

The Pre-assembly activities will be carried out in the sub assembly preparation lab. The pre- assembly activities include the following:

i. Withdrawal of fabricated parts and standard parts from the store.
ii. Preparation of part list as per latest drawing and obtain Contractor's QA clearance.
iii. Visual inspection of parts.
iv. Thorough de-burring of holes, edges and corners (if required)
v. Suiting of threads during trial assembly.
vi. Cleaning and purging of parts.
vii. Visual inspection of critical parts (seats, seals, plunger, poppet, sliding area, etc.) under microscope
viii. Proof pressure test.
ix. Post proof pressure test cleaning.
x. Lapping of seats, sliding parts, etc. (if required)
xi. FCD inspection Sliding clearance computation.
xii. Rework of parts if required.
xiii. Surface treatment, spring & bellow calibration etc.

7.4.2 Functional Assembly

The Functional assembly is carried out inside a clean room of class 10,000. The Functional Assembly activities include the following;

i. Ultrasonic cleaning of parts.
ii. Vacuum drying of subassemblies.
iii. Mechanical assembly

7.4.3 Electrical Assembly

The Electrical assembly is carried out inside the electrical labas per approved document. The electrical Assembly activities include the following activities;

i. Epotherm coating,
ii. Coil winding.
iii. Screening of micro switches, diodes, actuators/motors & connector
iv. RTV filling and cleaning.
v. Connector wiring and soldering.

7.4.4 Functional Testing

The functional testing is carried at the clean room and the various test labs of LPSC facilities. The functional testing activities include the following;

Functional test & flight acceptance tests for various categories of Fluid control valves/modules to be done are as follows;

Check Valves

- Cyclic actuation
- Internal seat leakage test
- Cracking pressure test
- Reseat & reseal pressure test
- Reverse seat leakage test
- Low temperature test
- Environmental test
- Flow test
- External Leakage test
- Environmental test
- External Leakage test

Pneumatically Operated Valves

- Internal seat(s) leakage test
- Cyclic actuation
- Response test
- Flow test
- Minimum command pressure test
- Low temperature test
- Environmental tests
- External leakage test

Motor Operated valves

- Electrical checks
- Internal seat leakage test
- Actuation margin test
- Response test
- Cyclic actuation
- Environmental tests
- External Leakage test

Electro pneumatic valves/ Solenoid valves

- Electrical checks
- Internal seat leakage test
- Actuation margin test/ thrust measurement test
- Response test
- Cyclic actuation
- Low temperature tests
- Environmental tests

- External Leakage test

Modules assembly

- Plumbing bending
- Ball check
- Welding and NDT checks
- Post welding hydraulic & pneumatic proof test
- Flushing & contamination checks using solvents
- Functional tests/ Actuation tests
- Flow tests
- Environmental tests
- External leak tests

7.5. Post assembly activities

After completion of flight acceptance testing activities, following activities are also to be completed:

i. Interface Control Dimension (ICD) check.
ii. Wire locking, Weighing of valves/modules.
iii. Preparation of test report
iv. Hardware shall be delivered with entire documents with QA clearance.

8. Facilities at the DEPARTMENT's site

The facilities for carrying out the Assembly, testing & related activities will be available at DEPARTMENT's site. It includes Assembly facilities, Machining facility for assembly correction and re- work, Inspection facility, NDT facility & testing facilities. CONTRACTOR shall deploy the trained manpower for operation of these facilities.

The details of the facilities are attached as **Annexure- 2.**

9. General Terms and Conditions

9.1 **Execution period**: The execution period reckoned from the date of award of Contract to the date of completion shall be 48 months including qualification of first set of hardware. Time is the essence of the Contract. If the ordered items are not supplied within the delivery schedule, Liquidated Damages (LD) shall be levied from your bill @ 0.5% per week for the undelivered items subject to a maximum of 5% of the order value for the delayed period. However, in case of inordinate delay i.e., delay of more than one- fourth (25%) of the total completion period, LD shall be applicable subject to a maximum of 10%.

