



भारत सरकार/Government of India
अंतरिक्ष विभाग/Department of Space
द्रव नोदन प्रणाली केंद्र
LIQUID PROPULSION SYSTEMS CENTRE
एच ए एल II स्टेज, 80 फीट रोड
HAL II STAGE, 80 FEET ROAD,
बेंगलूरु/BANGALORE-560 008.
फोन सं./Phone No.080 25037140
ई-मेल/Email: purchase@lpscb.gov.in



दिनांक/Date: 06.03.2024

लोक निविदा सूचना सं. एल बी202400005401 दिनांक 06.03.2024

PUBLIC TENDER NOTICE NO. LB202400005401 DATED 06.03.2024

अनुप्रयोग सॉफ्टवेयर के साथ आँकड़ा अभिग्रहण प्रणाली की आपूर्ति, इसके संस्थापन एवं परीक्षण हेतु निविदा।

Tender for Supply, installation and testing of Data Acquisition System with application software.

निविदा वर्गीकरण/Tender Classification : लोक निविदा/PUBLIC TENDER

निविदा की निर्धारित तिथियाँ/TENDER SCHEDULE

| | |
|---|--------------------|
| बोली प्रस्तुति की आरंभिक तिथि/Bid Submission Start Date | : 06.03.2024 14:00 |
| बोली स्पष्टीकरण की नियत तिथि/Bid Clarification Due Date | : 13.03.2024 14:00 |
| बोली प्रस्तुतीकरण की नियत तिथि/Bid Submission Due Date | : 27.03.2024 14:00 |
| बोली खुलने की तिथि/Bid Opening Date | : 27.03.2024 14:30 |
| मूल्य बोली खुलने की तिथि / Price Bid Opening Date | : 10.04.2024 14:00 |

निविदा दस्तावेज़ <https://www.isro.gov.in/> OR <https://eproc.vssc.gov.in> या इसरो ई-प्रापण पोर्टल से डाउनलोड किए जा सकते हैं। Tender documents can be downloaded from <https://www.isro.gov.in/> OR <https://eproc.vssc.gov.in> or ISRO E-Procurement Portal.

हस्ताक्षरित/Signed
क्रय व भंडार अधिकारी/Purchase & Stores Officer

**GOVERNMENT OF INDIA
DEPARTMENT OF SPACE
LIQUID PROPULSION SYSTEMS CENTRE (LPSC-B)
BANGALORE**

**Tender for Supply, installation and testing of Data Acquisition System
with application software for OMPS-EGSE**

Bids to be submitted online

**Tender No.: LPSC-B/Liquid Propulsion Systems
Centre,Bengaluru/LB202400005401 dated 06-03-2024**

A. Tender Details

| | |
|------------------------|---|
| Tender No : | LPSC-B/Liquid Propulsion Systems Centre,Bengaluru/LB202400005401 |
| Tender Date : | 06-03-2024 |
| Tender Classification: | GOODS |
| Purchase Entity : | Liquid Propulsion Systems Centre,Bengaluru |
| Centre : | LIQUID PROPULSION SYSTEMS CENTRE (LPSC-B) |

Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE

Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE

A.1 Tender Schedule

| | |
|------------------------------|-------------------------|
| Bid Submission Start Date : | 06-03-2024 14:00 |
| Bid Clarification Due Date : | 13-03-2024 14:00 |
| Bid Submission Due Date : | 27-03-2024 14:00 |
| Bid Opening Date : | 27-03-2024 14:30 |
| Price Bid Opening Date : | 10-04-2024 14:00 |

B. Tender Attachments

NA

Instructions To Vendors

1. GENERAL INSTRUCTION TO TENDERERS : SINGLE or TWO PART PUBLIC TENDER(PT)

1. Mode of delivery should be clearly specified with justification

2. ONLY CLASS I/CLASS II LOCAL SUPPLIERS ARE ELIGIBLE TO PARTICIPATE IN THE TENDER ENQUIRY.

Note: (a)CLASS I: Those suppliers/service providers whose goods/ works/ services offered for procurement meets Local content equal to or more than 50%.

(b)CLASS II : Those suppliers/service providers whose goods/ works/ services offered for procurement meets Local content more than 20%.

(c) The 'Class-I local supplier'/ 'Class-II local supplier' at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'/ 'Class-II local supplier', as the case may be. They shall also give details of the location(s) at which the local value addition is made along with the offer.

3. As far as implementation of public procurement policy (Preference to make in India) Order, 2017 is concerned, the Office Orders vide No. P-45021/2/2017-B.E-II dt. 15.06.2017, which is partially modified by Order No. P-45021/2/2017-PP(BE-II) dt. 28.05.2018, Order No.P-45021/2/2017-PP(BE-II)dt. 29.05.2019, Order No. P- 45021/2/2017-PP (BE-II) dt 04.06.2020 and Order No.P-45021/2/2017-PP (BE-II) dt 16.09.2020 and subsequent Amendments issued by the Department for Promotion of Industries and Internal Trade, Ministry of Commerce and Industry and Internal Trade, Ministry of Commerce and Industry regarding Class-I/Class-II local suppliers, Purchase preference, verification of local contents etc shall be applicable to this tender. Therefore, bidders may ensure compliance of the same while submitting tenders.

4. Based on the response to the e-Public tender Notice, LPSC(B) reserves the right to change any milestone date of the tendering activity.

5. Bidders are expected to comply with the technical & commercial and other terms and conditions given in vendor specified terms of this tender. In case of any deviation, the reasons thereof should be clearly specified in the vendor specified terms column.

6. Bids will not be entertained after the due date and time.

7. Delivery Terms:

In case of Indigenous items : FOR LPSC, ITPF, TUMAKURU CAMPUS

In case of Foreign orders: EX-WORKS / FOB /FCA

8. EARNEST MONEY DEPOSIT NOT APPLICABLE

9. Fax & Email offers are not accepted.

10. Head, Purchase and Stores, LPSC, Bangalore, reserves the right to accept or reject any/or all the tenders in part or full without assigning any reasons thereof.

11. If an agent submits bid on behalf of the Principal/OEM the same agent shall not submit a bid on behalf of another Principal/OEM in this tender for the same Item/Product.

12. In a tender, either the Indian Agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same Item/Product in this tender.

13. In case of any clarification to be sought to this tender you may please contact Purchase and Stores Officer (PSO) through Email: purchase@lpsc.gov.in and Ph No: 080 250 37 170/171/140

14. Instructions to Indian Agent:- Bidders are required to provide the following information in respect of their authorization from their Principal, if any, along with technical bid as the same is mandatory as it is required for consideration of the bid. Name, Address, Telephone no. , Fax no., email of the Indian Agent including the contact person to be provided.

15. LPSC(B) reserves the right to verify all claims made by the bidder.

16. Original Equipment Manufacturer (OEM) or their representative can submit bid to LPSC(B). Indian agents while quoting on behalf of their principals are requested to attach necessary authorization letter from their Principals in their bid.

17. Price Preference shall be extended to the MSEs under the Public Procurement Policy for MSEs. Such MSEs shall produce documentary proof of registration as per provisions of the Policy ie: registration with District Industries Centre (DIC) or Khadi and Village Industries Commission (KVIC) or Khadi and Industries Board (KVIB) or Coir Board or National Small Industries Commission (NSIC) or Directorate of Handicrafts and Handlooms or Udyog Aadhar Memorandum or any other body specified by Ministry of MSME.

18. Request for the extension of the due date will not be considered.

19. Tenderers can participate in the said tender opening for which, the representative of the firm shall be duly authorized by Competent Authority. Against proper e-authorization only such representatives shall be allowed to attend the tender opening.
20. TENDER FEE NOT APPLICABLE.
21. Tenders which are not prepared in terms of these instructions are liable to be rejected.
22. The exact date and time of opening of price bid of successful tenderers will be intimated later.
23. The offer should be valid for a minimum period of six (06) months from the due date of opening.
24. The parties are advised to download the tender and submit the bid on online at least two days prior to Tender Closing Date to avoid last minute network problem. The due date shall not be extended due to network or computer related problems.
25. The quoted price is fixed & firm. Once the offer is submitted in on line mode by the vendor and bid sealing is done by LPSC(B), vendor will not be able to provide revised offer.
26. The quote should indicate quantity wise unit rate separately which have to be filled online in Price Part-II. The Prices are to be mentioned both in figures as well as in words. The GST, Duties, etc., are to be calculated and indicated in the column provided in online forms explicitly.
27. The vendors have to compulsorily submit the compliance statement online otherwise their offer will not be considered for further evaluation. Before entering the compliance statement, vendors are advised to refer the detailed specification provided in the Technical Writeup/ Drawings document. The specification offered by the vendors may also be indicated in the compliance statement wherever necessary.
28. The vendors have to get themselves registered in above site to download the tender details. To register in above ISRO portal (<https://eprocure.isro.gov.in>) the vendors need to have Class - III Digital Certificate. The Digital Certificate can be obtained from any digital certifying authority. The following e-tokens with their current drivers are tested and working fine with our system. Aladdin, Vasco, Starkey, Moser baer, E-pass-2003, Safenet-2032, WD Proxkey Grey / SPC Token and Trustkey.

C. Bid Templates

C.1 Technical Bid - Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE

1. Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE.

Item specifications for Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE.

| SI No | Specification | Value | Compliance | Offered Specification | Remark |
|-------|--|-----------------|--------------------|-----------------------|--------|
| 1 | Detailed specification of Data acquisition system with application software is attached in Documents | Refer Documents | Yes / No / Explain | | |

Document : Compliance matrix

Document : Specification document

Common Specifications (Applicable for all items)

| SI No | Specification | Value | Compliance | Offered Specification | Remark |
|-------|---|-------|------------|-----------------------|--------|
| 1 | Refer section 5.1 of attached RFP for general specification of data acquisition system and Refer section 6.0 for application software | | - | | |

Supporting Documents required from Vendor

1. Refer section No.7 for documents

5 additional documents can be uploaded by the vendor

C.2 Commercial Terms / Bid

| Sl. No. | Description | Compliance | Vendor Terms |
|---------|---|--------------------|--------------|
| 1 | This is a Two Part Tender. Do not mention price element in Techno Commercial Bid. If any Price element mentioned in technical bid, your offer will not be considered. | Yes / No / Explain | |
| 2 | GST: Kindly mention exact percentage of GST (HSN Code, if applicable) IGST@5% concessional rate for supply of Goods: IGST concessional rate @ 5% is applicable for the following goods mentioned under Sl. No. 243B as per Department of Revenue Notification No. 07/2018: "Scientific and technical instruments, apparatus, equipment, accessories, parts, components, spares, tools, mock ups and modules, raw material and consumables required for Launch Vehicles and Satellites and Payloads" Kindly mention the nature of Goods. | Yes / No / Explain | |
| 3 | P & F charges (if applicable) | Yes / No / Explain | |
| 4 | Payment Term: - 100% payment shall be made through RTGS within 30 days of receipt and acceptance of the items at our site. | Yes / No / Explain | |
| 5 | Delivery Period (Within 06 months from the date of receipt of PO) | Yes / No / Explain | |
| 6 | Liquidated Damages (LD): - Since delivery is the essence of this order, LD @ 0.5% per week or part thereof subject to a maximum of 10% of the order value of undelivered Stores for each calendar week of delay. The total liquidated damages shall not exceed ten percent (10 percent) of the contract price of the unit or units so delayed. | Yes / No / Explain | |
| 7 | Warranty : Warranty for the offered item shall be from the date of installation/acceptance of the item at our site for a minimum period of one year or as specified in the tender document. Warranty certificate shall be provided along with supply. | Yes / No / Explain | |

| | | | |
|----|---|--------------------|--|
| 8 | Performance Bank Guarantee (PBG) : You have to submit a PBG from a Nationalised / Scheduled Bank in Rs.200/- Stamp Paper for 3% of the order value towards the performance of the system at the time of supply valid till the completion of warranty period plus 60 days (as claim period) as per the format provided by the Department. OR 3% of the order value shall be with held till the completion of Warranty Period plus 60 days. | Yes / No / Explain | |
| 9 | Security Deposit (SD) : You have to furnish a Bank Guarantee from a Nationalised / Scheduled Bank in Rs.200/- Stamp Paper for 3% of the order value within 10 days of receipt of order towards the faithful execution of the order valid till the completion of the scope of work as per order plus sixty days(as claim period). (This will be returned to you immediately on execution of the order satisfactorily as per order terms. In case of non-performance / poor performance, the amount will be forfeited). | Yes / No / Explain | |
| 10 | Security Deposit cum Performance Bank Guarantee (SD cum PBG):In case, if parties are unable to provide two separate BGs i.e. one for SD and one for PBG, they can submit a combined BG for SD cum PBG from a Nationalised / Scheduled Bank in Rs.200/- Stamp Paper within 10 days of receipt of order for 3% of order value valid till the completion of total contractual obligation (i.e. supply period plus warranty period plus 60 days) as per the format provided by the Department. | Yes / No / Explain | |
| 11 | Freight charges : If any, mentioned as EXTRA OR INCLUDED in your quote, please mention the percentage in Vendor Terms. | Yes / No / Explain | |
| 12 | Installation Charges: If any, mentioned as EXTRA OR INCLUDED in your quote, please mention the percentage in Vendor Terms. | Yes / No / Explain | |
| 13 | In case two or more tenders are received from an Indian agent on behalf of more than one foreign Principal/OEM, in the same tender for the same item/product will not be considered. | Yes / No / Explain | |

| | | | |
|----|--|--------------------|--|
| 14 | Insurance : Being a Government of India Department, Insurance is not required at our cost. Please ensure the safe delivery of the ordered item with proper AIR / SEA / ROAD worthy packing. | Yes / No / Explain | |
| 15 | Validity of Offer : (a) The validity of the offers should be 06 months from the date of opening of the tenders. NOTE : Tenders validity period shorter than offer validity mentioned above will not be considered for evaluation. | Yes / No / Explain | |
| 16 | Warranty : Warranty for the offered item shall be from the date of installation/acceptance of the item at our site for a minimum period of one year or as specified in the tender document | Yes / No / Explain | |
| 17 | In case of foreign orders:(a) Please specify whether any Export clearance is required. If it is required please provide End User Certificate format along with offer. (b) Please specify whether any Agency Commission is involved or not. If YES mention the percentage of Agency Commission. [Agency Commission shall be claimed by the Indian Agent through an Invoice. The Agency Commission shall be paid to the Indian Agent in Indian Rupees worked out on the basis of Telegraphic Transfer buying rate of exchange prevailing on the date of placement of the Purchase order/Contract and shall be paid within 30 days from the date of satisfactory acceptance of the item at our site. Distributers are not eligible for Agency Commission] | Yes / No / Explain | |
| 18 | Arbitration: In the event of dispute or difference arising out of or in connection with this purchase order/contract, which cannot be resolved through amicable settlement by mutual consultation, the same shall be settled under the Rules of Arbitration & Conciliation act 1996 under the Indian statute only, whose decision shall be final and binding on both the parties. | Yes / No / Explain | |
| 19 | Jurisdiction: The Courts in and around the City of Bangalore alone shall have jurisdiction to deal with and decide any matter or dispute whatsoever arising out of this agreement including those arising under the Arbitration Act. | Yes / No / Explain | |

