REQUEST FOR PROPOSAL (RFP)

SUPPLY, INSTALLATION AND COMMISSIONING OF AUTOMATED CHECKOUT SYSTEM FOR TESTING INJECTION VALVE AT INTEGRATED LABS FOR FLOW CONTROL VALVES & CONTROL SYSTEMS (ILFC) FACILITY AT LPSC VALIAMALA
(Revision-01)

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Abbreviations/ short forms:

1.	SITVC	-	Secondary Injection Thrust Vector Control
2.	TVC	-	Thrust Vector Control
3.	PSOM	-	PSLV Strap On motors
4.	DMM	-	Digital Multimeter
5.	PS1	-	First stage of PSLV
6.	PS0	-	Stage Zero of PSLV
7.	AI	-	Analog Input
8.	AO	-	Analog Output
9.	FRA	-	Frequency Response Analyzer
10.	PTFE	-	Polytetrafluoroethylene
11.	SDRAM	-	Synchronous Dynamic Random Access Memory
12.	Cmm	-	command monitoring
13.	Fbk	-	feedback
14.	fbk tm	-	feedback telemetry
15.	cmd	-	command
16.	mon	-	monitoring
17.	CE	-	control electronics
18.	PVC	-	Poly vinyl chloride
19.	PREV	-	preview
20.	CV	-	Constant voltage
21.	CC	-	Constant current
22.	PROT	-	protection
23.	OCP	-	over current protection
24.	OVP	-	over voltage protection
25.	CMRR	-	common mode rejection ratio

Part 1
Technical Aspects

1. Introduction

LPSC is realizing electromechanical injection valves (PS1 & PS0) for the SITVC system of PSLV launch vehicles. The PS1 SITVC and PS0 SITVC Control Electronics generates the control signals to operate the injection valves in proportional mode, corresponding to a command of 0 to 10V. The Injection valve comprises of flow control unit, Actuation unit and sensor unit. The flow control unit consists of a pintle to control the valve opening based on the command issued.
The pintle position can be set to vary the opening from 0 to 8mm for PS1 injection valves and from 0 to 4mm for PS0 injection valves for 0 to 10Vcommand range. The actuation unit consists of a dc torque motor to vary the pintle position in the linear direction. The sensor unit consists of a potentiometer sensor that is linked to the pintle and gives a direct output on pintle position.An automated checkout system needs to be realized to test the injection valve under flow condition with water as medium.

This RFP document provides the scope of supply, hardware and software requirements, terms and conditions etc, needed for realizing of automated checkout system for the flow testing of PS1 & PS0 injection valves at ILFC facility at LPSC Valiamala.

2. Scope

2.1 Procurement and Supply of Equipments / Materials

Refer table 1 (Equipments / Materials which are under the scope of supply of the Vendor) for the list of items to be supplied by the vendor and its specification. Vendor shall have to supply the items as per the detailed specification given in annexure 2.

2.2 Installation & Wiring of the Checkout Systems

Necessary routing diagrams for command generation and acquisition of data for execution of work are provided in this RFP. Details of installation & wiring work to be done by the vendor and corresponding figures & routing diagrams are given in the section 7. Vendor shall have to prepare and submit the detailed engineering drawing to LPSC for concurrence. Integration of total system at LPSC - Vendor shall have to carry out the wiring of checkout system rack (ie. Power supplies and instruments, PXI system),which is connected to package and valves. Laying of shielded cables, connectors harness, Installation of Racks etc. are also to be done by the vendor.

2.3 Development of software

Vendor shall do the Development and installation of - Application and report generation software and other system software /drivers for basic functionality.

2.4 Evaluation, Checking & Commissioning Activities

Vendor shall have to carry out necessary functional checks like continuity and integrity check of end to end wiring, voltage simulation tests and calibration of measurements and command channels etc. as part of the commissioning of the entire system. Vendor shall have to generate and submit the necessary test report of the above tests to LPSC. The detailed procedures and guidance for doing these tests will be given by LPSC to the vendor after P.O placement.

a. Demonstration of checkout system with Injection valve and Control electronics package.
b. Training of personnel at LPSC

2.5 Documentation

Vendor shall provide the documents - Hardware requirement specification (HRS), Software requirement specification (SRS), Software design document (SDD), user manual and source code for the checkout software.

2.6 General

1. Warranty of the system for minimum 1 year from the date of commissioning.
2. Vendor shall have previous experience in similar work.
3. AMC (non comprehensive) rates should be quoted separately.

3 Responsibilities of Vendor

1. Submission of detailed engineering drawing.
2. Supply of equipments / materials mentioned in section 8.
3. Providing warranty for the equipments supplied by the vendor.
4. Installation and commissioning activities in stipulated time.
5. Development of application software.
6. Test & evaluation of the total Checkout system and submit the report to LPSC.
7. Work site safety of the workers of the vendor.
8. Tools required for the installation activities.
9. Safe handling of the items and equipment without any damage during the installation and commissioning phase of instrumentation systems.