9.2 **Security Deposit**: The contractor shall submit a Security Deposit (SD) for a sum equal to 3% of the total Contract price while commencing the work.

9.3 **Warranty**: The items shall be warranted for satisfactory performance for a period of 12 months from the date of final acceptance. The contractor shall submit a Performance Bank Guarantee (PBG) for a sum equal to 3% of the total contract price.

9.4 **HR Policy**: The Service Provider shall have HR policy of retaining trained workforce. This is very essential since attrition would lead to derailment of

production activities, affect quality and result in inordinate delay in delivery schedule and lead to uncertainty in contract execution.

9.5 **Absolute Responsibility:** Throughout the currency of the Contract, the CONTRACTOR shall be solely responsible for the correctness, accuracy and sufficiency of the documents, drawings, tools, jigs, fixtures, bought out consumables etc. Any clearance given by the DEPARTMENT shall not absolve the CONTRACTOR of their responsibility in executing the Contract in full conformity with the specifications.

10. Pre-Qualifying Criteria (PQC)

The following are the Pre-Qualification Criteria (PQC) for screening-in forthe issue of RFP.

Sl No	Description	Remarks
1.	The Bidder shall have been operational for minimum 5 (five) years up to the date of response submission and shall have experience of minimum 5 (five) years (up to the date of Response submission) in Aerospace/ defence domain.	Documentary evidence shall be provided. **This is an Essential criterion**
2.	The Bidder shall have a valid PAN certificate and a valid GST registration certificate.	Bidders shall submit the copy of PAN certificate and GST certificates **This is an Essential criterion**
3.	The Bidder shall have a sound financial track record as prescribed herein below: i. Minimum annual average Turnover of INR **30 Crore** per year for the past 3 (three) financial years (i.e., financial year 2023- 24, 2022- 23, and 2021- 22) ii. Positive net worth for two years in the past 3 (three) financial years (i.e., financial year 2023- 24, 2022- 23, 2021- 22). i.e., as per audited statements of accounts, the bidder should not have incurred financial loss during above said period i.e., 2 years in past 3 financial years.	Bidder shall submit documents such as Annual profit and loss statement, Cash flow and Income tax return statement issued by a practicing Chartered Accountant/ Cost Accountant. **This is an Essential criterion**
4.	Bidders should have executed satisfactorily end to end realisation of valves/ assembly and testing of valves for defence/ aerospace application (on board	Bidders shall submit the details of contract executed as per the

	[not ground application]) with a single order cost of **INR 100 lakhs (minimum)** for last 5 years i.e., from 31/3/2020 to 31/3/2025.	format provided in **FORM- IV)** and PO copies also shall be attached. **This is an Essential criterion.**
5.	The Bidder shall be an Indian Entity under Indian Management and Control. • Legal Entity: The Bidder shall be: (i) a company incorporated under the Companies Act, 2013 or (ii) a partnership firm established under the Limited Liability Partnership Act, 2008 (iii) a trust under the Indian Trusts Act, 1882 (iv) an association of persons or body of individuals incorporated under relevant statutes in India. • Foreign Investment: Any foreign investment into the bidding entity shall be as guided by the Foreign Exchange Management (Non- Debt Instrument) Rules 2019 and subject to the Bidder remaining an Indian Entity under Indian Management and Control.	Documentary evidence shall be provided. **This is an Essential criterion**
6.	The Bidder shall not have been blacklisted by any Central/ State Government Department/ Public Sector Undertakings/ Central Government- funded organizations/ State Government- funded organizations/ World Bank, or other World Bank organizations or should not be under any illegal expression by the Government of India.	Bidder shall submit the Declaration for Non-blacklisting as per the format provided in **FORM- VIII).** **This is an Essential criterion**
7.	There shall be no outstanding bankruptcy, judgment or pending legal action that could impair the operations of the Bidder as a going concern. Also, the Bidder must be solvent.	A Certificate in this regard shall be issued by a practicing Chartered Accountant/ Cost Accountant. **This is an Essential criterion**
8.	The Bidder shall have valid AS 9100 Rev D/ ISO 9001:2015 certification.	Bidders shall submit the details of quality management as per the format provided in **FORM- VI** **This is an Essential**