| | | | |
|----|--|--------------------|--|
| 20 | Force Majeure: Neither LPSC, Bangalore nor party shall be considered in default of the performance of their obligations under this Purchase Order if such performance is prevented or delayed for any causes beyond the reasonable control of the parties to the order getting affected, such as Acts of God, war, riots, civil, commotion, illegal strikes, legal lock-outs, epidemics, fire accidents of any Government thereof, provided notice in writing of any such cause with necessary proof that the obligation under the Purchase Order is hereby affected or prevented or delayed is given within 14 days from the happening of the event. As soon as the cause of force majeure has ceased to exist, the party whose ability to perform his obligation has been affected shall notify the other party of the actual delay that has occurred due to such force majeure condition. | Yes / No / Explain | |
| 21 | Details of Indian Agent: Address, contact details like Telephone Number, Fax, e-mail etc., (if applicable) | Yes / No / Explain | |
| 22 | Address, contact details like Telephone Number, Fax, e-mail etc., on which order to be placed. | Yes / No / Explain | |
| 23 | Details of Principal:Address, contact details like Telephone Number, Fax, e-mail etc., (if applicable) | Yes / No / Explain | |
| 24 | You shall provide suppliers bank details such as name of the bank, IFSC code, IBAN Number, SWIFT etc., along with your offer which shall be not be changed till completion of payment. | Yes / No / Explain | |
| 25 | Offers received through fax or email or unsigned will not be considered. | Yes / No / Explain | |
| 26 | Any other terms shall be mentioned in Vendor Terms column. | Yes / No / Explain | |

| | | | |
|----|---|--------------------|--|
| 27 | Special conditions against Indian Agents submitting quotations in Foreign Currency: (a) Foreign Principals proforma invoice indicating the commission payable to the Indian Agent and nature of after sales service to be rendered by the Indian Agent. (b) Copy of Agency agreement with the Foreign Principal and Indian agent, precise relationship between them and their mutual interest in the business. (c) Copy of registration and item empanelment of the Indian agent. | Yes / No / Explain | |
| 28 | The tenders received from Indian agents on behalf of their foreign Principals/OEMs (in cases where the Principals/OEMs also submit their tenders simultaneously for the same item/product in the same tender) the same will be not be considered. | Yes / No / Explain | |
| 29 | Purchase/Preference to MSEs: Purchase/Price Preference shall be extended to the MSEs under the Public Procurement Policy for MSEs formulated under the Micro, Small & Medium Enterprises Development Act 2006. Necessary authenticated documentary evidences shall be submitted along with your offer. NOTE: This is not applicable for foreign Suppliers. | Yes / No / Explain | |
| 30 | Price Preference shall be extended to the MSEs under the Public Procurement Policy for MSEs. Such MSEs shall produce documentary proof of registration as per provisions of the Policy ie: registration with District Industries Centre (DIC) or Khadi and Village Industries Commission (KVIC) or Khadi and Industries Board (KVIB) or Coir Board or National Small Industries Commission (NSIC) or Directorate of Handicrafts and Handlooms or Udyog Aadhar Memorandum or any other body specified by Ministry of MSME. | Yes / No / Explain | |

| | | | |
|----|--|--------------------|--|
| 31 | As far as implementation of public procurement policy (Preference to make in India) Order, 2017 is concerned, the Office Orders vide No. P-45021/2/2017-B.E-II dt. 15.06.2017, which is partially modified by Order No. P-45021/2/2017-PP(BE-II) dt. 28.05.2018, Order No.P-45021/2/2017-PP(BE-II)dt. 29.05.2019, Order No. P-45021/2/2017-PP (BE-II) dt 04.06.2020 and Order No.P-45021/2/2017-PP (BE-II) dt 16.09.2020 and subsequent Amendments issued by the Department for Promotion of Industries and Internal Trade, Ministry of Commerce and Industry and Internal Trade, Ministry of Commerce and Industry regarding Class-I/Class-II local suppliers, Purchase preference, verification of local contents etc shall be applicable to this tender. Therefore, bidders may ensure compliance of the same while submitting tenders. | Yes / No / Explain | |
| 32 | Delivery Terms : In case of Indigenous Supplier : LPSC, BANGALORE. | Yes / No / Explain | |
| 33 | Delivery Terms : In case of Foreign Suppliers: EX-WORKS / FOB /FCA | Yes / No / Explain | |

C.3 Price Bid

| Sl. No. | Item | Quantity | Unit Price | Currency | Total Price | Remark |
|---------|--|----------|------------|----------|-------------|--------|
| 1 | Supply, installation and testing of Data Acquisition System with application software for OMPS-EGSE. | 1.00 Lot | | - | | |

Common charges (Applicable for all items)

| | |
|---|--|
| Installation & Configuration | |
| Other Costs, if any (Value) | |

| | |
|-----------------------------------|--|
| Taxes, if any (Percentage) | |
|-----------------------------------|--|

Specification Document of Data Acquisition system for Electrical Ground Support Equipment for OMPS

CONTENTS

| Sl. No. | Section |
|------------|---|
| 1 | Introduction |
| 2 | Scope of work |
| 3 | Signal/Interface details |
| 4 | Schematic representation of Data Acquisition system |
| 5 | Specification of Data Acquisition System |
| 6 | Application Software |
| 7 | Documents to be submitted |
| 8 | Inspection & Quality assurance plan |
| 9 | Inspection and Testing |
| 10 | Essential spares |
| 11 | Price Format |
| Annexure-1 | General terms & conditions |

ABBREVIATIONS

| | |
|------|----------------------------------|
| CMPS | Crew Module Propulsion System |
| SMPS | Service Module Propulsion System |
| ADC | Analog to Digital Converter |
| EU | Engineering Unit |
| DAS | Data Acquisition System |
| TTL | Transistor Transistor Logic |
| DIO | Digital Input/Output |
| SAT | Site Acceptance Test |
| BOM | Bill Of Material |
| SRD | Software Requirement Document |
| SDD | Software Design Document |

| SPECIFICATIONS | | | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|-------------------------------------|-----------------------|------------|-------------|------------------------|---|
| 1.0 Introduction | | | | | | |
| Gaganyaan mission has Crew Module Propulsion System (CMPS) and Service Module Propulsion System (SMPS). Electrical Ground Support system is required to monitor the health of propulsion system parameters like Pressure & Temperature during various stages of testing, measurement & acquisition of mass flowmeter & weighing balance data during simulant loading/draining & Propellant loading activities. EGSE shall also command the Latch valve to open & close and monitor its status. | | | | | | |
| 2.0 Scope of work | | | | | | |
| The scope of work is to Supply, installation and testing of Data Acquisition System including application software for Electrical Ground Support System for OMPS. | | | | | | |
| 3.0 Signal /Interface details | | | | | | |
| Sl.No | Parameter Description | Signal /Interface | Qty (Nos.) | Spare(Nos.) | | |
| 1 | Pressure & Temperature (Thermistor) | Voltage (± 10 V) | 48 | 8 | | |
| 2 | PRT 1000 Ω ,100 Ω | RTD | 10 | 6 | | |
| 3 | Weighing balance | RS 232 & Ethernet | 2+1 | 2+1 | | |
| 4 | Mass Flow Meters | RS 485 | 2 | 2 | | |
| 5 | Latch valves (command & status) | Digital I/O | 24 | 8 | | |
| 4.0 Schematic representation of Data Acquisition system | | | | | | |
| Refer attached document for Schematic representation of Data Acquisition system | | | | | | |
| Note: Power supply, Valve driver and Voltage divider are under the scope of LPSC | | | | | | |
| 5.0 Specification of Data Acquisition System | | | | | | |
| 5.1 Features of Data Acquisition system | | | | | | |
| 1. Data acquisition system in a single standalone configuration | | | | | | |
| 2. All hardware and software shall be of latest state of art technology | | | | | | |
| 3. All hardware used shall be modular and expandable | | | | | | |
| 4. In DAS each channel shall have individual ADC and ADC shall be a part of signal | | | | | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| conditioning module | | |
| 5. DAS system configuration shall have amplifier, Filter, ADC and software filter for all measurement channels | | |
| 6. Health indication like network connectivity, failure indication, power ON status and controller health shall be provided for DAS | | |
| 7. LEMO/D-Sub connector with suitable locking mechanism (push-pull/locking bolt) shall be provided for DAS input card connector. Mating connector also to be supplied. | | |
| 8. The digitized data shall be stored in DAS controller & Laptop | | |
| 9. Controller shall have a sufficient memory capacity, in case of any failure, the data shall be retrievable | | |
| 10. The system should be highly resistant to electromagnetic interference | | |
| 11. Data Acquisition system shall have voltage input modules for measurement of pressure & temperature (Thermistor) | | |
| 12. Data acquisition system shall have RTD input module for measurement of PRT | | |
| 13. Digital I/O module for command & status monitoring of Latch valves | | |
| 14. Data Acquisition system shall have serial interface port (RS232 & RS485) for measurement and acquisition of Weighing balance & mass flowmeter data | | |
| 15. DAS controller shall be capable of communicating with the analog input and Digital I/Os through Back plane or through suitable standards to acquire and save the data | | |
| 16. The configuration and the storage capacity of the controller shall be enough to acquire and store all the channels (>100GB) at maximum sampling rate for a continuous duration of at least 24 hours | | |
| 17. The system should have internal high precision reference clock (minimum 10MHz) for timing accuracy | | |
| 18. On line computation and display of critical parameters | | |
| 19. Real time monitoring of Raw voltage, EU of acquired data & Trend graph displays | | |
| 20. Offline processing of acquired data for further data analysis, Graph plotting & printing of processed data | | |
| 21. Application software and driver software to meet the requirement. All the required | | |