4 Responsibilities of LPSC

1. Make the work site ready for the installation activities.
2. Supply of PS1 and PS0 CE packages, pressure transducer, flow meters with transmitter details mentioned in section 10.
3. Arranging pre-bid meeting with the vendor at LPSC.
4. Acceptance of detailed engineering drawing.
5. Inspection of the equipment / materials supplied by the vendor.
6. Providing test & evaluation plan of injection valve to the vendor.
7. Supervision & evaluation of the work done by the vendor.

5 Scope of Work

The scope of work includes the configuration of checkout hardware and instrumentation. The instrumentation system consists of control room and test bed instrumentation.

5.1 Control room instrumentation

The Control Room will be an air-conditioned room. The 19-inchinstrumentation racks will be placed in this room. The rack houses PXI/ PXIe system for data acquisition, power supplies, test console to operate and monitor the test results, measurement instruments to communicate with PXI system, connector plates etc. The hardware elements of the checkout system need to be positioned in the rack with proper routing of cable.

Rack at control room includes the following components

1. Power supplies
2. PXI/ PXIe chassis and associated cards
    a. PXI/PXIe Controller

b. Relay module cards (signal switching, high current)
c. Data acquisition cards (Analog input and output, DMM add on module)
d. Frequency response analyzer card

3. Monitor
4. Signal conditioners
5. Connectors& terminal blocks printer
6. Printer

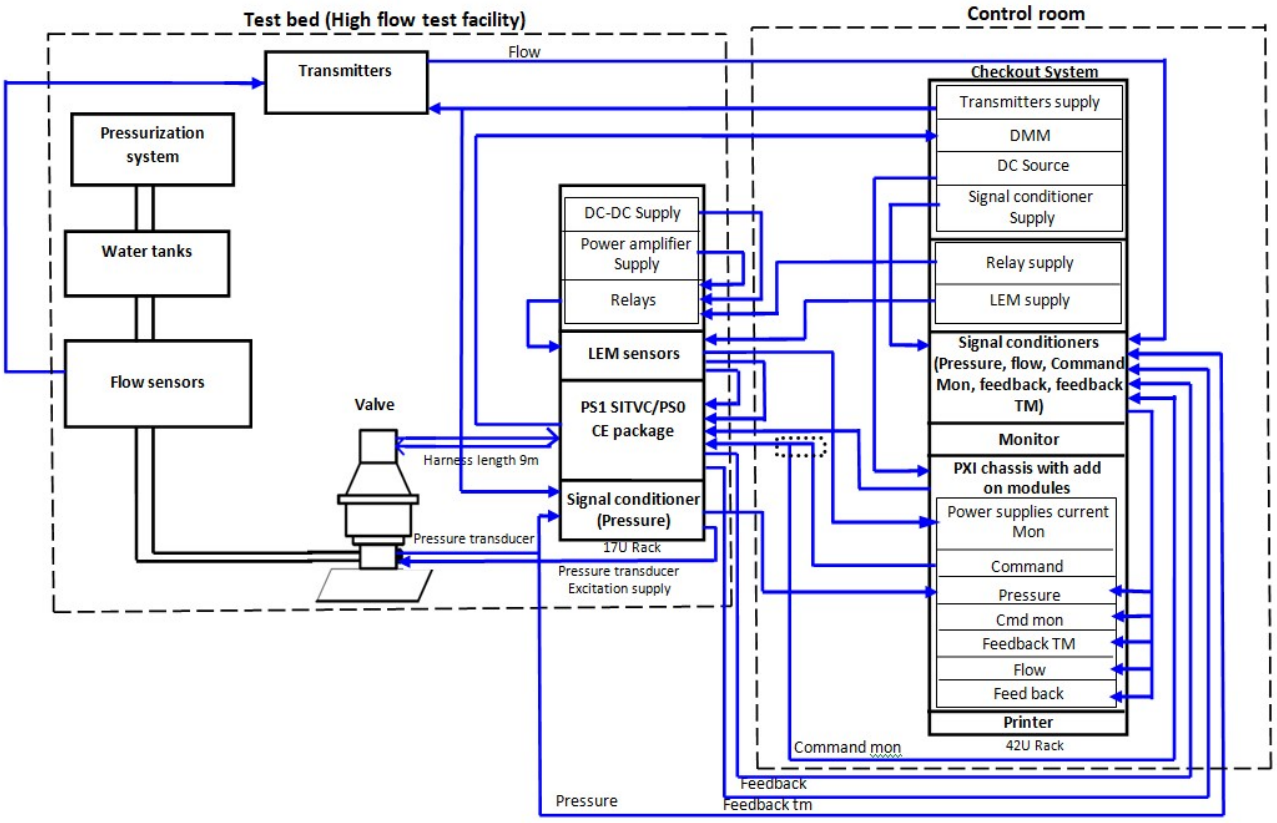

Figure 1- Test setup for flow mode tests

Power supplies are to be routed through relays for ON/OFF control and the relay drivers should be part of the PXI/ PXIe system. Test set up for Flow mode tests is shown in figure 1. The control room and test bed are at a distance will be of around 50 meters. The length of harness between package and valve is 9m.The checkout system along with all add on modules will be sitting on control room which is at a distance of 50 meters from test bed. The control packages, its power supplies, valve and LEM sensors etc are placed on the test bed. Separate rack is planned for putting package and its supplies. Rack configurations (equipments placed in each rack slot) is given in Figure 1.