		criterion
9.	The bidder shall not submit multiple responses to this EoI through other Affiliates.	Bidders shall submit the Anti- collusion certificate as per the format provided in **FORM- IX.** **This is an Essential criterion**
10.	The bidder shall have own facility for the fabrication and inspection of parts of fluid control valves and modules. Details of Machinery and marks for the evaluation are attached as **Annexure- 3.** **The bidder needs to obtain minimum score of 60 out of 100.** **Let the marks obtained = X**	Bidder shall submit the details of machines of fabrication and inspection as per the format provided in **FORM- V).** **This is an Essential criterion**
11.	The bidder shall have human resource with adequate knowledge in the areas of manufacturing, metrology, non- destructive testing, inspection and quality control, assembly and testing. Details of area expertise of human resource and marks for each category are attached as **Annexure- 4.** **The bidder need to obtain minimum score of 60 out of 100** **Let the marks obtained = Y**	Bidder shall submit the details of human resource as per the format provided in **FORM- VII).** **This is an Essential criterion**
12.	The bidder need to obtain composite marks of minimum 70 for the pre- qualification criteria mentioned in Sl. no. 11 and 12 together. i.e., (Marks obtained for Sl.no.11+ Marks obtained for Sl.No.12)/2 i.e., (X+Y/2) shall be minimum 70.	**This is an essential criterion.**
13.	The bidder needs to furnish Compliance Matrix, duly filled in [as per **Form- X**] along with the response	**This is an essential criterion.**

Note:

- Capability of the bidder will be evaluated and RFP will be issued to the shortlisted bidders based on the pre- qualification criteria (Sl. No 1- 13) and documents submitted.
- In case of requirement, LPSC personnel shall visit the bidder's premise for evaluation.

FORM-I Cover Letter for Application/ Response

Company letter head

No..... Date:.....

Head, Purchase & Stores.
Purchase & Stores Division
Liquid Propulsion Systems Centre
Indian Spare Research Organisation
Valiamala, Thiruvananthapuram
PIN - 695 547

Sir / Madam,

Sub: Submission of Expression of Interest
Ref: Invitation for Expression of Interest No.....

With respect to your Notice vide above referred invitation for EoI, we hereby submit our Expression of Interest (EoI) to participate in the Bidding for "Production of Fluid Control Valves and Modules of Engines of Next Generation Launch Vehicle". We attach the relevant documents requested in your Notice.

Thanking you,

Yours faithfully

(Authorized Signatory)

FORM-II Non- Disclosure Agreement

I/ We, having our office at _____ being interested to participate in the bidding for "Production Of Fluid Control Valves And Modules Of Engines Of Next Generation Launch Vehicle" project vide invitation for EoI No. _____ dated _____ by Govt. of India, Dept. of Space, Liquid Propulsion Systems Centre (LPSC), Valiamala, Thiruvananthapuram, Kerala - 695 547 (hereinafter referred to as LPSC), do hereby declare that:

1. Any information submitted or given by LPSC to me/ us shall be treated by me/ us in strict confidence.
2. The term 'information' comprises of technical knowledge of any nature (documents, data, materials, process details and the like) whether patented or not.
3. I/ We understand and agree that the penalties detailed in the Indian Official Secrets Act, 1923, for breach of trust in maintaining the confidentiality of the said technical knowledge shall be suffered not only by our Company/ Organization as body corporate, but also individually on its Chief Executive and me.
4. The provision of the Indian Official Secrets Act, 1923 (XIX of 1923) shall apply to me/ us with reference to exchange and use of information provided by LPSC to me/ us during the course of working for the project.
5. I/ We shall not make public, any knowledge or information which LPSC shall have disclosed or may hereafter disclose to me/ us incident to the placing of any order on us.