| SPECIFICATIONS | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|--|--|---|
| software shall be preloaded in the controller & Laptop | | | |
| 22. Reliable and user-friendly software in Windows platform for all application programs with LabVIEW or suitable application software | | | |
| 23. System shall have the diagnostic features to detect failures such as health status LEDs, fault status LED and other indication LEDs to be provided or any software message | | | |
| 5.2 Technical Specification of Data Acquisition System | | | |
| The Data acquisition system consists of following deliverables | | | |
| Sl. No. | Description | | |
| 1 | Chassis | | |
| 2 | Controller | | |
| 3 | Voltage input module | | |
| 4 | RTD module | | |
| 5 | Digital Input/output Module | | |
| 6 | Serial Port Module | | |
| 7 | Ethernet switch | | |
| 8 | Laptop | | |
| 9 | Color LaserJet printer | | |
| 10 | Application software with drivers | | |
| 11 | Cables & mating connectors (as required) | | |
| 5.2.1 Chassis | | | |
| Sl. No. | Description | Specification | |
| 1 | Type | 19" rack mountable system | |
| 2 | Input Power | 230 VAC, 50Hz | |
| 3 | Cooling | Suitable cooling for panel/chassis to be provided | |
| 4 | LED indication/alarms | Temperature alarm, system failure, power on | |
| 5 | Connectors on back and front panel | Suitable mating connectors to be provided. LEMO/suitable locking connector | |
| 6 | Operating temperature | 10 to 50°C (Nominal) | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|-------------------------|-----------------------------|--|------------------------|---|
| 7 | Humidity (Nominal) | 10 to 90% RH non-condensing | | |
| 8 | Shock &vibration | EN60068-2-6, EN60721-3-2, EN60068-2-27 or equivalent | | |
| 9 | EMI/EMC | EN61000-3-2 , EN61000-3-3 or equivalent | | |
| | | Note: Chassis shall have 2 Nos of dummy slots for future expansion | | |
| 10 | Chassis compatibility | Chassis compatible with controller | | |
| 11 | Digital bus | PXI/PXI Express/ EtherCAT/Proprietary bus | | |
| 12 | Bus throughput rate (min) | ≥ 100MBytes /second | | |
| 13 | Synchronization clock (min) | ≥10MHz between all input cards/Chassis | | |
| 14 | Synchronization | All Input modules shall be part of main system. If separate modules are used, then it should be hardware synchronized with main chassis through standard protocol like IRIG/PTP/NTP/EtherCAT | | |
| 5.2.2 Controller | | | | |
| Sl. No. | Description | Specification | | |
| 1 | Controller | Embedded controller/FPGA/PXI/PXIe/Proprietary Controller with real time storage and analysis | | |
| 2 | Processor | Intel Core i7 / Atom / Xeon 4 core or better processor | | |
| 3 | Processor Type | 64 bit | | |
| 4 | RAM | 16 GB RAM or higher for embedded controller with RTOS or 32 GB or better for general-purpose processor. | | |
| 5 | Secondary memory | Flash /SSD 1TB | | |
| 6 | Processor speed | 2.8 GHz or better | | |
| 7 | Communication interface | 3x10GB Ethernet ports | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|---|---|------------------------|---|
| 8 | Data Interface | Ethernet 10GB LAN, USB 3.0 (4 Nos) & EtherCAT | | |
| 9 | Operating system | Windows (64 bit)/Linux | | |
| 10 | LED Indication, Alarm | System failure, Power on Alarm, Network Connectivity Indication etc. | | |
| 5.2.3 Voltage input module ($\pm 10V$) | | | | |
| Sl. No. | Description | Specification | | |
| 1 | Voltage input | $\pm 10V$ | | |
| 2 | Number of channels | 56 minimum. | | |
| 3 | Input configuration | Differential | | |
| 4 | CMRR | ≥ 80 dB @ 50 Hz | | |
| 5 | Input Impedance | $\geq 10M\Omega$ | | |
| 6 | Overall Accuracy | $\leq \pm 0.1\%$ of FSO (Including gain accuracy, gain linearity, gain temperature coefficient, Stability, Offset drift etc.) | | |
| 7 | Excitation | | | |
| 7.1 | Voltage | 1-12VDC $\pm 0.05\%$ freely programmable | | |
| 7.2 | Current | ≥ 40 mA /channel | | |
| 7.3 | Protection | Short circuit , Over voltage | | |
| 7.4 | Line & Load regulation | $\leq \pm 0.05\%$ | | |
| 8 | Isolation | | | |
| 8.1 | Type | Channel to Channel and Channel to ground | | |
| 8.2 | Isolation voltage | $\geq 250VDC$ | | |
| 9 | ADC Configuration | | | |
| 9.1 | Quantity | Individual ADC for each channel | | |
| 9.2 | Type | Delta sigma/SAR | | |
| 9.3 | Sampling rate | 10, 100, 1000, 5000Hz selectable. | | |
| 9.4 | Resolution | ≥ 16 bit | | |
| Note: | Party has to provide Signal to noise ratio & Cross talk specification | | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|--|--|------------------------|---|
| | Anti-aliasing Filter: System shall be configured with Low pass filter for anti aliasing for each channel Programmable Filter: 4 pole Bessel or better programmable digital filter 10Hz-5KHz | | | |
| 5.2.4 RTD input Module | | | | |
| Sl. No. | Description | Specification | | |
| 1 | Type of input and configuration | <ul style="list-style-type: none"> ➤ PT1000, PT2000, PT100, (Resistance inputs) comply to IEC 751. ➤ 2 wire, 3wire and 4 wire software selectable. ➤ The type and its range should be software selectable per channel ➤ Sensor break detection | | |
| 2 | Number of channels | 16 minimum. | | |
| 3 | Sensor excitation | ≤1mA DC excitation/pulsed dc excitation | | |
| 4 | Input impedance | ≥1MΩ | | |
| 5 | Accuracy | ≤1°C | | |
| 6 | Range | 0 to 100 °C | | |
| 7 | Filter | | | |
| 7.1 | Anti-aliasing Filter | Low pass filter for anti aliasing | | |
| 7.2 | Programmable Filter | 4 pole or better programmable Digital filter (1-100 Hz) | | |
| 8 | Isolation | | | |
| 8.1 | Type | Channel to Channel and Channel to Ground | | |
| 8.2 | Isolation voltage | ≥250VDC | | |
| 9 | ADC Configuration | | | |
| 9.1 | Type | Delta sigma/SAR | | |
| 9.2 | Resolution | ≥16 bit | | |
| 9.3 | Sampling rate | 1to 100Hz selectable | | |
| 5.2.5 Specification of Digital Input/output Module | | | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|---------------------------|--|------------------------|---|
| Sl. No. | Description | Specification | | |
| 1 | DIO Module | | | |
| | No. of channels | 32 minimum (configurable for input/output) | | |
| 2 | Input | | | |
| 2.1 | Type of input | TTL, Single Ended | | |
| 2.2 | Input Current | $\pm 250\mu\text{A}$ maximum | | |
| 2.3 | Input Digital Logic Level | OFF State $\leq 0.8\text{V}$ ON State $\geq 2.2\text{V}$ | | |
| 3 | Output | | | |
| 3.1 | Type of output | TTL, Single Ended | | |
| 3.2 | Output Update Rate | $7\mu\text{s}$ nominal | | |
| 3.3 | Output Current | $\leq 64\text{mA}$ | | |
| 5.2.6 Specification of Serial Port Module | | | | |
| Sl. No. | Description | Specification | | |
| 1 | No. of Ports | 4 Nos. RS232 , 4 Nos. RS485 | | |
| 2 | Baud rate | 50 bps to 921.6 kbps | | |
| 3 | Data bits | 5,6,7,8 | | |
| 4 | Stop bits | 1,1.5,2 | | |
| 5 | Parity | None, Even, Odd, Space, Mark | | |
| 6 | Serial signals | RS232- TxD, RxD, RTS RS485- Data+, Data-, GND | | |
| 7 | Software | Necessary drivers for windows to be provided | | |
| 5.2.7 Specification of Ethernet switch | | | | |
| Sl No. | Description | Specification | | |
| 1 | Type | Layer 2 Manageable switch | | |
| 2 | Qty | 1 | | |
| 3 | No of Ports | 8 ports 10/100 /1000Mbps | | |
| 4 | Switching capacity | 8.8 Gbps | | |
| 5 | Transmission method | Store and forward | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--------------------------------------|--------------------|---|------------------------|---|
| 6 | VLANS | 255 static VLANS | | |
| 7 | Stacking capacity | 32 units per stack | | |
| 8 | Stacking bandwidth | 13.6 Gbps Integrated Modular stacking system | | |
| 9 | Power supply | 24V DC /230 V + 10%AC, 50Hz | | |
| 5.2.8 Specification of Laptop | | | | |
| Sl. No | Parameters | Specifications | | |
| 1 | Form Factor | Laptop | | |
| 2 | CPU | Intel core i7, 3.4Hz, 8MB cache or higher,64-bit processor | | |
| 3 | Chipset | Intel Q8 series or better | | |
| 4 | Screen | 17", LED backlight, 1920 X 1080 & built-in speaker | | |
| 5 | Memory | DDR4 16 GB 1.6GHz with 32 GB expandability | | |
| 6 | Graphics | Integrated Intel HD graphics | | |
| 7 | Ethernet | Integrated NIC Additional Network Interface Card- 2 Nos.1/10GB | | |
| 8 | USB ports | USB 3.0: Min. 4 Nos. | | |
| 9 | Video port | DVI and HDMI | | |
| 10 | Optical drive | DVD/RW (If internal drive is not available external drive shall be given) | | |
| 11 | Operating System | 64 Bit Windows 10 professional/ Latest Windows OS with perpetual license. Bootable Installation media shall be provided. | | |
| 12 | Hard Disk | 1TB SSD | | |
| 13 | Software | Required driver software for Mother Board, Chipset Driver in CD/DVD | | |
| 14 | Input Power | 230V, 50Hz | | |
| 15 | Office | Latest MS office professional in installable | | |

| SPECIFICATIONS | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|--|------------------------|---|
| | | | media with perpetual license. |
| 16 | Battery life | | Min. 5 hours |
| 17 | Accessories | | Appropriate Bag, Battery Adapter, Mouse |
| 5.2.9 Color Laser Jet Network Printer | | | |
| | 1. Supports A4 size print | | |
| | 2. 20 PPM in Colour | | |
| | 3. 600 x 600 True DPI | | |
| | 4. Wide Format (12" x 18") | | |
| | 5. 160 MB RAM (expandable up to 540 MB) | | |
| | 6. Network Ready (10/100 Base TX Ethernet card) | | |
| | 7. Automatic Duplex | | |
| | 8. 500 Sheet Capacity paper tray | | |
| | 9. Power input: 230V, 50 Hz | | |
| 6.0 *Application Software | | | |
| 1. | The supply should include all software required for developing the application program, graphics event sequencing alarm history, modification and De-bugging. | | |
| 2. | The programming station shall also have the facilities for monitoring offline processing and plotting. | | |
| 3. | The vendor has to supply the customized application software for real time monitoring and data acquisition, analysis, processing, plotting and operating system-related runtime aiding applications. | | |
| 4. | The system shall have suitable user friendly, reliable driver software and application software to meet the entire configuration in Linux/Windows platform with Labview API or suitable software. | | |
| 5. | The software engineering practices have to be strictly followed in accordance with IEEE 12207 standards/Equivalent updated standard. | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| 6. The software shall be programmed in the latest programming language by the vendor | | |
| 7. Customized Application software shall be developed & installed in the DAS/laptop. | | |
| 8. The vendor shall provide application development environment. It should have perpetual license. | | |
| 9. The system configuration and capacity should be able to acquire and store the required channels in the maximum sampling rate for the continuous duration of at least 24 hours, with multiple files for quick processing and retrieval. | | |
| 10. The data acquisition software shall have provision for on-line processing and monitoring of parameters (mV/Engineering Unit), on line trend graph display, off line processing, graph plotting, mathematical tool and analysis. | | |
| 11. Online monitoring (Data and Trend graph displays) of pressure, temperature, voltage , mass flowmeter & weighing balance parameters | | |
| 12. On line Computation and display of TMR logic, Gas mass & vapour loss. | | |
| 13. Offline processing of acquired data for further data analysis | | |
| 14. Graph plotting module for plotting of graph for the selected channels from the acquired data. | | |
| 15. All screens given are sample, party may discuss all user interface before actual implementation | | |
| 16. Vendor shall prepare SRD and SDD as per the software specification | | |
| 17. Error code definition and troubleshooting to be provided for application software. | | |
| 18. The following tools (but not limited to) shall be provided. | | |
| <ul style="list-style-type: none"> • Graphics editing software with all necessary tools | | |
| <ul style="list-style-type: none"> • Drag and drop facilities for graphics /programming | | |
| <ul style="list-style-type: none"> • Zooming, resizing, rotating facility in graphics | | |
| 19. Programs and logic diagrams implemented in the system shall be available in the printed format. | | |
| *The above section provides only the base line requirements. During design and realization, | | |

| SPECIFICATIONS | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|--|------------------------|---|
| update & modification will be provided. | | | |
| 6.1 Detailed requirement of Application software | | | |
| 6.1.1 Configuration screen: Application software shall have the configuration screen as per the below table. | | | |
| Type of Satellite | User Editable | | |
| Project | User Editable | | |
| Testing stage | Dropdown Box (Input: Pressurization, Depressurization, Simulant Filling IPA, Simulant Filling HFE, Propellant Loading MON3, Propellant Loading MMH, Post Integration, Others) | | |
| Graph selection (Refer fig No.3. not limited to) | This is for real time trend display of selected parameter combination of mass & EGSE parameters. Dropdown Box shall have following parameter combination for real time graph <ol style="list-style-type: none"> 1. Time Vs EGSE pressure, temperature 2. Time Vs Mass total & volume total 3. Time Vs Mass total &WB 4. Time Vs Mass total & Qty to be loaded.,etc., | | |
| COM Port selection | Dropdown Box used to select COM port for WB & Mass Flow Meter communication. Ex: COM1, COM2 and so on. | | |
| Equipment details | User editable. Used to enter the equipment identification number for min. 4 equipment's. | | |
| Propellant tank volume | User Editable | | |
| Fluid type | Dropdown Box (Input: IPA, Freon, MON-3, MMH and so on) | | |
| Loading mass (kg) | User Editable | | |
| Loading pressure (bar) | User Editable | | |
| Gas | Dropdown Box (Input: Nitrogen, Helium, Argon) Type of Gas used for pressurization or propellant loading. | | |
| Mass difference | Dropdown Box (Input: 0.5kg, 1kg, 1.5kg, 2kg) | | |
| Sampling Rate (Voltage module) | User selectable | | |

| SPECIFICATIONS | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|---------------------------|---|---|
| Sampling Rate (RTD module) | User selectable | | |
| Data Logging Interval | User Editable | | |
| File Name | User Editable * | | |
| Equipment No. | User Editable | | |
| Equipment Validity | User Editable | | |
| Location | User Editable | | |
| Operating Team | User Editable | | |
| * If same file name is repeated, pop up shall display with the query that append or overwrite | | | |
| 6.1.2 Calibration screen | | | |
| The calibration screen is required for configuration of parameters like pressure, temperature and entering the calibration constants. Provision is required for entering 4 th order constants. For Sample screen, refer attached document. | | | |
| Note: selected channels only appear on the main screen. This screen shall be disabled once the acquisition starts so that channel description or constant shall not be modified. | | | |
| 6.1.3 Main Screen | | | |
| The main screen shall have two main tabs | | | |
| 1. Propulsion System Parameters Display & Acquisition | | | |
| 2. Latch Valve Command & status | | | |
| 1. Propulsion System Parameters Display & Acquisition | | | |
| Sl. No | Description | Remarks | |
| 1 | Project | Project shall be referred from configuration screen & displayed | |
| 2 | Testing stage | Testing stage shall be referred from configuration screen & displayed | |
| 3 | Date & Time | Date & time shall be displayed | |
| 4 | Time of Start | Starting time of Acquisition to be displayed | |
| 5 | Data Interval | Data logging interval shall be displayed | |
| 6 | Data Logged | No. of data logged shall be displayed | |
| 7 | Excitation Voltage | Excitation voltage of pressure transducers shall be | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|----------------|--------------------------------|---|------------------------|---|
| | | displayed | | |
| 8 | Start Acquisition | Once this button is clicked acquisition shall be started | | |
| 9 | Stop acquisition | Once this button is clicked acquisition shall be stopped | | |
| 10 | Monitor | Once this button is clicked data shall be displayed without acquisition. | | |
| 11 | Parameter Configuration | If the button is clicked, calibration screen to be opened for verification of calibration constants and channel identification & editing. | | |
| 12 | Channel display | <ul style="list-style-type: none"> • Selected channel name with channel ID (pressure/temperature), raw voltage and Engineering Unit shall be displayed. Raw voltage shall be converted to Engineering unit (bar/°C) using calibration constants from the calibration screen. • Mass parameters like mass flowmeter, weighing balance data shall be acquired through RS485 & RS232/ Ethernet and displayed. From mass flow meters, all parameters received thorough MODBUS RS485 shall be acquired and stored. • Weighing balance shall have the provision for acquiring data through RS232 & Ethernet protocol. • From the acquired Mass flowmeter and weighing balance data, MF1-MF2, WB-MF1, WB-MF2, Average of MF1, MF2 & WB shall be displayed. | | |
| 13 | Gas mass | Gas mass is a measure of weight of vented gas from the storage tank during propellant loading. This will be computed automatically through the software by using the formula $PV=mRT$. Gas mass shall be computed on line and displayed in the main screen. Details will be provided during time of coding. | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|----------------|-----------------------------------|---|------------------------|---|
| 14 | Vapor loss | Vapor loss is a measure of mass of vapors escaped along with gas during spacecraft tank venting. Vapor loss also computed on line and shall be displayed. Details will be provided during time of coding. | | |
| 15 | Propellant to be loaded | This parameter shall display the value of propellant to be loaded. TMR logic shall be used for computing the loading mass. Software shall acquire the data from Mass flow meters (2 nos) & weighing balance and through TMR logic the value shall be displayed. Details will be provided during time of coding. | | |
| 16 | ROP | Rate of Pressurization should be given in bar/min. It will be difference of 1 st sec pressure value & 30 th sec pressure value and so on for the selected channel | | |
| 17 | Elapsed time | Software shall display the elapsed time. This is a pause timer between each stage of filling. Timer will start to count elapsed time, when flow stops or flow rate reads zero. Once flow started again, timer shall reset to zero. | | |
| 18 | Real time graph | During testing, real time graph (trend graph) of selected parameters shall be displayed in the screen. X & Y axis scale shall be editable to suit the requirement. Parameters shall be user selectable for X & Y axis. Each graph shall have the provision to select the no. of channels to plot and can be able to add/remove the parameters during real time acquisition. | | |
| 19 | Pressure & Temperature | Pressure & temperatures monitoring screen shall read and acquire the pressure and temperature channels. Raw voltage will shows the signal output from the sensor, Engg value shall be computed through software using polynomial constants. | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|-------------------------|---|------------------------|---|
| 20 | Exit | If this button is clicked, the application software shall exit | | |
| For sample screens, refer attached document. | | | | |
| Note: | | | | |
| 1. All the parameters shall be acquired & displayed as shown in sample screens. | | | | |
| 2. When acquisition is going on, other activities can be given least priority. | | | | |
| 3. Party has to customize the software as per the requirements and before developing the software code, party has to prepare Software Requirement algorithm in line with the tendered specification which will be approved by LPSC for development. | | | | |
| 4. The party has to accept any modification (if required by LPSC) in the software during design phase. | | | | |
| 5. Source code shall be submitted to LPSC(B) for future reference. | | | | |
| 2. Latch Valve Command and Status Monitoring | | | | |
| Application software shall command the Latch valve through Digital Output (TTL) and also display & store the status of Latch valves through Digital Input. There are 8 Nos of Latch valves and each Latch valve needs two commands (Open & Close). DIO card shall be used for this purpose. For commanding Latch valve, TTL signal with defined pulse width to be generated for selectable duration. Max duration of pulse shall be 10000 msec. For sample Latch valve screen, refer attached document. | | | | |
| Digital events of Latch valve (On/Off command) and status of latch valve also to be logged with time. | | | | |
| 6.1.4 Offline Data Processing Module | | | | |
| Offline data processing module shall have the provision to process the data from the saved file with selectable data logging interval (1sec, 2sec, 10sec etc.) for selected channels. | | | | |
| Sl.No | Description | Remarks | | |
| 1 | Project | Project shall be referred from configuration screen & displayed | | |
| 2 | Select file name | Once the button is clicked, File shall be selected for data processing. Processed file shall be saved and | | |