The above mentioned equipments and devices are used to provide powering and control commands to Control electronics packages and monitor various parameters pressure, temperature, current flow and telemetry. The data acquisition and command generation system is through PXI /PXIe based system. Power supply control is through LAN.

5.2 Test bed instrumentation

Test bed means the place or bay where the injection valve is placed. The test article (ie. the flight components in which the test is being done), Control Electronics packages, LEM sensors, transducers, flow meters, transmitters, etc. will be placed here. The CE package & LEM sensors are to be placed in a small 19 inch rack. Cables from sensors, transmitters & transducers and valves shall be neatly tied and routed through cable duct and cable trays. Proper routing should be done from the rack to valves. The cable trays are to be painted prior to fixing. All the cables to instrumentation racks at the control room shall be routed either through flexible metal hose or case & capping for additional protection. The distance between control room and test bed is 50meter. The harness length between Valve and package is 9m.

5.3 Software Configuration

The test software shall contain proper GUI for carrying out the testing in Manual or Auto Mode and for displaying all parameters during testing in graphical and numeric in engineering unit. The operator should be able to select any window of Interest for doing a particular test. The application software should provide easy access to the test and storage of test results and raw data. After completion of the test, report generation software should provide a consolidated test report and provision to take print out of the report. The application software is to be developed, delivered and installed with the following functional modules.

a) Command generation module

The primary function of this module is to generate the commands required for testing.

b) Data acquisition module

The primary function of this module is to acquire all the analog and digital telemetries during operation. It also saves the data during operation

c) Offline analysis module

This module is used to analyze the raw data archived during operation.

d) Report generation module

This module is required for consolidating the test results and for generating the test report in the prescribed format and for printing the test result.

6 Channel requirements for valve testing:

Sl no	Channel type	Total channels	Allocation of channels	Spare channels
1	Analog input (AI)	8	Feedback - 1 no, feedback telemetry- 1no, power supply current-2 Nos, command monitoring- 1no, pressure -1 no and flow – 2 nos for PS1 & PS0	2
2	Analog output (AO)	2	Command generation for PS1 & PS0 CE package	2
3	Signal switching relay channels	20	Switching of analog inputs for PS1 & PS0	2
4	Frequency response analyser card Analog Input Analog output	 2 2	 Command monitoring & feedback Telemetry of PS1 & PS0 Command for PS1 & PS0	