Signed by:

Name:
Designation:

Countersigned by:

Authorized signatory of Contract with Name & Address

Place:

// Company Seal //

Date:

Witness: 1.

2.

FORM-III General Details of the Bidder

Sl. No.	Particulars	Input of the Bidder
1	Company Profile	
	Name:	
	Country of incorporation:	
	Address of the corporate headquarters and its branch office(s)	
	Date of incorporation and or commencement of business:	
	Corporate Website URL	
	Addresses of manufacturing and/ or operational setup in India (Highlight the address where ISRO representative will visit for audit)	1. 2. 3.
2	Brief description of the Company including details of its main lines of business and proposed role and responsibilities in this Project:	Type brief profile of the Party not more than 2 pages
3	Details of individual(s) who will serve as the point of contact/ communication for the Authority:	
	Name:	
	Designation:	
	Company:	
	Address:	
	Telephone Number:	
	E-Mail Address:	
	Fax Number	
4	Particulars of the Authorized Signatory of the Bidder	
	Name:	
	Designation:	
	Address:	
	Phone Number:	
	Fax Number	

FORM-IV Experience in Aerospace Projects

Sl. No.	Project Name	Aerospace/ Defence	Client/ Organization Name	Date of contract/ issue of work order	Project Value	Status (Ongoing/ completed)

Project Data Sheets for each individual project

Name of the Aerospace/Defence Industry	
Scope of Work	
PO Date	
Value of the Contract (INR/ Any other currency#)	
Present Status of the PO	
Application**	
Is any part of the above work sub- contracted to other Parties? If yes, provide the details	
Name of the sub- contractors	Description of activity outsourced to sub-contractors

Note:

- Copies of work orders/ purchase orders, completion certificates/proof for work completion and contract agreements shall be submitted.
- ** Mention if the system is for on-board or ground or any other use
- # For work orders/ purchase orders/ completion certificates/contract agreements awarded in any currency other than INR, the applicable exchange rate for converting to INR for the purpose of determining the project value would be the exchange rate prevailing as on the date of award of the respective project.
- In case of requirement, LPSC personnel shall visit customer's premise for evaluation.

FORM-V Manufacturing Facilities & Inspection facilities

List of infrastructure and facilities available with the Bidders against the given requirements **(Annexure- 2)** shall be submitted.

Sl.No.	Equipment/ Machine	Specification	Qty.	Remarks
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10				

FORM-VI Quality Management

1	State the Quality Policy of the Bidder (Max in 200 words)	(Type overall Quality management system and mention about the quality department reporting, non- conformance management system, quality control practices, record maintenance, onsite activity QMS and internal review mechanism)
2	Quality Standards/ certifications obtained by the Bidder [Tick the appropriate box] (provide certification copies as Annexures)	AS9100Rev C
		ISO 9001:2008 Others (If others, kindly mention)

Certification Agency:

FORM-VII Manpower details

Manpower Strength of Sole Bidder in the following streams/ discipline.

Sl. No.	Area of expertise	Engineers	Supervisors	Technicians
1	Procurement & Inventory Management			
2	Precision Machining			
3	Precision Assembly			
4	Quality Assurance & reliability			
5	TIG/ MIG /Orbital TIG welding			
6	Electron Beam welding			
7	Pressure Test & Leak test			
8	Metrology & NDT (UT, DP and Radiography)			
9	Environmental testing (Thermal cyclic test/ Vibration test) and Instrumentation and Data acquisition			
10	Operation of high pressure gas systems and Surface Treatment			

Note: Mention the levels of technical hierarchical structure (from entry level to highest cadre) of your organization.