| SPECIFICATIONS | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|------------------------------------|--|---|------------------------|---|
| | | exported to excel, csv, pdf format. | | |
| 3 | Select the measurement channels | Offline module shall have check box for selection of channels for graph plotting. | | |
| 4 | Data logging interval | Provision to process the data with selected data logging interval. | | |
| 5 | Mathematical tool | Offline module shall have the provision for FFT analysis, Min, Max, Average, peak, RMS etc.,. | | |
| 6.1.5 Propulsion mimic page | | | | |
| 1. | Propulsion mimic page shall be configured and to be uploaded with the final launch base configuration. | | | |
| 2. | Final loading report sheet format will be provided by LPSC(B) and which should be of printable format. | | | |
| 6.1.6 Graph Plotting module | | | | |
| 1. | Graph plotting module shall the provision for plotting the graph for the selected file (EU/Raw voltage) and for selected parameters. Maximum: 4 per graph. Different tab shall be provided for graphs. | | | |
| 2. | The graph plotting module shall have the provision to select the required No. of channels for plotting | | | |
| 3. | Graph plotting module shall have the preview option to view the plotted graph before printing/saving. | | | |
| 4. | Each plot shall have proper header & footer. | | | |
| 5. | Print option shall be provided for graph. Plotted graph also to be exported in jpeg /pdf format. | | | |
| 6. | The graphical display shall have the provision for changing the color for selected parameters and background. | | | |
| 7. | The graph plotting shall have the provision for auto scaling / manual scaling. | | | |
| 8. | The graph plotting shall have the multiple scaling for Y scale. | | | |
| 9. | The graph plotting shall have the provision for zoom in zoom out. | | | |
| 10. | The graph plotting shall have the x and y axis cursor provision with the corresponding data | | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| points. | | |
| 6.1.7 File Saving | | |
| 1. Report to be generated from the saved file for the selected parameters (EU & Raw voltage) for selected interval. | | |
| 2. The selected time frame in the acquired data shall be exported to standard file formats like *.xlsx, *.txt, *.csv, *.dat, and *.xml. | | |
| 3. The selected time frame in the acquired data shall be printable in multiple pages with user-defined time-based segment fit in each page with corresponding header information. Data shall be averaged as per the data logging interval. (If sampling rate selected is 1000 S/sec & Data logging interval is 1sec than data shall be averaged for 1sec and so on. | | |
| 4. Report shall have the header with time stamp, Project Name, Test Stage, start time of test and data logging interval. | | |
| 5. In report generation, data logging interval (1sec, 2sec, 3sec, 5 sec, 10sec, 20sec, 30sec, 60sec, 120sec and 180sec), discrete time selection shall be user selectable. | | |
| 6. Report format shall have the time stamping in the first column followed by selected parameters followed by raw data and engineering data. | | |
| 6.1.8 Power failure | | |
| In case of power failure for the controller, intermittent software crashing/restart, logged data should be saved till the time of failure. | | |
| 6.1.9 Screen Snap | | |
| Provision for screen snap (with comments) shall be provided. This tab is for saving the current screen in the predefined folder at the desktop. | | |
| 7.0 Documents to be submitted | | |
| The following documents shall be prepared and submitted by the party for the approval from the department | | |
| Along with Technical Offer | | |
| 1. Compliance matrix of each specification as given in this document. | | |
| 2. List and details of non-compliance of specifications by the vendor if any. | | |
| 3. Confirmation of scope of supply as given in this document. | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|------------------------|---|
| 4. Detailed configuration schematics which shall include | | |
| 4.1 Detailed specification of proposed chassis, controller, voltage input module, RTD input module & Digital I/O module | | |
| 4.2 Make and model of Serial port module | | |
| 4.3 Selection of voltage input modules, RTD input modules & DIO to meet the channel requirements | | |
| 4.4 Number of channels per voltage, RTD inputs & DIO module | | |
| 4.5 Type of mating connectors proposed for each module | | |
| Along with supply | | |
| 1. System architecture & configuration for Data acquisition system. | | |
| 2. Software document (SRD, SDD) as per IEEE12207/Equivalent updated standard. | | |
| 3. Detailed operation manual for DAS (software & Hardware) | | |
| 4. SAT, Test and Evaluation Procedure for DAS & application software | | |
| 5. Inspection and quality assurance plan | | |
| 8.0 Inspection & Quality assurance plan | | |
| The quality assurance is a unified approach that attempts which includes the checking of the adequacy of the equipment/ component's installation, test and evaluation. It is the combined responsibility of the Vendor and the Department to ensure that all possible failure modes are exercised and validated during SAT. | | |
| The Vendor must look for the quality factors individually attributed to engineering developments, selection of equipment's and components, test and acceptance procedures followed, repetitive performance achieved, risk analysis carried out, etc. each and every module must be manufactured and tested as per quality standards. | | |
| Vendor's shall provide specifications of Data acquisition system, controller and DAS modules with relevant datasheets/catalogues, configuration schematic, installation/ commissioning plan, verification/ evaluation plan during SAT. | | |
| 1. The vendor shall prepare detailed inspection & quality surveillance plan for DAS and accessories | | |
| 2. Site acceptance test (SAT) shall be carried out as per the approved document (LPSC & | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| Vendor). Test plan & procedure document & acceptance criteria shall be available prior to SAT | | |
| 3. The vendor shall supply the relevant test/calibration & warranty certificates for DAS. | | |
| 4. Wherever inspection at manufacturer's shop is waived because of any reason, the testing reports shall be verified before dispatch. In no case items shall be released without proper inspection/ verification. | | |
| 8.1 Quality assurance plan | | |
| The supplier shall provide the detailed quality assurance plan for DAS to the purchaser for review and approval based on the sample format of the quality assurance plan given in Table No.15. Refer attached document. | | |
| 9.0 Inspection and Testing | | |
| 9.1 Site Acceptance Test (SAT) of DAS | | |
| All specification of data acquisition system will be verified and vendor shall demonstrate the following major performance matrix | | |
| 1. Hardware verification as per final BOM | | |
| 2. Visual & mechanical check-up for proper workmanship, identification, ferruling etc. | | |
| 3. System configuration as per requirement. | | |
| 4. Demonstration of all system diagnostics. | | |
| 5. Functional check of input/output module, linearity check, timing accuracy check, CMRR and Isolation Checks | | |
| 6. Over voltage check | | |
| 7. Noise performance check | | |
| 8. Verification of configuration settings | | |
| 9. Storage and retrieval of data in controller at different sampling rate. | | |
| 10. Error diagnostics of the network failure, controller failure, input, output card failure | | |
| 11. Timing accuracy verification of command channel | | |
| 12. Data storage test (continuous storage for 24 hours with maximum sampling rate), retrieval and processing of data | | |
| 13. Validation of DAS configuration software | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| 14. Burn In test for 48 hrs | | |
| 15. Endurance test | | |
| 16. Any other mutually agreed test which is essential to meet the requirement | | |
| 9.2 SAT of Application software | | |
| 1. Verification of configuration of measurement and command channels | | |
| 2. Verification of acquisition of all measurement and command channels | | |
| 3. Parameter selection for on line trend graph display | | |
| 4. Verification of filter programmability | | |
| 5. Verification of all computed parameters | | |
| 6. Verification of Gas mass and Vapor loss computation | | |
| 7. Verification of TMR logic and related display | | |
| 8. Verification of Rate of Pressurization computation | | |
| 9. Verification of On-line numerical and trend graph | | |
| 10. Ambient data processing | | |
| 11. Verification of Offline data processing and graph plotting of selected channels | | |
| 12. Verification of data saving | | |
| 13. Simulation of software failure and verification of data storage till the point of failure. | | |
| 14. Generate pulse command with different ON time & verify the command output with CRO for timing accuracy for DIO module | | |
| 15. Latch Valve Status verification | | |
| 16. Any other mutually agreed test. | | |
| Any malfunctioning in the system shall be rectified at once. Failure of any component shall be replaced with new one. No repaired parts/modules shall be accepted. | | |
| 9.3 Test and Evaluation of DAS (End to end verification of complete system Demonstration) | | |
| The loop calibration of the system is performed and Accuracy of measurement and command channels shall be computed by simulating sensor signals in steps of 0%, 25%, 50%, 75% and 100% in ascending & descending and logging the processed engineering values from DAS. | | |
| 1. The accuracy of the measurement and command channels shall be computed from T&E processed data for each channel and shall be compared against specification. | | |