7 Checkout Configuration:

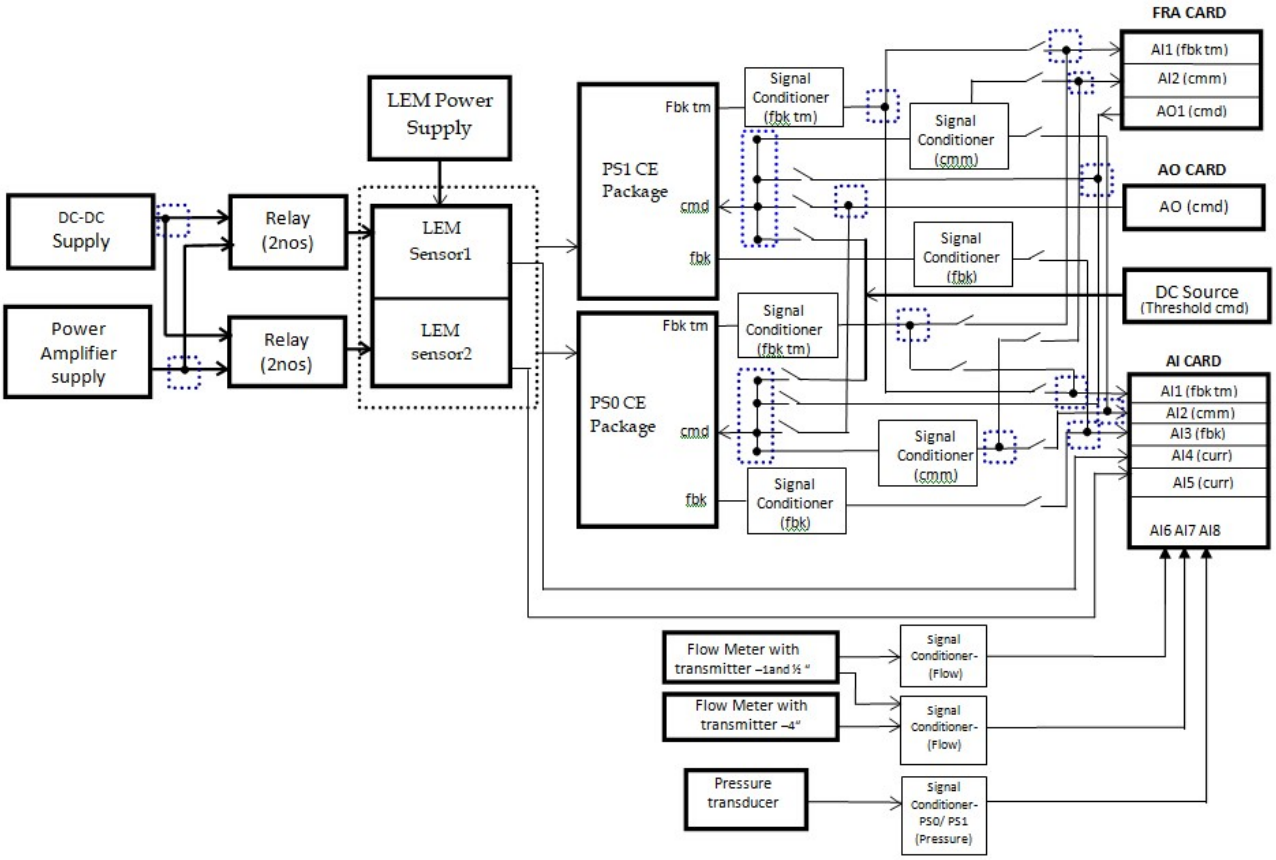

Figure 2 - Checkout Interface diagram

Note: Other power supplies connected directly to instruments not through relay cards.

All Power Supplies, Network Switches and data acquisition cards with its accessories, monitor with keyboard, measuring instruments, LEM sensors shall be mounted in 19-inch instrumentation racks. Channel Allocation of data acquisition cards for signal routing to packages and other instruments/supplies connections are shown in checkout interface diagram figure 2. Wiring shall be done neatly and tied with cable ties. Racks shall be labelled with respective names. All the instruments mounted in the rack shall be labelled with printed stickers. All the termination of cables shall be labelled at both ends. Proper termination shall be used with proper tools. The low-level signal in the order of milli volt signal from the sensor is fed to the signal conditioner.

8 Equipments / Materials which are under the scope of supply of the Vendor

Table 1: List of major hardware

Sl. No.	Item Description	Qty required	Spare Qty	Total cost
1	42U Height Rack &its accessories	1		
2	17U Height Rack & its accessories	1		
3	19" Rack mount monitor with keyboard	1		

Sl. No.	Item Description	Qty required	Spare Qty	Total cost
4	Printer	1		
5	Programmable DC power supply Type 1	2		
6	Programmable DC power supply Type 2	1		
7	Programmable DC power supply Type 3	2		
8	PXI chassis and rack mount kit	1		
9	PXI Controller	1		
10	Multifunction I/O card(AI& AO)or Separate AI/AO card	1 or 2	1	
11	Relay	4		
12	Signal Switching relay module	1		
13	FRA (Frequency response analyzer) module	1		
14	DMM Instrument	1		
15	Micro meter (Depth gauge)	1		
16	Signal conditioner/Instrument amplifier	9		
17	DC source generator	1		
18	LEM current sensor	2		
19	Power supply for LEM	1		
20	Walkie Talkie Communication Device	3	2	
21	Network switches	3		
22	RJ -45 male connectors	6	4	
23	Ethernet cable	1		
24	Shielded wires	1 Lot each		
25	Connectors	25 nos		
26	Custom Made Software Module with back up System design - Software design and development as per user requirement. (including licensed application software)			
27	Integration, wiring and testing of hardware	1 lot		
28	Documentation			
Total				

All the above mentioned items are detailed in annexure 2

8.1 Unforeseen Items

Any other items which are essential for the successful commissioning of the facility and which are not specified in this RFP shall be added by the vendor at the time of pre- bid meeting and supplied at additional cost, with the approval of LPSC.

9 Software requirements Specifications

9.1 General Requirements

Following are the general requirements of the application software.

1. Facility to conduct all tests as listed in the test matrix given in Annexure1. Detailed test plan will be provided once P.O is placed.
2. Communication with power supplies and measuring instruments for its configuration, parameter settings and ON/OFF control. Power supply settings is provided in table 2.
3. Interface with Analog Input/Analog Output modules for generation of commands and acquisition of TM parameters.
4. Continuous acquisition of power supply parameters (current), analog telemetries and logging of data.
5. Automatic abort on observing anomaly in the power supply parameters.
6. Provision to ground the command input before powering.
7. Archival of raw data with time stamp in .txt format.
8. Data analysis and processing to find out the performance parameters.
9. Display of real time logged data as waveform/table along with calculated parameters.
10. Provision of data plotting software, User friendly GUI.
11. Option to switch from one valve to another valve.
12. Preferred sampling rate 1kS/s for all the tests.