FORM-VIII Declaration of Non- Blacklisting

(To be provided on the Company letter head)

1. We confirm that our company or firm, _____, is currently not blacklisted in any manner whatsoever by any of the State or UT and/ or Central Government in India on any ground including but not limited to indulgence in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.

2. We confirm that our company or firm, _____, is currently not under liquidation, court receivership or similar proceedings, and should not be bankrupt.

(Authorised Signatory)

Signature:

Name:

Designation:

Address:

Seal:

Date:

FORM-IX Anti- Collusion Certificate

(To be provided on the Company letter head)

We hereby certify and confirm that in the preparation and submission of our Application/ Bid (as applicable) for "Production of fluid control valves and modules of engines of Next Generation Launch Vehicle" against the EoI issued by Authority, We have not acted in concert or in collusion with any other eligible Bidder/ Bidders (as the case may be) or other person(s) and also not done any act, deed or thing, which is or could be regarded as anti- competitive. We further confirm that we have not offered nor will offer any illegal gratification in cash or kind to any person or organization in connection with the instant Bid.

We also confirm that neither we nor our members have any conflict-of-interest terms provided in this EoI.

(Authorised Signatory)

Signature:

Name:

Designation:

Address:

Seal:

Date:

FORM-X Compliance Matrix

Sl. No.	Description	Compliance (Yes/No)	Remarks (in case of No)
1.	Compliance of Section 1 to 9 of EoI		
2.	Terms and Conditions of Project synopsis (Section 8)		
3.	Pre-Qualification criteria (Section 9)		
4.	Form I: Cover Letter for Application/ Response		
5.	Form II: Non- Disclosure Agreement		
6.	Form -III: General Details of the Bidder		
7.	Form-IV: Experience in Aerospace Project		
8.	Form V: Manufacturing Facilities & Inspection facilities		
9.	Form VI: Quality Management		
10.	Form VII: Manpower details		
11.	Form VIII: Declaration of Non- Blacklisting		
12.	Form IX: Anti- Collusion Certificate		

Annexures

Annexure- 1

Types and quantity of Engine Fluid Control Valves & Modules

Sl No	Type of Fluid Control Valves/ Modules	Quantity for 4 flights
1.	Pneumatically operated Valves	516
2.	Check Valves	584
3.	Motor Operated Valves	140
4.	Electro pneumatic valve/Solenoid valve	648
5.	Relief valves	44
6.	Manually operated valves	112
7.	Modules	8
	Total	**2052**

Annexure- 2

Labs at Department's Facility for Assembly and Testing

Sl No	Name of facility
1	High pressure gas storage and distribution systems
2	Pre-assembly lab
3	Clean room 01 & 02 (ISO-7)
4	Spring calibration lab
5	Proof pressure test lab
6	Pneumatic lab 01 &02
7	Low temperature test lab
8	Water flow test lab
9	Vibration lab
10	Thermal lab
11	Wiring & coil winding lab
12	Instrumentation and data acquisition labs
13	Surface treatment lab
14	Ultrasonic cleaning & flushing lab
15	Leak & actuation lab
16	Sub assy. preparation lab
17	Deburring lab
18	Machining lab
20	EB welding lab
21	TIG Welding Lab
22	Metrology Lab
23	NDT lab
24	Fabricated parts store
25	Standard parts store
26	Raw Material Store