| SPECIFICATIONS | | | | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|--|--|--------------|------------------------|---|
| 2. Detailed T&E evaluation plan for each measurement/ command channel and software validation plan to be prepared by the vendor and approved by LPSC. | | | | | |
| 3. T&E report for each measurement channel shall be prepared and submitted for approval and Software validation test results to be compiled and submitted for approval. | | | | | |
| 10.0 Essential spares | | | | | |
| Party has to quote for essential spares for DAS (One No. of Voltage input module, RTD input module and 20 % spare for connectors) and spare price shall not be considered for computation of L1 however spare price quoted along with the offer shall be valid for minimum 2 years. | | | | | |
| 11.0 Price Format | | | | | |
| Sl. No | Description | Qty (Nos.) | Total in INR | | |
| | DAS | | | | |
| 1 | Hardware: | As required to meet the indent specifications. | | | |
| 1.1 | Chassis | | | | |
| 1.2 | Controller | | | | |
| 1.3 | Voltage input module | | | | |
| 1.4 | RTD module | | | | |
| 1.5 | Digital Input/output Module | | | | |
| 1.6 | Serial Port Module | | | | |
| 1.7 | Ethernet switch | | | | |
| 1.8 | Cables & mating connectors (as required) | | | | |
| 2 | Application Software: | | | | |
| 2.1 | Software for DAS | As per specification | | | |
| 3 | Laptop & printer | 1 each | | | |
| 4 | Essential spares | | | | |
| 4.1 | Voltage Input module | 1 | | | |
| 4.2 | RTD input Module | 1 | | | |
| 4.3 | Connectors | 20% | | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| | | |
| Annexure-1 | | |
| General commercial terms and conditions | | |
| 1. Price | | |
| The prices are FIRM and FIXED. On receipt of Purchase Order, Vendor has to supply the system within the stipulated delivery period | | |
| 2. Security Deposit | | |
| The party shall submit the security deposit for the performance of the contract, equivalent to 3% of the total order value in the form of bank guarantee or either form of negotiable instrument, issued by a nationalized or scheduled bank in a Rs. 500 non-judicial stamp paper. This Security Deposit will be returned (interest free) after the successful completion of the ordered contract. The security deposit shall have a further claim period of 6 months. | | |
| 3. Warranty | | |
| The total system shall be warranted for total performance and failure-free operation for a period of 12 months from date of final acceptance of system by LPSC(B)/ISRO. | | |
| 4. Performance Bank Guarantee (PBG) | | |
| To cover the warranty period of 12 months, the party shall submit the performance bank guarantee for the performance of the systems, equivalent to 3% of the total order value in the form of bank guarantee or either form of negotiable instrument issued by a nationalized or scheduled bank in a Rs. 500 non-judicial stamp paper. This PBG (interest free) will be returned after the successful completion of the warranty period. The PBG shall have a further claim period of 6 months. | | |
| 5. Liquidated Damages | | |
| As per the Delivery Schedule mentioned is the essence of the order, in case if you fail to deliver the item within the time specified or any extension thereof. Liquidated Damages at 0.5% (Zero Point Five Percent) of the order value or part thereof of the undelivered item for each calendar week of delay shall be recovered from your bill. However, total LD shall not exceed 10% (Ten Percent of the Order Value). | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| 6. Arbitration | | |
| Dispute if any shall be settled mutually, failing which it will be referred to a One Man arbitrator appointed by Director, LPSC(B) in accordance with the Indian Arbitration and Conciliation Act 1996, whose decision shall be final and binding on both the parties. In case of import supply, the Arbitration shall be applicable as per International Chamber of Commerce. | | |
| 7. Jurisdiction | | |
| The Courts in the City of Bangalore alone shall have jurisdiction to deal with and decide any matter or dispute whatsoever arising out of this agreement including those arising under the Arbitration Act. | | |
| 8. Force Majeure | | |
| If at any time during the continuance of the order the performance in whole or in part by either Contractor of any obligation under this order shall be prevented or delayed by reasons of any war, hostility, acts of public enemy, civil commotion, sabotage, fire, floods, epidemic, quarantine restrictions, strikes, go-slow, lockout or acts of God, notice of which is given either Contractor to the other within 21 days from the date of occurrence thereof, neither Contractor shall be reasons of such eventuality be entitled to terminate this order nor shall either Contractor have any claim for damages against the other in respect of such non-performance or delay in performance. | | |
| 9. Secrecy | | |
| The drawings and documents sent along with this tender form part of vital documents and same should be kept on top secret. Under any situations, contractor should not part with or transfer the technology/contents of drawings and documents whatsoever to any 3rd party/agency without our prior consent. If at any time, it is brought to our notice that the secrecy has been transferred by you intentionally or otherwise to any third party /agency, contractor shall be liable to indemnify the loss/ damage to Government of India. | | |
| 10. Indemnity | | |
| Contractor shall warrant and be deemed to have warranted that all the items supplied against this tender are free and clean of any infringement of any patent, copy right or trademark and shall at all times indemnify LPSC(B) against all claims which may be made in respect of the items | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|---|------------------------|---|
| for infringement of any right protected by patent registration of design or trade mark and shall take all risk of accidents or damage which may cause a failure of the supply from whatsoever cause arising and the entire responsibility for the sufficiency of all the means used for executing the Purchase Order. | | |
| 11. Delivery | | |
| Items shall be supplied & installed and site acceptance tested within 6 months from the date of receipt of Purchase Order. | | |
| 12. Payment Terms | | |
| 100% payment shall be made after receipt of all items and installation, commissioning & satisfactory acceptance at the LPSC(B) site. | | |
| 13. Validity | | |
| The quoted price should be valid for a period of 6 months from the date of opening of the technical and commercial quotation. | | |
| 14. Heritage Clause | | |
| The party should have a previous experience of having successfully completed the similar system for reputed aerospace industries in India, the address and details of the company (year of supply, commissioning date, and customer feedback) where they have supplied shall be mentioned in the offer. | | |
| 15. General Conditions to the vendors | | |
| 1. The party has to supply the system and application software as per the specifications and requirements deliberated in previous sections. The response to the tender is in the form of two separate offers, one as 'Part-A: Technical-Commercial Offer' and other as 'Part-B: Price Bid'. Both the offers are to be submitted simultaneously in separate sealed covers. | | |
| 2. Any modifications in the system till installation shall meet the technical specification of the tender document and prior approval to be obtained from LPSC(B). Further the modifications made shall be technically equal or superior w.r.t. to the original offer and should not have any additional cost implication. | | |
| 3. The total system shall be guaranteed for performance and failure-free operation for a | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|------------------------|---|
| period of 12 months from date of final acceptance of system by LPSC(B)/ISRO. | | |
| 4. During the evaluation of technical bids alternatives/options/suggestions shall be confirmed in technical offer to meet the system specifications. As the contract is for fixed price, no provision for addition/reduction in charges will be entrained after opening the price bid | | |
| 5. Any information kept vague or not furnished shall be treated as non-compliance with the requirements of the vendor and hence tender are liable for rejection. | | |
| 16. Responsibilities of vendor | | |
| 1. Design, supply, integration & installation of Electrical Ground Support System at LPSC(B)/ ISRO campus as per the tender specification | | |
| 2. The vendor shall integrate, install and commission the system at party premises as per specification and deliver the complete system at LPSCB/ISRO. | | |
| 3. To Conduct Site Acceptance Test (SAT) as per the tender document | | |
| 17. Responsibilities of LPSC (B) | | |
| 1. To review and approve the system configuration | | |
| 2. To provide final clearance for DAS by SAT and Test Evaluation | | |
| Mode of Quoting | | |
| The offers shall be submitted on two-part basis as follows: Technical &commercial (other than price) bid & Price bid. Also the validity of quotation shall be 6 months minimum from the date of quoting. | | |
| a. The quotation shall be based on fixed and firm price and no price escalation is permitted. | | |
| b. During the evaluation of technical bids alternatives/options/suggestions shall be confirmed in technical offer to meet the system specifications. As the contract is for fixed price, no provision for addition/reduction in charges will be entertained after opening the price bid. | | |
| c. FIRM DELIVERY PERIOD After receipt of order shall be quoted taking into account of all contingencies. | | |
| d. Any information kept vague or not furnished shall be treated as non-compliance with the requirements of the vendor and hence tender are liable for rejection. | | |

| SPECIFICATIONS | Compliance (Yes/No) | Detailed specification/ vendor comments |
|--|------------------------|---|
| 1. Following documents shall be submitted by the vendor along with Technical Offer (Part-A) | | |
| 1. Compliance matrix of each specification as given in this document. | | |
| 2. List and details of non-compliance of specifications by the vendor if any. | | |
| 3. Confirmation of scope of supply as given in this document. | | |
| 4. List of imported & indigenous items and source of supply shall be provided for getting custom duty concession certificate from LPSC(B). | | |
| 5. Specification of components of DAS, model number, data sheet and source of supply. | | |
| 6. Commercial Terms such as delivery date, taxes, duties payable, place of delivery, payment term, validity, guarantee etc. and scope of supply shall not be covered in this part. Please enclose a copy of the details indicated in price quotation (WITHOUT PRICES OR BY MASKING THE PRICE) mainly to know the items/ specifications for which you have indicated prices in price bid. This part should not contain prices. | | |
| 2. Following documents shall be submitted along with Price Bid (Part-B) | | |
| 1. This contract is proposed to be firm and fixed price contract and no price escalation will be permitted during the period of contract. | | |
| 2. The Vendor is chosen on the basis of suitability of techno-commercial merits. The scope of contract will cover the supply of the total system including application software | | |
| 3. The total cost of the system including design, supply, installation, commissioning and testing. | | |
| 4. Break up cost of imported & indigenous items. | | |
| 5. Transportation charges, taxes, government levies shall be specified separately. | | |
| 6. Installation & commissioning charges shall be specified separately. | | |
| 7. Warranty certificate for the period of 1 year, from the date of acceptance of the total system. | | |
| 8. Performance bank guarantee for a minimum period of 12 months from the date of acceptance of the total system by LPSC(B)/ISRO from a nationalized Bank. | | |
| 9. Acceptance to the commercial clauses and conditions. | | |
| 10. Any other information relevant to this tender. | | |

**Specification Document of Data Acquisition
system for Electrical Ground Support
Equipment for OMPS**

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Abbreviations

| | |
|------|----------------------------------|
| CMPS | Crew Module Propulsion System |
| SMPS | Service Module Propulsion System |
| ADC | Analog to Digital Converter |
| EU | Engineering Unit |
| DAS | Data Acquisition System |
| TTL | Transistor Transistor Logic |
| DIO | Digital Input/Output |
| SAT | Site Acceptance Test |
| BOM | Bill Of Material |
| SRD | Software Requirement Document |
| SDD | Software Design Document |

1.0 Introduction

Gaganyaan mission has Crew Module Propulsion System (**CMPS**) and Service Module Propulsion System (**SMPS**). Electrical Ground Support system is required to monitor the health of propulsion system parameters like Pressure & Temperature during various stages of testing, measurement & acquisition of mass flowmeter & weighing balance data during simulant loading/draining & Propellant loading activities. EGSE shall also command the Latch valve to open & close and monitor its status.

2.0 Scope of work

The scope of work is to Supply, installation and testing of Data Acquisition System including application software for Electrical Ground Support System for OMPS.

3.0 Signal /Interface details

| Sl.No | Parameter Description | Signal /Interface | Qty (Nos.) | Spare(Nos.) |
|-------|-------------------------------------|-----------------------|------------|-------------|
| 1 | Pressure & Temperature (Thermistor) | Voltage (± 10 V) | 48 | 8 |
| 2 | PRT 1000 Ω ,100 Ω | RTD | 10 | 6 |
| 3 | Weighing balance | RS 232 & Ethernet | 2+1 | 2+1 |
| 4 | Mass Flow Meters | RS 485 | 2 | 2 |
| 5 | Latch valves (command & status) | Digital I/O | 24 | 8 |

Table No. 1

4.0 Schematic representation of Data Acquisition system

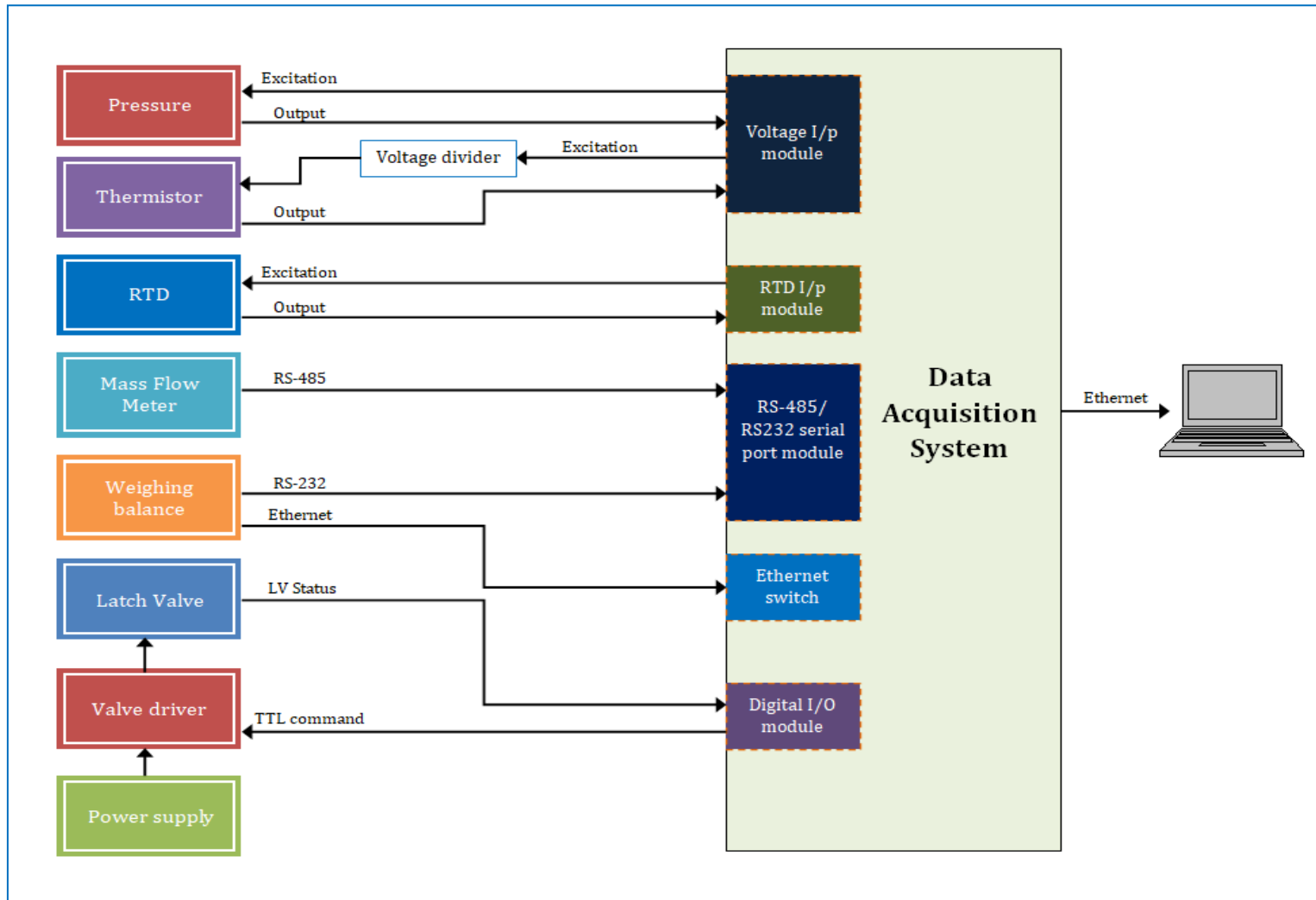


Figure No. 1

Note: Power supply, Valve driver and Voltage divider are under the scope of LPSC

5.0 Specification of Data Acquisition System

5.1 Features of Data Acquisition system

1. Data acquisition system in a single standalone configuration
2. All hardware and software shall be of latest state of art technology
3. All hardware used shall be modular and expandable
4. In DAS each channel shall have individual ADC and ADC shall be a part of signal conditioning module
5. DAS system configuration shall have amplifier, Filter, ADC and software filter for all measurement channels
6. Health indication like network connectivity, failure indication, power ON status and controller health shall be provided for DAS
7. LEMO/D-Sub connector with suitable locking mechanism (push-pull/locking bolt) shall be provided for DAS input card connector. **Mating connector also to be supplied.**
8. The digitized data shall be stored in DAS controller & Laptop
9. Controller shall have a sufficient memory capacity, in case of any failure, the data shall be retrievable
10. The system should be highly resistant to electromagnetic interference
11. Data Acquisition system shall have voltage input modules for measurement of pressure & temperature (Thermistor)
12. Data acquisition system shall have RTD input module for measurement of PRT
13. Digital I/O module for command & status monitoring of Latch valves
14. Data Acquisition system shall have serial interface port (RS232 & RS485) for measurement and acquisition of Weighing balance & mass flowmeter data
15. DAS controller shall be capable of communicating with the analog input and Digital I/Os through Back plane or through suitable standards to acquire and save the data
16. The configuration and the storage capacity of the controller shall be enough to acquire and store all the channels (>100GB) at maximum sampling rate for a continuous duration of at least 24 hours
17. The system should have internal high precision reference clock (minimum 10MHz) for timing accuracy
18. On line computation and display of critical parameters
19. Real time monitoring of Raw voltage, EU of acquired data & Trend graph displays

- 20. Offline processing of acquired data for further data analysis, Graph plotting & printing of processed data
- 21. Application software and driver software to meet the requirement. All the required software shall be preloaded in the controller & Laptop
- 22. Reliable and user-friendly software in Windows platform for all application programs with LabVIEW or suitable application software
- 23. System shall have the diagnostic features to detect failures such as health status LEDs, fault status LED and other indication LEDs to be provided or any software message

5.2 Technical Specification of Data Acquisition System

The Data acquisition system consists of following deliverables

| Sl. No. | Description |
|----------------|--|
| 1 | Chassis |
| 2 | Controller |
| 3 | Voltage input module |
| 4 | RTD module |
| 5 | Digital Input/output Module |
| 6 | Serial Port Module |
| 7 | Ethernet switch |
| 8 | Laptop |
| 9 | Color LaserJet printer |
| 10 | Application software with drivers |
| 11 | Cables & mating connectors (as required) |