Note: software to be developed preferably using labview/ labwindows/ c#/python.

9.2 The major interlocks to be in corporate are

1. Confirm the power supply setting before the start of test.
2. Ensure all command inputs are grounded before powering the package.
3. Ensure that Valve load is connected.
4. **Power ON sequence of power supplies**
   i. DC – DC power supply
   ii. Power amplifier supply
5. Power amplifier supply cannot be switched on until DC-DC supply is switched ON and voltage & current measurements are within specification.
6. **Power OFF sequence**
   i. Power amplifier supply
   ii. DC-DC power supply
7. Test should start only when all power supply voltage, current and the telemetry monitoring are within specification.
8. If a test need to be aborted due to some anomaly, power supplies need to be switched off in the power off sequence.
9. Software/hardware interlocks need to be provided for the following
   i. During testing both the packages should not be powered simultaneously. Only the package for the valves under test need to be powered. Other package should be isolated.

ii. On commanding one package other package command lines should be disconnected. It can be done by opening the relays through which the signals are routed.
iii. To the same package, avoid commanding from multiple sources

9.3 Data acquisition requirements

During functional test power supply surveillance and data acquisition should run concurrently. Section 6 provides the parameters to be monitored and the channel requirements.

1. Following are the major data acquisition requirements
   a) Ensure checkout readiness prior to each test.
   b) Continuous monitoring of the power supply current through LEM sensor and verification for its limits.
   c) If the data exceeds the limit software should call for automatic abort.
   d) Continuous monitoring of telemetry data.
   e) Status monitoring of the relays must be incorporated.
2. Real time processing of data for performance parameter evaluation.
3. Comparison of the test results with the spec and giving ok/ Not ok status
4. Data input to the software must be based on .txt files, which include different configuration files, command input, command duration, frequency of operation (as in frequency response test).

9.4 Data logging & Report generation

Data logging and report generation will be done by following steps

1. Test data along with result need to be logged in proper format along with Package ID, valve reference number, test name, test condition and date for each test.
2. Storage of raw data in .txt format w.r.t time stamp in separate directory for each test
3. Offline data analysis and plotting of data
4. Provide sufficient tool for plotting and data analysis
5. Consolidation of valve wise test data in proper format.
6. Generation of test report.

9.5 GUI (Graphical user interface)Requirements:

1. GUI should be user friendly.
2. Menu based GUI is required for selecting different tests according to the test matrix.
3. As per the test requirements, checkout must provide the provision for selecting
   a) Power supply Voltage selection (26 V, 28.5 V & 32 V)
   b) Valve selection (PS1 and PS0 valves)
   c) Test & Test command selection
   d) Provision to enter the package details (Package ID, scale factor, offset, valve Reference number etc) and test condition.
   e) Provision to select test configuration (Dry mode/flow mode)
4. Interlocks must be provided for power supply sequencing & to enable the start button after selecting all the required parameters. (Package, valve, command, test voltage etc).
5. Provision for online graphical and Tabular display of Acquired as well as calculated parameters etc.
6. Provision for printing the test report after each test.
7. Provision for selecting the text files through GUI in viewable format for offline analysis

10 Equipments/ Materials which are under the scope of supply of LPSC

LPSC will supply the following items required for the checkout system work. These items will be handed over to the vendor at the time of installation work.

SL No	Item	Qty(Nos)
1	Flow meter	2
2	Pressure transducer	1
3	transmitter	2
4	PS1 CE package	1
5	PS0 CE package	1
6	Test article	1

Annexure 1

1. TEST MATRIX FOR INJECTION VALVE CHECKOUT SYSTEM

a. DRY MODE TESTS (Post connector wiring & Cover assembly)

1. Self-closing test
2. Pintle travel and Steady state error test
3. Step response test–((0–2%, 0–3%, 0–10%, 0–90% & 10–90%) of full scale command (10V))
4. Frequency response test
   - (10%command, 50%bias)
   - (1%command,3%bias(QM only))
   - (2%command,5%bias(QM only))
   - (5%command,7.5%bias(QM only))
   - (10%command,12%bias(QM only))
   - (45%command,50%bias(QM only))

b. FLOW MODE TESTS

Flow mode tests are conducted with valve under specified pressurized condition of 5.4 MPa for PS1 valves and 4.9MPa for PS0 valves and flow media is De ionized water. The valve mated with Pressure transducer is mounted on the test bed and is interfaced to the equivalent electronics setup in the flow test facility.