Annexure 3

Evaluation Matrix for Fabrication and Inspection Facilities

1] Machining Facility

Sl. No.	Equipment/ Machines	Specification			Marks (Max)
1	**Conventional Centre Lathe** -1 Nos	Centre Height	:	100 (min.)	3
		Spindle Accuracy	:	<= 0.05 mm	
		Speed range (RPM)	:	50- 2020 (Nominal)	
2	**Conventional Milling Machine** - 2 Nos	Axis traverse - longitudinal	:	600 mm (min.)	3
		Axis traverse -Cross	:	250 mm (min.)	
		Axis traverse -Vertical	:	300 mm (min.)	
		Spindle Accuracy (Runout)	:	<= 0.02mm	
		Speed range (RPM)	:	40-1800 (Nominal)	
3	**Die-sinking EDM** - 1 No	Axes Traverse (X & Y)	:	350x250 mm (min.)	4
		Z axis travel	:	300 mm (min.)	
		Accuracy & Repeatability (Asper VDIDGQ3441) of all 3axes	:	<= 0.005mm	
4	**Wire EDM** - 1 No	Axes Traverse (X & Y)	:	600 x 400 mm (min.)	4
		Z axis travel	:	250 mm (min.)	
		Taper Angle	:	±30Deg up to 50 mm	
		Accuracy & Repeatability (Asper VDIDGQ 3441) of all 3axes	:	<= ±0.002mm	
		Wire Size	:	Dia 0.1-0.3 mm	
		Best Surface Finish	:	Ra 0.4 or better	
5	**Drill EDM** - 1 No	Axes Travel (X & Y)	:	350x250 mm (min.)	3
		Z axis travel	:	250 mm (min.)	
		Electrode Material	:	Copper, Brass	
		Hole Size:	:	Ø 0.3 - 3mm	

6	**CNC Lathe** - 6 Nos	Turning diameter	:	Ø 300 mm (min.)	4
		Spindle Speed (RPM)	:	50 - 3500 (Nominal)	
		Positioning Accuracy in (X &Z)	:	X = 0.005, Z = 0.001 mm (min.)	
		Repeatability	:	0.006 mm (min.)	
		Spindle accuracy(runout at nose)	:	0.005 mm (min.)	
7	**Vertical Machining Centre** - 4 Nos	Axes Traverse (X & Y)	:	600 x 560 mm (min.)	6
		Z axis travel	:	500 mm (min.)	
		Spindle Speed (RPM)	:	20 - 14000 (Nominal)	
		Accuracy X, Y, Z	:	0.005 mm (min.)	
8	**Cylindrical Manual Grinding Machine** - 1 No	Distance between centers	:	650mm (min.)	4
		Height of the centres	:	175 mm Work head & Wheel head	
		spindle bearings	:	Hydrodynamic bearings	
		Roundness on live spindle (Accuracy)	:	0.0005 mm or better	
9	**Jig boring machine** -1 No	X axis travel	:	500 mm (min.)	6
		Y axis travel	:	400 mm (min.)	
		Z axis travel	:	300 mm (min.)	
		Positional Accuracy for all 3 axes	:	0.005 or better	
		Repeatability for all 3 axes	:	0.005 or better	
10	**High Precision Manual Lathe** - 4 Nos	Height of centers	:	150mm (min.)	4
		Distance between centers	:	500mm (min.)	
		Spindleaccuracy (runout at nose)	:	0.001 or better	
11	**Surface grinding machine** - 1 No	Table travel	:	700 x 350 mm (min.)	2
		Distance of spindle centre to table	:	500 mm (min.)	
12	**Precision Drilling machine** - 1 No	Table travel	:	450 x 250 mm (min.)	5
		Quill stroke	:	110 mm (min.)	

		Spindle speed (RPM)	:	50 - 6300 (Nominal)	
13	**Automatic Bandsaw Cutting Machine** - 2 Nos	Max work Holding	:	360 x 360 mm (min.)	2
		Max Cutting Speed	:	360 m/ min	
		Control	:	Fully Automatic (PLC controlled)	
				Total (Max)	**50**

2] Welding Facility

Sl. No.	Equipment	Specification			Marks (Max)
1	**Electron Beam Welding Machine** -1 No	Chamber size	:	350mm cube	7
		Beam Power	:	6kW.	
		Voltage	:	0-60kV	
		Beam Current	:	0-100mA	
		Welding Speed	:	0-2m/min.	
		Gun Type	:	Triode Type Vertical Gun	
		No.of Guns	:	One	
2	**TIG welding machine** -1 No	Current Range	:	3A-400A	3
		Rated output	:	250amps @100% duty cycle & 300amps @60% duty cycle	
		OCV	:	75V	
		Polarity	:	AC & DC	
		Welding Processes	:	High speed pulsed and constant current TIG welding, Stick welding(SMAW)	
				Total (Max)	10