Table No. 2

5.2.1 Chassis

| Sl. No. | Description | Specification |
|---------|------------------------------------|--|
| 1 | Type | 19" rack mountable system |
| 2 | Input Power | 230 VAC, 50Hz |
| 3 | Cooling | Suitable cooling for panel/chassis to be provided |
| 4 | LED indication/alarms | Temperature alarm, system failure, power on |
| 5 | Connectors on back and front panel | Suitable mating connectors to be provided. LEMO/suitable locking connector |
| 6 | Operating temperature | 10 to 50°C (Nominal) |
| 7 | Humidity (Nominal) | 10 to 90% RH non-condensing |
| 8 | Shock &vibration | EN60068-2-6, EN60721-3-2, EN60068-2-27 or equivalent |
| 9 | EMI/EMC | EN61000-3-2 , EN61000-3-3 or equivalent |
| | | Note: Chassis shall have 2 Nos of dummy slots for future expansion |
| 10 | Chassis compatibility | Chassis compatible with controller |
| 11 | Digital bus | PXI/PXI Express/ EtherCAT/Proprietary bus |
| 12 | Bus throughput rate (min) | ≥ 100MBytes /second |
| 13 | Synchronization clock (min) | ≥10MHz between all input cards/Chassis |
| 14 | Synchronization | All Input modules shall be part of main system. If separate modules are used, then it should be hardware synchronized with main chassis through standard protocol like IRIG/PTP/NTP/EtherCAT |

Table No. 3

5.2.2 Controller

| Sl. No. | Description | Specification |
|---------|-------------------------|---|
| 1 | Controller | Embedded controller/FPGA/PXI/PXIe/Proprietary Controller with real time storage and analysis |
| 2 | Processor | Intel Core i7 / Atom / Xeon 4 core or better processor |
| 3 | Processor Type | 64 bit |
| 4 | RAM | 16 GB RAM or higher for embedded controller with RTOS or 32 GB or better for general-purpose processor. |
| 5 | Secondary memory | Flash /SSD 1TB |
| 6 | Processor speed | 2.8 GHz or better |
| 7 | Communication interface | 3x10GB Ethernet ports |
| 8 | Data Interface | Ethernet 10GB LAN, USB 3.0 (4 Nos) & EtherCAT |
| 9 | Operating system | Windows (64 bit)/Linux |
| 10 | LED Indication, Alarm | System failure, Power on Alarm, Network Connectivity Indication etc. |

Table No. 4

5.2.3 Voltage input module ($\pm 10V$)

| Sl. No. | Description | Specification |
|---------|---|---|
| 1 | Voltage input | $\pm 10V$ |
| 2 | Number of channels | 56 minimum. |
| 3 | Input configuration | Differential |
| 4 | CMRR | ≥ 80 dB @ 50 Hz |
| 5 | Input Impedance | $\geq 10M\Omega$ |
| 6 | Overall Accuracy | $\leq \pm 0.1\%$ of FSO (Including gain accuracy, gain linearity, gain temperature coefficient, Stability, Offset drift etc.) |
| 7 | Excitation | |
| 7.1 | Voltage | 1-12VDC $\pm 0.05\%$ freely programmable |
| 7.2 | Current | ≥ 40 mA /channel |
| 7.3 | Protection | Short circuit , Over voltage |
| 7.4 | Line & Load regulation | $\leq \pm 0.05\%$ |
| 8 | Isolation | |
| 8.1 | Type | Channel to Channel and Channel to ground |
| 8.2 | Isolation voltage | $\geq 250VDC$ |
| 9 | ADC Configuration | |
| 9.1 | Quantity | Individual ADC for each channel |
| 9.2 | Type | Delta sigma/SAR |
| 9.3 | Sampling rate | 10, 100, 1000, 5000Hz selectable. |
| 9.4 | Resolution | ≥ 16 bit |
| Note: | Party has to provide Signal to noise ratio & Cross talk specification Anti-aliasing Filter: System shall be configured with Low pass filter for anti aliasing for each channel Programmable Filter: 4 pole Bessel or better programmable digital filter 10Hz-5KHz | |

Table No. 5

5.2.4 RTD input Module

| Sl. No. | Description | Specification |
|---------|---------------------------------|--|
| 1 | Type of input and configuration | <ul style="list-style-type: none"> ➤ PT1000, PT2000, PT100, (Resistance inputs) comply to IEC 751. ➤ 2 wire, 3wire and 4 wire software selectable. ➤ The type and its range should be software selectable per channel ➤ Sensor break detection |
| 2 | Number of channels | 16 minimum. |
| 3 | Sensor excitation | $\leq 1mA$ DC excitation/pulsed dc excitation |
| 4 | Input impedance | $\geq 1M\Omega$ |
| 5 | Accuracy | $\leq 1^\circ C$ |
| 6 | Range | 0 to 100 $^\circ C$ |
| 7 | Filter | |
| 7.1 | Anti-aliasing Filter | Low pass filter for anti aliasing |

| Sl. No. | Description | Specification |
|---------|--------------------------|---|
| 7.2 | Programmable Filter | 4 pole or better programmable Digital filter (1-100 Hz) |
| 8 | Isolation | |
| 8.1 | Type | Channel to Channel and Channel to Ground |
| 8.2 | Isolation voltage | $\geq 250\text{VDC}$ |
| 9 | ADC Configuration | |
| 9.1 | Type | Delta sigma/SAR |
| 9.2 | Resolution | ≥ 16 bit |
| 9.3 | Sampling rate | 1 to 100Hz selectable |

Table No. 6

5.2.5 Specification of Digital Input/output Module

| Sl. No. | Description | Specification |
|---------|---------------------------|---|
| 1 | DIO Module | |
| | No. of channels | 32 minimum (configurable for input/output) |
| 2 | Input | |
| 2.1 | Type of input | TTL, Single Ended |
| 2.2 | Input Current | $\pm 250\mu\text{A}$ maximum |
| 2.3 | Input Digital Logic Level | OFF State $\leq 0.8\text{V}$ ON State $\geq 2.2\text{V}$ |
| 3 | Output | |
| 3.1 | Type of output | TTL, Single Ended |
| 3.2 | Output Update Rate | $7\mu\text{s}$ nominal |
| 3.3 | Output Current | $\leq 64\text{mA}$ |

Table No. 7

5.2.6 Specification of Serial Port Module

| Sl. No. | Description | Specification |
|---------|----------------|--|
| 1 | No. of Ports | 4 Nos. RS232 , 4 Nos. RS485 |
| 2 | Baud rate | 50 bps to 921.6 kbps |
| 3 | Data bits | 5,6,7,8 |
| 4 | Stop bits | 1,1.5,2 |
| 5 | Parity | None, Even, Odd, Space, Mark |
| 6 | Serial signals | RS232 - TxD, RxD, RTS RS485 - Data+, Data-, GND |
| 7 | Software | Necessary drivers for windows to be provided |

Table No. 8

5.2.7 Specification of Ethernet switch

| Sl No. | Description | Specification |
|--------|---------------------|--|
| 1 | Type | Layer 2 Manageable switch |
| 2 | Qty | 1 |
| 3 | No of Ports | 8 ports 10/100 /1000Mbps |
| 4 | Switching capacity | 8.8 Gbps |
| 5 | Transmission method | Store and forward |
| 6 | VLANS | 255 static VLANS |
| 7 | Stacking capacity | 32 units per stack |
| 8 | Stacking bandwidth | 13.6 Gbps Integrated Modular stacking system |
| 9 | Power supply | 24V DC /230 V + 10%AC, 50Hz |

Table No. 9

5.2.8 Specification of Laptop

| Sl. No | Parameters | Specifications |
|--------|------------------|---|
| 1 | Form Factor | Laptop |
| 2 | CPU | Intel core i7, 3.4Hz, 8MB cache or higher,64-bit processor |
| 3 | Chipset | Intel Q8 series or better |
| 4 | Screen | 17", LED backlight, 1920 X 1080 & built-in speaker |
| 5 | Memory | DDR4 16 GB 1.6GHz with 32 GB expandability |
| 6 | Graphics | Integrated Intel HD graphics |
| 7 | Ethernet | Integrated NIC Additional Network Interface Card- 2 Nos.1/10GB |
| 8 | USB ports | USB 3.0: Min. 4 Nos. |
| 9 | Video port | DVI and HDMI |
| 10 | Optical drive | DVD/RW (If internal drive is not available external drive shall be given) |
| 11 | Operating System | 64 Bit Windows 10 professional/ Latest Windows OS with perpetual license. Bootable Installation media shall be provided. |
| 12 | Hard Disk | 1TB SSD |
| 13 | Software | Required driver software for Mother Board, Chipset Driver in CD/DVD |
| 14 | Input Power | 230V, 50Hz |
| 15 | Office | Latest MS office professional in installable media with perpetual license. |
| 16 | Battery life | Min. 5 hours |
| 17 | Accessories | Appropriate Bag, Battery Adapter, Mouse |

Table No. 10

5.2.9 Color Laser Jet Network Printer

1. Supports A4 size print
2. 20 PPM in Colour
3. 600 x 600 True DPI
4. Wide Format (12" x 18")
5. 160 MB RAM (expandable up to 540 MB)
6. Network Ready (10/100 Base TX Ethernet card)
7. Automatic Duplex
8. 500 Sheet Capacity paper tray
9. Power input: 230V, 50 Hz

6.0 *Application Software

1. The supply should include all software required for developing the application program, graphics event sequencing alarm history, modification and De-bugging.
2. The programming station shall also have the facilities for monitoring offline processing and plotting.
3. The vendor has to supply the customized application software for real time monitoring and data acquisition, analysis, processing, plotting and operating system-related runtime aiding applications.
4. The system shall have suitable user friendly, reliable driver software and application software to meet the entire configuration in Linux/Windows platform with Labview API or suitable software.
5. The software engineering practices have to be strictly followed in accordance with IEEE 12207 standards/Equivalent updated standard.
6. The software shall be programmed in the latest programming language by the vendor
7. Customized Application software shall be developed & installed in the DAS/laptop.
8. The vendor shall provide application development environment. It should have perpetual license.
9. The system configuration and capacity should be able to acquire and store the required channels in the maximum sampling rate for the continuous duration of at least 24 hours, with multiple files for quick processing and retrieval.
10. The data acquisition software shall have provision for on-line processing and monitoring of parameters (mV/Engineering Unit), on line trend graph display, off line processing, graph plotting, mathematical tool and analysis.

11. Online monitoring (Data and Trend graph displays) of pressure, temperature, voltage , mass flowmeter & weighing balance parameters
12. On line Computation and display of TMR logic, Gas mass & vapour loss.
13. Offline processing of acquired data for further data analysis
14. Graph plotting module for plotting of graph for the selected channels from the acquired data.
15. All screens given are sample, party may discuss all user interface before actual implementation
16. Vendor shall prepare SRD and SDD as per the software specification
17. Error code definition and troubleshooting to be provided for application software.
18. The following tools (but not limited to) shall be provided.
 - Graphics editing software with all necessary tools
 - Drag and drop facilities for graphics /programming
 - Zooming, resizing, rotating facility in graphics
19. Programs and logic diagrams implemented in the system shall be available in the printed format.

***The above section provides only the base line requirements. During design and realization, updation & modification will be provided.**

6.1 Detailed requirement of Application software

6.1.1 Configuration screen: Application software shall have the configuration screen as per the below table.

| | |
|---|--|
| Type of Satellite | User Editable |
| Project | User Editable |
| Testing stage | Dropdown Box (Input: Pressurization, Depressurization, Simulant Filling IPA, Simulant Filling HFE, Propellant Loading MON3, Propellant Loading MMH, Post Integration, Others) |
| Graph selection (Refer fig No.3. not limited to) | This is for real time trend display of selected parameter combination of mass & EGSE parameters. Dropdown Box shall have following parameter combination for real time graph <ol style="list-style-type: none"> 1. Time Vs EGSE pressure, temperature 2. Time Vs Mass total & volume total 3. Time Vs Mass total &WB 4. Time Vs Mass total & Qty to be loaded.,etc., |
| COM Port selection | Dropdown Box used to select COM port for WB & Mass Flow Meter communication. Ex: COM1, COM2 and so on. |
| Equipment details | User editable. Used to enter the equipment identification number for min. 4 equipment's. |
| Propellant tank volume | User Editable |
| Fluid type | Dropdown Box (Input: IPA, Freon, MON-3, MMH and so on) |
| Loading mass (kg) | User Editable |
| Loading pressure (bar) | User Editable |
| Gas | Dropdown Box (Input: Nitrogen, Helium, Argon) Type of Gas used for pressurization or propellant loading. |
| Mass difference | Dropdown Box (Input: 0.5kg, 1kg, 1.5kg, 2kg) |
| Sampling Rate (Voltage module) | User selectable |
| Sampling Rate (RTD module) | User selectable |
| Data Logging Interval | User Editable |
| File Name | User Editable * |
| Equipment No. | User Editable |
| Equipment Validity | User Editable |
| Location | User Editable |
| Operating Team | User Editable |

Table No. 11

* If same file name is repeated, pop up shall display with the query that append or overwrite

6.1.2 Calibration screen

The calibration screen is required for configuration of parameters like pressure, temperature and entering the calibration constants. Provision is required for entering 4th order constants. Sample screen is given below.

| Description | ID | A0 | A1 | A2 | A3 | A4 | Raw Volts | EU | Channel No. | Channel Selection |
|-------------------------|-----|----|----|----|----|----|--------------|----|----------------|----------------------|
| Ox Feed Line | PLO | | | | | | | | 1 | |
| Fu Feed Line | PLF | | | | | | | | 2 | |
| OX Tank | PO | | | | | | | | 3 | |
| Fuel Tank | PF | | | | | | | | 4 | |
| Gas Bottle | PG | | | | | | | | 5 | |
| OX Tank Top | OTT | | | | | | | | 6 | |
| OX Tank Bottom | OTB | | | | | | | | 7 | |
| FU Tank Top | FTT | | | | | | | | 8 | |
| FU Tank Bottom | FTB | | | | | | | | 9 | |
| Gas Tank PRT- 1 | GT1 | | | | | | | | 10 | |
| Gas Tank PRT- 2 | GT2 | | | | | | | | 11 | |
| Gas Tank PRT- 3 | GT3 | | | | | | | | 12 | |
| Voltage Channel +15V | +15 | | | | | | | | 13 | |
| Voltage Channel -15V | -15 | | | | | | | | 14 | |
| Voltage Channel +5V | +5 | | | | | | | | 15 | |
| Spare | | | | | | | | | 16 | |

Table No. 12

Note: selected channels only appear on the main screen. This screen shall be disabled once the acquisition starts so that channel description or constant shall not be modified.