1. Leakagetestat5.4MPa for PS1 valves and 4.9MPa for PS0 valves
2. Flow calibration
3. Self-closing test
4. Step response test – ((0–2%, 0–3%, 0–10%, 0–90% & 10–90%) of full scale command (10V))
5. Frequency Response test
   - (10%command, 50%bias)
   - (1%command,3%bias(QM only))
   - (2%command,5%bias(QM only))
   - (5%command,7.5%bias(QM only))
   - (10%command,12%bias(QM only))
   - (45%command,50%bias(QM only))
6. Threshold Measurement

Annexure 2

I. Specification of the hardware modules.

Note :Wires and connectors :

1. Power supplies routed through 20AWG & signals through 24AWG shielded twisted pair cables.
2. Wiring for power amplifier supply: Max current will be 10A and wiring has to be done to sustain the same for a continuous testing duration of 1 hr.

1. 42U height Rack& its accessories

S.L No	Parameter	Specification	Compliance by vendor
1	No of Rack	1 No	
2	Size	42U X 600mm X 800 mm (H X W X D)	
3	colour	Black or Grey	
4	Painting type	Powder coating	
5	Construction material	light duty stainless steel	
6	Heavy duty Nylon castor wheels with foot operated brakes	Required	
7	Front doors	Lockable Toughened Glass Door, Steel Single, Steel Dual	
8	Rear door	light duty stainless Steel. Door lock and door handle on rear side also	
9	Cooling system	Fan cooling	
10	Standards for rack	DIN 41494 and current industry practices	
11	Mounting angle	19" Mounting angles made of formed steel	

Scope of supply per each Rack

Sl.No.	Description	Qty.(Nos.)	Compliance by vendor
1	Profile, vertical	4	
2	End frame assembly top	1	
3	End frame assembly bottom	1	
4	Cover side	2	
5	Cover top	1	
6	Cover bottom	1	
7	Horizontal support channel	5	
8	Front door	1	

9	Rear door	1	
10	Cooling fans suitable for mounting in 19" fan tray	4	
11	2 inch Heavy Duty Nylon Castor wheels with foot operated brakes	4	
12	Power distribution box of (15 x 5A, 2 x 15A) with spike suppressor	1	
13	Copper Earthing bar and accessories	1	
14	All fasteners such as mounting bolts, mounting screws, metallic washers, nuts and cage nuts required for mounting above items.	1 set	

2. 17U height Rack & its accessories

S.L No	Parameter	Specification	Compliance by vendor
1	No of Rack	1Nos	
2	Size	17U X 600mm X 600 mm (H X W X D)	
3	colour	Black or Grey	
4	Painting type	Powder coating	
5	Construction material	light duty stainless steel should be used.	
6	Heavy duty Nylon castor wheels with foot operated brakes	Required	
7	Front doors	Toughened tinted glass.	
8	Rear door	light duty stainless Steel. Door lock and door handle on rear side also	
9	Cooling system	Fan cooling	
10	Standards for rack	DIN 41494 or equivalent standard	
11	Mounting angle	19" Mounting angles made of formed steel	

Scope of supply

Sl. No.	Description	Qty.(Nos.)	Compliance by vendor
1	Profile, vertical	4	
2	End frame assembly top	1	
3	End frame assembly bottom	1	
4	Cover side	2	
5	Cover top	1	

6	Cover bottom	1	
7	Horizontal support channel	3	
8	Front door	1	
9	Rear door	1	
10	Cooling fans suitable for mounting in 19" fan tray	4	
11	2 inch Heavy Duty Nylon Castor wheels with foot operated brakes	4	
12	Power distribution box of (2 x 15A) with spike suppressor	1	
13	Copper Earthing bar and accessories	1	
14	All fasteners such as mounting bolts, mounting screws, metallic washers, nuts and cage nuts required for mounting above items.	1 set	

3. 19 "Rack mount monitor with keyboard

SL. No.	Parameter	Specification	Compliance by vendor
1	Mounting	Foldable 1U rack mount	
2	Monitor	commercial type, 19 inch wide LCD monitor	
3	Interface	PS-2/USB /VGA	
4	External support	USB connectors for keyboard , mouse and printer, LAN ports	
5	Video quality	supports resolutions of up to 1280 x 1024	
6	Keyboard	Keyboard Language support: English	
7	Maximum Input voltage	230V AC, 50Hz	

4. Printer

SL. No.	Parameter	Specification	Compliance by vendor
1	Mounting	19 inch rack mount	
2	Type	Laser jet	
3	Power supply required	230V ,50Hz	
4	Duplex Print Options	automatic	
5	Resolution	600 x 600 dpi for both colour, black & white	

6	Paper handling capacity	Input: 100-sheet input tray Output: 50-sheet output bin	
7	Operating system compatibility	Windows 10/11(32/64 bit)	
8	Connectivity	USB port	