3] Surface Treatment Facility

Sl. No.	Equipment	Specification			Marks (Max)
1	Pickling and passivation and decontamination Set up -1 No	Bath Size	:	250 x 250 x 200 mm (Approx.)	5
				Total (Max)	5

4] Heat Treatment Facility

Sl. No.	Equipment	Specification			Marks (Max)
1	Heat Treatment Vacuum Furnace -1 No	Configuration	:	Vertical Loading Type	5
		Charge Capacity	:	30kg	
		Hot Zone Size:	:	Dia.300mmx450 mm	
		Max. operating temp.	:	1350deg.C	
		Min. operating temp.	:	-85 deg.C	
		Accuracy	:	±5Deg.C	
		Vacuum Level	:	10-5mbar	
				Total (Max)	5

5] Inspection Facility

Sl. No.	Equipment	Specification			Marks (Max)
1	Surface plate	Range	:	1 m x 1 m	0.5
		Accuracy	:	< 2 μ	
2	Micrometers(Ext. &Int, etc.)	Range	:	200/100 mm	1
		Accuracy	:	1 μ	
3	Vernier calipers	Range	:	300 mm	1

		Accuracy	:	10 μm	
4	**Dial indicators** (lever & plunger type)	Range	:	0.2/100mm	1
		Accuracy	:	2/110, 1, 0.5μm	
5	**Bore dial gauges**	Accuracy	:	1μ	0.5
6	**Pin gauges**	Range	:	10/5/1μm steps	0.5
7	**Depth gauge**	Accuracy	:	1μ	0.5
8	**Micrometers** (flange, groove, PCD Vernier etc.)			Different ranges and accuracies	1
9	**Electronic height gauge**	Range	:	600 mm	1
		Accuracy	:	1 μm	
10	**Ring/plug gauges**	Range	:	M3 to M14	0.5
		Accuracy	:	6 H	
11	**Slip gauge set**		:	Inspection grade	0.5
12	**Magnifying system**	Range	:	10X	0.5
13	**Height master**	Range	:	300 mm	1
		Accuracy	:	<= 2μm	
14	**Stereo microscope**	Magnification	:	50 X	0.5
15	**Profile projector**	Range	:	400 mm screen,	2
		resolution	:	1μm	
17	**Roundness tester**	Range	:	300 mm dia	4
		Accuracy	:	<0.5 μm	

18	**Contour graph/form talysurf**	Range	:	Transverse length 100 mm	4
		Resolution	:	1μ	
19	**Corodinate Measuring Machine (CMM)**	Size	:	300 x 300 x 300 mm	4
		Resolution	:	0.2 μm	
		Accuracy	:	0.5 μ	
20	**Endoscope** (visual inspection)	Magnification	:	10 X	3
21	**Surface finish tester** (portable)	Measuring length	:	25 mm	3
		Cut off	:	0.4, 0.8 mm	
				Total (Max)	30

Annexure 4

Evaluation Matrix for Human Resource

Sl No.	Area of expertise	Marks (max.)
1.	Procurement & Inventory Management	10
2.	Precision Machining	10
3.	Precision Assembly	10
4	Quality Assurance & reliability	10
5	TIG/ MIG/ Orbital TIG welding	10
6	Electron Beam welding	10
7	Pressure Test & Leak test	10
8	Metrology & NDT (UT, DP and Radiography)	10
9	Environmental testing (Thermal cyclic test/ Vibration test) and Instrumentation and Data acquisition	10
10	Operation of high pressure gas systems and Surface Treatment	10
	Total (Max.)	**100**