6.1.3 Main Screen

The main screen shall have two main tabs

1. Propulsion System Parameters Display & Acquisition
2. Latch Valve Command & status

1. Propulsion System Parameters Display & Acquisition

| Sl. No | Description | Remarks |
|--------|--------------------------------|--|
| 1 | Project | Project shall be referred from configuration screen & displayed |
| 2 | Testing stage | Testing stage shall be referred from configuration screen & displayed |
| 3 | Date & Time | Date & time shall be displayed |
| 4 | Time of Start | Starting time of Acquisition to be displayed |
| 5 | Data Interval | Data logging interval shall be displayed |
| 6 | Data Logged | No. of data logged shall be displayed |
| 7 | Excitation Voltage | Excitation voltage of pressure transducers shall be displayed |
| 8 | Start Acquisition | Once this button is clicked acquisition shall be started |
| 9 | Stop acquisition | Once this button is clicked acquisition shall be stopped |
| 10 | Monitor | Once this button is clicked data shall be displayed without acquisition. |
| 11 | Parameter Configuration | If the button is clicked, calibration screen to be opened for verification of calibration constants and channel identification & editing. |
| 12 | Channel display | <ul style="list-style-type: none"> • Selected channel name with channel ID (pressure/temperature), raw voltage and Engineering Unit shall be displayed. Raw voltage shall be converted to Engineering unit (bar/°C) using calibration constants from the calibration screen. • Mass parameters like mass flowmeter, weighing balance data shall be acquired through RS485 & RS232/Ethernet and displayed. From mass flow meters, all parameters received thorough MODBUS RS485 shall be acquired and stored. • Weighing balance shall have the provision for acquiring data through RS232 & Ethernet protocol. • From the acquired Mass flowmeter and weighing balance data, MF1-MF2, WB-MF1, WB-MF2, Average of MF1, MF2 & WB shall be displayed. |

| | | |
|----|-----------------------------------|---|
| 13 | Gas mass | Gas mass is a measure of weight of vented gas from the storage tank during propellant loading. This will be computed automatically through the software by using the formula $PV=mRT$. Gas mass shall be computed on line and displayed in the main screen. Details will be provided during time of coding. |
| 14 | Vapor loss | Vapor loss is a measure of mass of vapors escaped along with gas during spacecraft tank venting. Vapor loss also computed on line and shall be displayed. Details will be provided during time of coding. |
| 15 | Propellant to be loaded | This parameter shall display the value of propellant to be loaded. TMR logic shall be used for computing the loading mass. Software shall acquire the data from Mass flow meters (2 nos) & weighing balance and through TMR logic the value shall be displayed. Details will be provided during time of coding. |
| 16 | ROP | Rate of Pressurization should be given in bar/min. It will be difference of 1 st sec pressure value & 30 th sec pressure value and so on for the selected channel |
| 17 | Elapsed time | Software shall display the elapsed time. This is a pause timer between each stage of filling. Timer will start to count elapsed time, when flow stops or flow rate reads zero. Once flow started again, timer shall reset to zero. |
| 18 | Real time graph | During testing, real time graph (trend graph) of selected parameters shall be displayed in the screen. X & Y axis scale shall be editable to suit the requirement. Parameters shall be user selectable for X & Y axis. Each graph shall have the provision to select the no. of channels to plot and can be able to add/remove the parameters during real time acquisition. |
| 19 | Pressure & Temperature | Pressure & temperatures monitoring screen shall read and acquire the pressure and temperature channels. Raw voltage will shows the signal output from the sensor, Engg value shall be computed through software using polynomial constants. |
| 20 | Exit | If this button is clicked, the application software shall exit |

Table No. 13

Sample screens are given in Fig No. 2 & Fig No. 3.

Note:

1. All the parameters shall be acquired & displayed as shown in sample screens.
2. When acquisition is going on, other activities can be given least priority.
3. Party has to customize the software as per the requirements and before developing the software code, party has to prepare Software Requirement algorithm in line with the tendered specification which will be approved by LPSC for development.
4. The party has to accept any modification (if required by LPSC) in the software during design phase.
5. Source code shall be submitted to LPSC(B) for future reference.

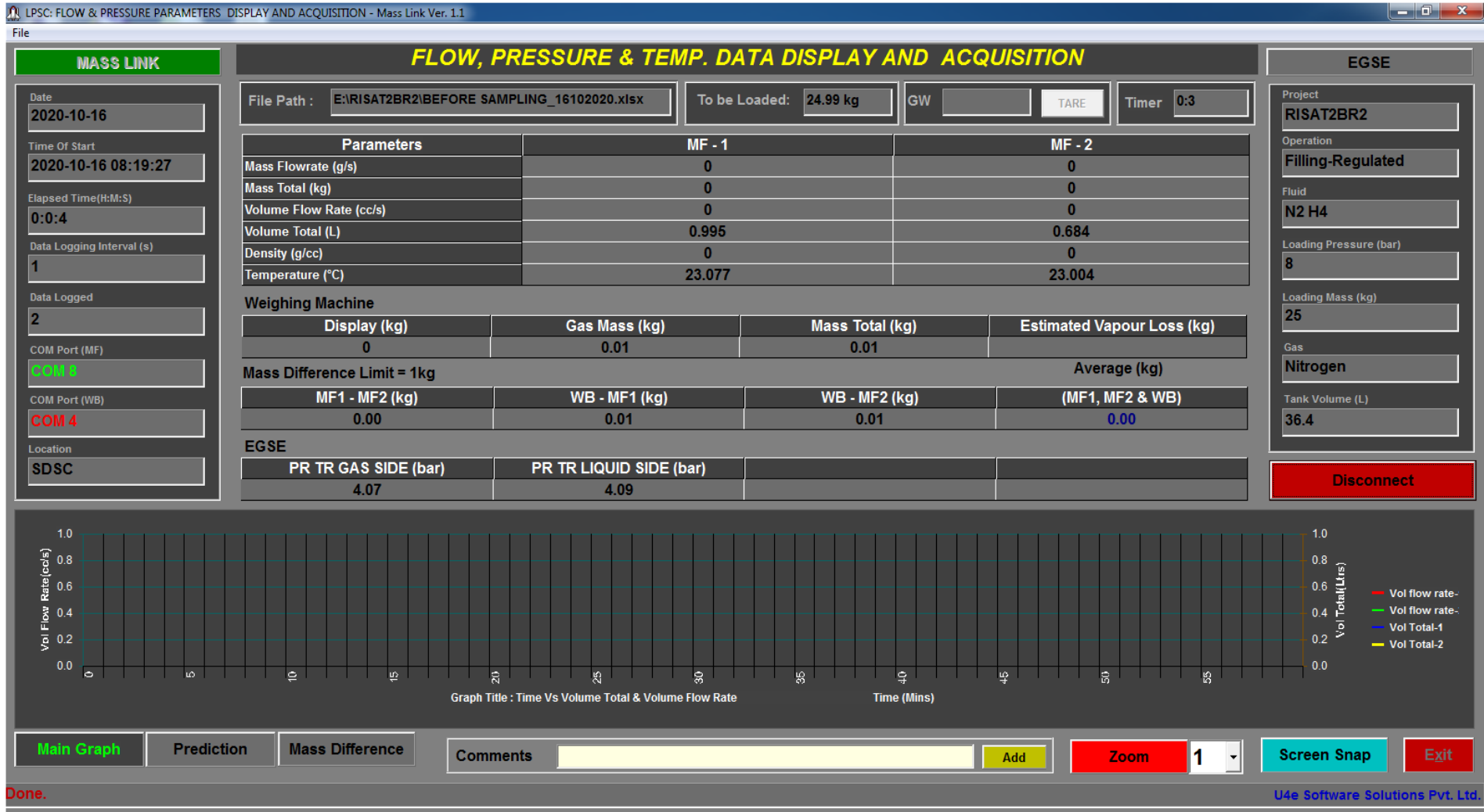


Figure No. 2

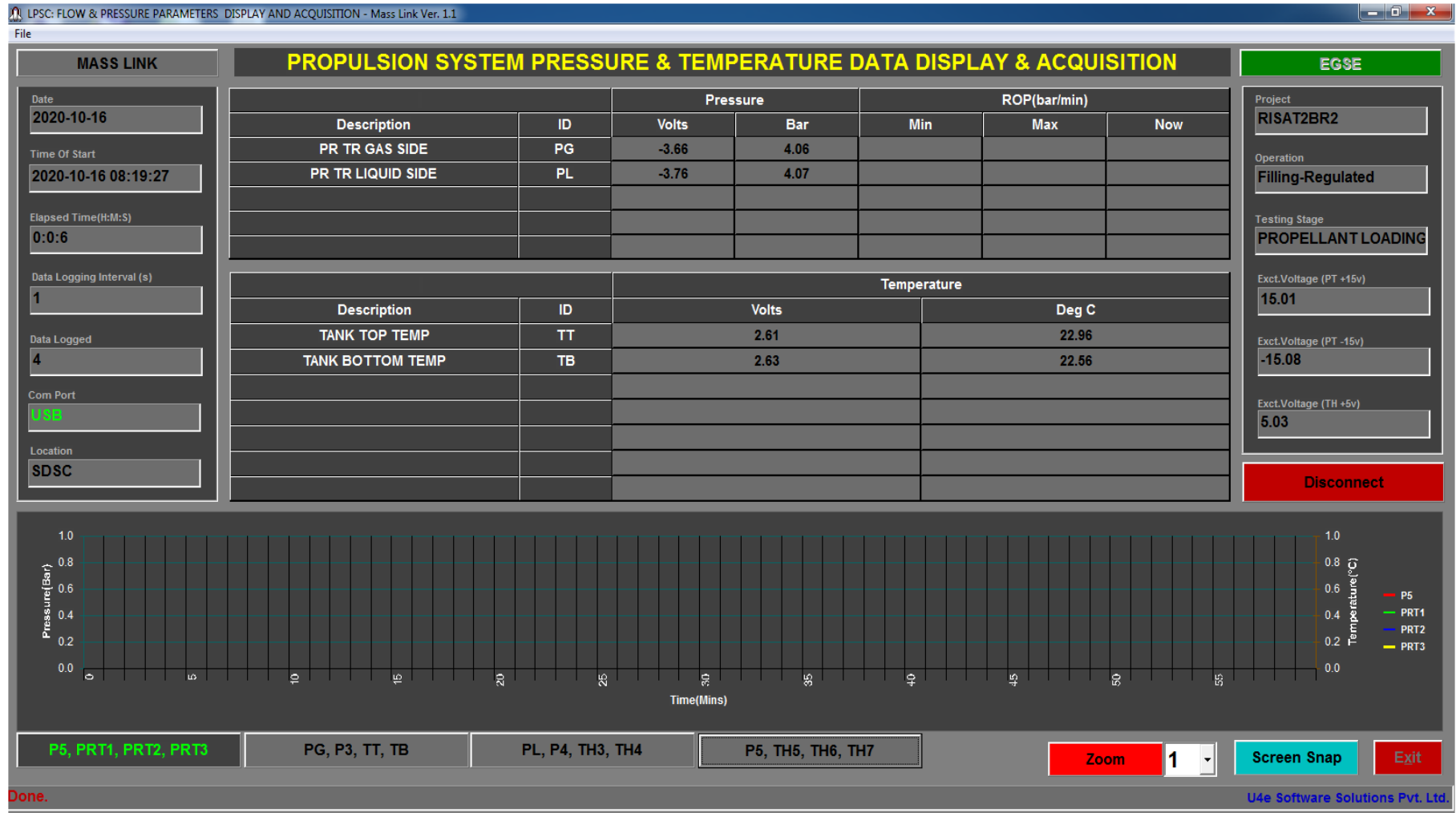


Figure No. 3

2. Latch Valve Command and Status Monitoring

Application software shall command the Latch valve through Digital Output (TTL) and also display & store the status of Latch valves through Digital Input. There are 8 Nos of Latch valves and each Latch valve needs two commands (Open & Close). DIO card shall be used for this purpose. For commanding Latch valve, TTL signal with defined pulse width to be generated for selectable duration. Max duration of pulse shall be 10000 msec. Sample Latch valve screen is given below.



Figure No. 4

Digital events of Latch valve (On/Off command) and status of latch valve also to be logged with time.

6.1.4 Offline Data Processing Module

Offline data processing module shall have the provision to process the data from the saved file with selectable data logging interval (1sec, 2sec, 10sec etc.,) for selected channels.

| Sl.No | Description | Remarks |
|-------|--|---|
| 1 | Project | Project shall be referred from configuration screen & displayed |
| 2 | Select file name | Once the button is clicked, File shall be selected for data processing. Processed file shall be saved and exported to excel, csv, pdf format. |
| 3 | Select the measurement channels | Offline module shall have check box for selection of channels for graph plotting. |
| 4 | Data logging interval | Provision to process the data with selected data logging interval. |
| 5 | Mathematical tool | Offline module shall have the provision for FFT analysis, Min, Max, Average, peak, RMS etc.,. |

Table No. 14

6.1.5 Propulsion mimic page

1. Propulsion mimic page shall be configured and to be uploaded with the final launch base configuration.
2. Final loading report sheet format will be provided by LPSC(B) and which should be of printable format.

6.1.6 Graph Plotting module

1. Graph plotting module shall the provision for plotting the graph for the selected file (EU/Raw voltage) and for selected parameters. Maximum: 4 per graph. Different tab shall be provided for graphs.
2. The graph plotting module shall have the provision to select the required No. of channels for plotting
3. Graph plotting module shall have the preview option to view the plotted graph before printing/saving.
4. Each plot shall have proper header & footer.
5. Print option shall be provided for graph. Plotted graph also to be exported in jpeg /pdf format.
6. The graphical display shall have the provision for changing the color for selected parameters and background.
7. The graph plotting shall have the provision for auto scaling / manual scaling.
8. The graph plotting shall have the multiple scaling for Y scale.
9. The graph plotting shall have the provision for zoom in zoom out.
10. The graph plotting shall have the x and y axis cursor provision with the corresponding data points.

6.1.7 File Saving

1. Report to be generated from the saved file for the selected parameters (EU & Raw voltage) for selected interval.
2. The selected time frame in the acquired data shall be exported to standard file formats like *.xlsx, *.txt, *.csv, *.dat, and *.xml.
3. The selected time frame in the acquired data shall be printable in multiple pages with user-defined time-based segment fit in each page with corresponding header information. Data shall be averaged as per the data logging interval. (If sampling rate selected is 1000 S/sec & Data logging interval is 1sec than data shall be averaged for 1sec and so on.
4. Report shall have the header with time stamp, Project Name, Test Stage, start time of test and data logging interval.
5. In report generation, data logging interval (1sec, 2sec, 3sec, 5 sec, 10sec, 20sec, 30sec, 60sec, 120sec and 180sec), discrete time selection shall be user selectable.
6. Report format shall have the time stamping in the first column followed by selected parameters followed by raw data and engineering data.