5. Programmable DC power supply Type1

SL. No.	Parameter	Specification	Compliance by vendor
1	Rated output voltage	0-36V or better	
2	Rated Output current	0-5 A or better	
3	Constant voltage mode		
	Load Regulation	0.01% of Vout or better	
	Line Regulation		
4	Constant current mode		
	Load Regulation	0.01% of Iout or better	
	Line Regulation		
5	Ripple and Noise	≤ 50mV pk-pk or better	
6	Display	4 digitsseparate voltage and Current	
7	Front panel buttons/Knobs	Coarse and fine controls for both Voltage and current	
8	Interface	LAN compatible mandatory	
9	indication	FINE, MENU , PREV, PROT, OUTPUT, CV , CC	
10	Weight of the supply	≤ 7 Kg	
Digital programming and read back (programming accuracy)			
11	Voltage	0.02% of full scale	
12	Current	0.02% of full scale	
13	Protective functions	OCP (constant current), OCP fold back, OVP	

6. Programmable DC power supply Type2

SL. No.	Parameter	Specification	Compliance by vendor
1	Rated output voltage	0-60 or better	
2	Rated Output current	0-15 A minimum	
3	Constant voltage mode		

	Max line regulation	0.01% of Vout or better	
	Max load regulation		
4	Constant current mode		
	Max line regulation	0.01% of Iout or better	
	Max load regulation		
5	Ripple and Noise	≤ 50mV pk-pk or better	
6	Display	4 digits separate voltage and Current	
7	Status indication	Indication of Output On, V/I Limits, CV, CI	
8	Interface	LAN compatible mandatory	
9	Front panel description indication	Preview setting, output ON/OFF,CV/CC	
10	Weight of the supply	≤ 10 Kg	
Digital programming and read back (programming accuracy)			
11	Voltage	0.02% of full scale	
12	Current	0.02% of full scale	
13	Protective functions	OCP (constant current), OCP fold back, OVP	

7. Programmable DC power supply Type 3

SL. No.	Parameter	Specification	Compliance by vendor
1	Rated output voltage	2 channels -0-30V minimum 1 channel – 0-5 V minimum	
2	Rated Output current	2 channels – 0-1.5A 1 channel – 0-2A minimum	
3	Constant voltage mode		
	Max line regulation	0.02% Vout or better	
	Max load regulation		
4	Constant current mode		
	Max line regulation	0.02 % of Iout or better	
	Max load regulation		
5	Ripple and Noise	≤ 5mV pk-pk or better	
6	Display	4 digits separate voltage and Current	
7	Status indication	Indication of Output On, V/I Limits, CV, CI	

8. PXI chassis and rack mount kit :

SL. No.	Parameter	Specification	Compliance by vendor
1	Slots	9 Slots minimum (including Controller & DAQ Modules), Should support PXI and PXIe cards (Hybrid slots)	
2	Chassis type	3U	
3	System bandwidth	20GB/s or better	
4	Cooling	Fan cooling for power supply and for module	
5	External support	USB connectors, LAN ports	
6	Operating Input voltage/ frequency	230V, 50Hz	
7	Synchronization between all slots	Yes	
8	All standard Accessories	Power cord & Rack mounting kit to be included	
9	Unused slots	Blank panel closing to be provided.	

9. PXI Controller

SL. No.	Parameter	Specification	Compliance by vendor
1.	Hard disk	500 GB SSD or better	
2.	Processor	Processor core(2 GHz min CPU frequency) or better	
3.	RAM	16 GB or better	
4.	Ethernet	10M/100M/1000M/2.5G Base-T, 2 ports	
5.	Operating System	Windows 10/11, 64 bit	
6.	Form factor	PXI and PXIe compatible with the chassis	
7.	USB	4 ports minimum	
8.	Display Interface	Compatible to PS/2-USB VGA	
9.	Bandwidth	8GB/s or better	
10.	Synchronization with other modules	Yes	
11.	PXI/PXIe Trigger Bus Input/output	Yes	
12.	Bus interface	PXI/ PXIe	

10. Multifunction I/O card (AI & AO) or Separate AI/AO

SL. No.	Parameter	Specification	Compliance by vendor
Analog input			
1.	Analog input channels	20 single ended or 10 differential	
2.	Resolution	16 bits or better	
3.	Sampling rate	10kS/s/ch or better	
4.	Input coupling	DC	
5.	Input signal range	±1 V, ±5 V, ±10 V, selectable	
6.	Maximum working voltage for analog inputs	± 10V of AI GND	
Analog Output			
7.	No. of channels	Minimum 4 Analog output channels	
8.	Resolution	16 bits or better	
9.	Sampling rate	10kS/s/ch or better	
10.	Output range	± 10 V	
11.	Maximum working current	± 5 mA or better	
12.	Output coupling	DC	
13.	Trigger Modes	Digital triggers	
14.	Cable	2m length shielded cable to interface with DAQ card. It isto be terminated on a D-sub connector at checkout back panel.	
15.	Form factor	PXI /PXIe compatible with the chassis	