6.1.8 Power failure

In case of power failure for the controller, intermittent software crashing/restart, logged data should be saved till the time of failure.

6.1.9 Screen Snap

Provision for screen snap (with comments) shall be provided. This tab is for saving the current screen in the predefined folder at the desktop.

7.0 Documents to be submitted

The following documents shall be prepared and submitted by the party for the approval from the department

Along with Technical Offer

1. Compliance matrix of each specification as given in this document.
2. List and details of non-compliance of specifications by the vendor if any.
3. Confirmation of scope of supply as given in this document.

4. Detailed configuration schematics which shall include
 - 4.1 Detailed specification of proposed chassis, controller, voltage input module, RTD input module & Digital I/O module
 - 4.2 Make and model of Serial port module
 - 4.3 Selection of voltage input modules, RTD input modules & DIO to meet the channel requirements
 - 4.4 Number of channels per voltage, RTD inputs & DIO module
 - 4.5 Type of mating connectors proposed for each module

Along with supply

1. System architecture & configuration for Data acquisition system.
2. Software document (SRD, SDD) as per IEEE12207/Equivalent updated standard.
3. Detailed operation manual for DAS (software & Hardware)
4. SAT, Test and Evaluation Procedure for DAS & application software
5. Inspection and quality assurance plan

8.0 Inspection & Quality assurance plan

The quality assurance is a unified approach that attempts which includes the checking of the adequacy of the equipment/ component's installation, test and evaluation. It is the combined responsibility of the Vendor and the Department to ensure that all possible failure modes are exercised and validated during SAT.

The Vendor must look for the quality factors individually attributed to engineering developments, selection of equipment's and components, test and acceptance procedures followed, repetitive performance achieved, risk analysis carried out, etc. each and every module must be manufactured and tested as per quality standards.

Vendor's shall provide specifications of Data acquisition system, controller and DAS modules with relevant datasheets/catalogues, configuration schematic, installation/ commissioning plan, verification/ evaluation plan during SAT.

1. The vendor shall prepare detailed inspection & quality surveillance plan for DAS and accessories
2. Site acceptance test (SAT) shall be carried out as per the approved document (LPSC & Vendor). Test plan & procedure document & acceptance criteria shall be available prior to SAT
3. The vendor shall supply the relevant test/calibration & warranty certificates for DAS.

4. Wherever inspection at manufacturer’s shop is waived because of any reason, the testing reports shall be verified before dispatch. In no case items shall be released without proper inspection/ verification.

8.1 Quality assurance plan

The supplier shall provide the detailed quality assurance plan for DAS to the purchaser for review and approval based on the sample format of the quality assurance plan given in Table No.15.

| Sl. No | Test | Equip ment/ Component tested | Characte ristics sought for | Extent of test | Test Procedure | Acceptance criterion | Form of record | Pre-Delivery inspection | | |
|--------|------|------------------------------|-----------------------------|----------------|----------------|----------------------|----------------|-------------------------|-------------------|---------------------|
| | | | | | | | | Test Performed by | Test witnessed by | Records reviewed by |
| | | | | | | | | | | |

Table No. 15

9.0 Inspection and Testing

9.1 Site Acceptance Test (SAT) of DAS

All specification of data acquisition system will be verified and vendor shall demonstrate the following major performance matrix

1. Hardware verification as per final BOM
2. Visual & mechanical check-up for proper workmanship, identification, ferruling etc.
3. System configuration as per requirement.
4. Demonstration of all system diagnostics.
5. Functional check of input/output module, linearity check, timing accuracy check, CMRR and Isolation Checks
6. Over voltage check
7. Noise performance check
8. Verification of configuration settings
9. Storage and retrieval of data in controller at different sampling rate.
10. Error diagnostics of the network failure, controller failure, input, output card failure
11. Timing accuracy verification of command channel

12. Data storage test (continuous storage for 24 hours with maximum sampling rate), retrieval and processing of data
13. Validation of DAS configuration software
14. Burn In test for 48 hrs
15. Endurance test
16. Any other mutually agreed test which is essential to meet the requirement

9.2 SAT of Application software

1. Verification of configuration of measurement and command channels
2. Verification of acquisition of all measurement and command channels
3. Parameter selection for on line trend graph display
4. Verification of filter programmability
5. Verification of all computed parameters
6. Verification of Gas mass and Vapor loss computation
7. Verification of TMR logic and related display
8. Verification of Rate of Pressurization computation
9. Verification of On-line numerical and trend graph
10. Ambient data processing
11. Verification of Offline data processing and graph plotting of selected channels
12. Verification of data saving
13. Simulation of software failure and verification of data storage till the point of failure.
14. Generate pulse command with different ON time & verify the command output with CRO for timing accuracy for DIO module
15. Latch Valve Status verification
16. Any other mutually agreed test.

Any malfunctioning in the system shall be rectified at once. Failure of any component shall be replaced with new one. No repaired parts/modules shall be accepted.

9.3 Test and Evaluation of DAS (End to end verification of complete system Demonstration)

The loop calibration of the system is performed and Accuracy of measurement and command channels shall be computed by simulating sensor signals in steps of 0%, 25%,

50%, 75% and 100% in ascending & descending and logging the processed engineering values from DAS.

1. The accuracy of the measurement and command channels shall be computed from T&E processed data for each channel and shall be compared against specification.
2. Detailed T&E evaluation plan for each measurement/ command channel and software validation plan to be prepared by the vendor and approved by LPSC.
3. T&E report for each measurement channel shall be prepared and submitted for approval and Software validation test results to be compiled and submitted for approval.

10.0 Essential spares

Party has to quote for essential spares for DAS (One No. of Voltage input module, RTD input module and 20 % spare for connectors) and spare price shall not be considered for computation of L1 however spare price quoted along with the offer shall be valid for minimum 2 years.

11.0 Price Format

| Sl. No | Description | Qty (Nos.) | Total in INR |
|--------|--|--|--------------|
| | DAS | | |
| 1 | Hardware: | As required to meet the indent specifications. | |
| 1.1 | Chassis | | |
| 1.2 | Controller | | |
| 1.3 | Voltage input module | | |
| 1.4 | RTD module | | |
| 1.5 | Digital Input/output Module | | |
| 1.6 | Serial Port Module | | |
| 1.7 | Ethernet switch | | |
| 1.8 | Cables & mating connectors (as required) | | |
| 2 | Application Software: | | |
| 2.1 | Software for DAS | As per specification | |
| 3 | Laptop & printer | 1 each | |
| 4 | Essential spares | | |
| 4.1 | Voltage Input module | 1 | |
| 4.2 | RTD input Module | 1 | |
| 4.3 | Connectors | 20% | |

Table No. 16

Annexure-1

General commercial terms and conditions

1. Price

The prices are FIRM and FIXED. On receipt of Purchase Order, Vendor has to supply the system within the stipulated delivery period

2. Security Deposit

The party shall submit the security deposit for the performance of the contract, equivalent to 3% of the total order value in the form of bank guarantee or either form of negotiable instrument, issued by a nationalized or scheduled bank in a Rs. 500 non-judicial stamp paper. This Security Deposit will be returned (interest free) after the successful completion of the ordered contract. The security deposit shall have a further claim period of 6 months.

3. Warranty

The total system shall be warranted for total performance and failure-free operation for a period of 12 months from date of final acceptance of system by LPSC(B)/ISRO.

4. Performance Bank Guarantee (PBG)

To cover the warranty period of 12 months, the party shall submit the performance bank guarantee for the performance of the systems, equivalent to 3% of the total order value in the form of bank guarantee or either form of negotiable instrument issued by a nationalized or scheduled bank in a Rs. 500 non-judicial stamp paper. This PBG (interest free) will be returned after the successful completion of the warranty period. The PBG shall have a further claim period of 6 months.

5. Liquidated Damages

As per the Delivery Schedule mentioned is the essence of the order, in case if you fail to deliver the item within the time specified or any extension thereof. Liquidated Damages at 0.5% (Zero Point Five Percent) of the order value or part thereof of the undelivered item for each calendar week of delay shall be recovered from your bill. However, total LD shall not exceed 10% (Ten Percent of the Order Value).

6. Arbitration

Dispute if any shall be settled mutually, failing which it will be referred to a One Man arbitrator appointed by Director, LPSC(B) in accordance with the Indian Arbitration and Conciliation Act 1996, whose decision shall be final and binding on

both the parties. In case of import supply, the Arbitration shall be applicable as per International Chamber of Commerce.

7. Jurisdiction

The Courts in the City of Bangalore alone shall have jurisdiction to deal with and decide any matter or dispute whatsoever arising out of this agreement including those arising under the Arbitration Act.

8. Force Majeure

If at any time during the continuance of the order the performance in whole or in part by either Contractor of any obligation under this order shall be prevented or delayed by reasons of any war, hostility, acts of public enemy, civil commotion, sabotage, fire, floods, epidemic, quarantine restrictions, strikes, go-slow, lockout or acts of God, notice of which is given either Contractor to the other within 21 days from the date of occurrence thereof, neither Contractor shall be reasons of such eventuality be entitled to terminate this order nor shall either Contractor have any claim for damages against the other in respect of such non-performance or delay in performance.

9. Secrecy

The drawings and documents sent along with this tender form part of vital documents and same should be kept on top secret. Under any situations, contractor should not part with or transfer the technology/contents of drawings and documents whatsoever to any 3rd party/agency without our prior consent. If at any time, it is brought to our notice that the secrecy has been transferred by you intentionally or otherwise to any third party /agency, contractor shall be liable to indemnify the loss/ damage to Government of India.

10. Indemnity

Contractor shall warrant and be deemed to have warranted that all the items supplied against this tender are free and clean of any infringement of any patent, copy right or trademark and shall at all times indemnify LPSC(B) against all claims which may be made in respect of the items for infringement of any right protected by patent registration of design or trade mark and shall take all risk of accidents or damage which may cause a failure of the supply from whatsoever cause arising and the entire responsibility for the sufficiency of all the means used for executing the Purchase Order.

11. Delivery

Items shall be supplied & installed and site acceptance tested within **6 months** from the date of receipt of Purchase Order.

12. Payment Terms

100% payment shall be made after receipt of all items and installation, commissioning & satisfactory acceptance at the LPSC(B) site.

13. Validity

The quoted price should be valid for a period of 6 months from the date of opening of the technical and commercial quotation.

14. Heritage Clause

The party should have a previous experience of having successfully completed the similar system for reputed aerospace industries in India, the address and details of the company (year of supply, commissioning date, and customer feedback) where they have supplied shall be mentioned in the offer.

15. General Conditions to the vendors

1. The party has to supply the system and application software as per the specifications and requirements deliberated in previous sections. The response to the tender is in the form of two separate offers, one as 'Part-A: Technical-Commercial Offer' and other as 'Part-B: Price Bid'. Both the offers are to be submitted simultaneously in separate sealed covers.
2. Any modifications in the system till installation shall meet the technical specification of the tender document and prior approval to be obtained from LPSC(B). Further the modifications made shall be technically equal or superior w.r.t. to the original offer and should not have any additional cost implication.
3. The total system shall be guaranteed for performance and failure-free operation for a period of 12 months from date of final acceptance of system by LPSC(B)/ISRO.
4. During the evaluation of technical bids alternatives/options/suggestions shall be confirmed in technical offer to meet the system specifications. As the contract is for fixed price, no provision for addition/reduction in charges will be entrained after opening the price bid
5. Any information kept vague or not furnished shall be treated as non-compliance with the requirements of the vendor and hence tender are liable for rejection.

16. Responsibilities of vendor

1. Design, supply, integration & installation of Electrical Ground Support System at LPSC(B)/ ISRO campus as per the tender specification
2. The vendor shall integrate, install and commission the system at party premises as per specification and deliver the complete system at LPSCB/ISRO.
3. To Conduct Site Acceptance Test (SAT) as per the tender document

17. Responsibilities of LPSC (B)

1. To review and approve the system configuration
2. To provide final clearance for DAS by SAT and Test Evaluation

Mode of Quoting

The offers shall be submitted on two-part basis as follows: Technical & commercial (other than price) bid & Price bid. Also the validity of quotation shall be 6 months minimum from the date of quoting.

- a. The quotation shall be based on fixed and firm price and no price escalation is permitted.
- b. During the evaluation of technical bids alternatives/options/suggestions shall be confirmed in technical offer to meet the system specifications. As the contract is for fixed price, no provision for addition/reduction in charges will be entertained after opening the price bid.
- c. FIRM DELIVERY PERIOD After receipt of order shall be quoted taking into account of all contingencies.
- d. Any information kept vague or not furnished shall be treated as non-compliance with the requirements of the vendor and hence tender are liable for rejection.

1. Following documents shall be submitted by the vendor along with Technical Offer (Part-A)

1. Compliance matrix of each specification as given in this document.
2. List and details of non-compliance of specifications by the vendor if any.
3. Confirmation of scope of supply as given in this document.
4. List of imported & indigenous items and source of supply shall be provided for getting custom duty concession certificate from LPSC(B).
5. Specification of components of DAS, model number, data sheet and source of supply.
6. Commercial Terms such as delivery date, taxes, duties payable, place of delivery, payment term, validity, guarantee etc. and scope of supply shall not be covered in this part. Please enclose a copy of the details indicated in price quotation (WITHOUT PRICES OR BY MASKING THE PRICE) mainly to know the items/ specifications for which you have indicated prices in price bid. **This part should not contain prices.**

2. Following documents shall be submitted along with Price Bid (Part-B)

1. This contract is proposed to be firm and fixed price contract and no price escalation will be permitted during the period of contract.
2. The Vendor is chosen on the basis of suitability of techno-commercial merits. The scope of contract will cover the supply of the total system including application software
3. The total cost of the system including design, supply, installation, commissioning and testing.
4. Break up cost of imported & indigenous items.

5. Transportation charges, taxes, government levies shall be specified separately.
6. Installation & commissioning charges shall be specified separately.
7. Warranty certificate for the period of 1 year, from the date of acceptance of the total system.
8. Performance bank guarantee for a minimum period of 12 months from the date of acceptance of the total system by LPSC(B)/ISRO from a nationalized Bank.
9. Acceptance to the commercial clauses and conditions.
10. Any other information relevant to this tender.