11. Relay

SL. No.	Parameter	Specification	Compliance by vendor
1.	Type	Electro Mechanical	
2.	Relay configuration	2 DPDT	
3.	Switching Voltage	50V or better	
4.	Maximum switching Current	12A	
5.	Relay operate time	<20ms	
6.	DC coil voltage	12/24/28V	

12. Signal Switching relay module

SL. No.	Parameter	Specification	Compliance by vendor
1	Relay configuration	2 wire matrix type minimum 22 channels or better	
2	Switching Voltage	20V DC or better	
3	Switching/carry Current (per Channel)	Minimum 1A	
4	Minimum switch load	100Ω or better	
5	Relay operate time	3 ms or better	
6	Power requirement	Atleast +5V DC, 500mA	
7	Cable	2m length shielded cable to interface with DAQ card. It is to be terminated on a D-sub connector at checkout back panel.	
8	Form factor	PXI /PXIe compatible with the chassis	

13. FRA (frequency response analyzer) module

SL. No.	Parameter	Specification	Compliance by vendor
1	No. of channels	2Analoginput and 2 analog output channels	
2	Sampling rate	Minimum 100KS/s per channel	
3	Type of sampling	Simultaneous sampling	
4	Input mode	Differential	
5	Resolution	16 bits or better	
6	Input coupling	AC or DC	
7	Input signal range	±10V	
8	Trigger functions	Start Trigger, Reference Trigger	
9	Trigger Modes	Analog and digital triggers	
10	Cable	2m length shielded cable to interface with DAQ card. It is to be terminated on a D-sub connector at checkout back panel.	
11	Form factor	PXI /PXIe compatible with the chassis	

14. DMM Instrument

SL. No.	Parameter	Specification	Compliance by vendor
1.	Resolution	6-1/2 digit	
2.	Maximum Input	1000 V on any range	
3.	Measurement Method	Multi-ramp A/D	
4.	resistance measurements	2 and 4-wire resistance measurements	
5.	Frequency measurements	300 kHz	
6.	current capability	10 A	
7.	display	Vacuum Fluorescent Display, dot matrix	
8.	Volatile Memory	SDRAM-128 MB, SRAM-4 MB	

15. Micro meter (Depth gauge)

SL. No.	Parameter	Specification	Compliance by vendor
1	Accuracy	Atleast3µm	
2	rod length	≥25mm increments	
3	Resolution	0.001mm	
4	Flatness of reference face	1.3µm for 60mm width base or better	
5	Flatness of measuring rod face	Minimum 0.3µm	
6	Measuring rod diameter	Minimum 4mm	
7	Display	LCD	
8	Supply type	Battery	
9	Function of Digital Model	Preset, Zero-setting, Data hold, Automatic power ON/OFF, Data output, Preset inch/mm conversion (inch/mm models) Alarm: Low voltage, Counting value composition error	

16. Signal conditioner

SL. No.	Parameter	Specification	Compliance by vendor
1	Gain	1-1000 programmable gain	

2	Accuracy	+/- 0.02%	
3	Input impedance	100MΩ	
4	Input type	Differential - floating	
5	Amplifier Linearity	+/- 0.01% of full scale	
6	Input signal range	±10mV to ± 10V	
7	Band width	DC-10 KHz	
8	Filter rolloff	Better than -36dB /Octave	
9	Cutoff frequencies	(10,20,50,100,200,500,1K, 2K, 5K) Hz	
10	output impedance	<1 ohm	
11	output	Dual buffered +/- 10V	
12	Configuration parameters	Excitation, gain, offset, filter	
13	Display functions	Display of input range, filter corner frequency, real time ADC count, gain, excit- V/mA etc	
14	CMRR	140dB or better	

17. DC source generator

SL. No.	Parameter	Specification	Compliance by vendor
1	Voltage Source	20V or better	
2	Current source	200mA or better	
3	Output resolution	5 ½ digit	
4	Programmable output	Up to 10000 points	
5	Accuracy	+/- 0.03 % or better	
6	Resolution range	100nV for 10mV range DC voltage	

18. LEM Current sensor

SL. No.	Parameter	Specification	Compliance by vendor
1.	Primary current	10A	
2.	Power supply	±15V	
3.	Output	±4V	
4.	Bandwidth	50KHz @ -3dB	

19. Power Supply for LEM Current sensor

SL. No.	Specification	Description	Compliance by vendor
1	Type	Fixed power supply	
2	Output Voltage	± 15 V with common GND	
3	Output Current	≥ ± 0.5 A	
4	Output Voltage accuracy	± 2 % or better	
5	Adjustability	±10 % of rated voltage	
6	Load Regulation	1 % or better	
7	Line Regulation	0.5 % or better	
8	Ripple and Noise (pk-pk)	≤150mv	
9	Over current protection	required	
10	Humidity	50% to 70% RH	
11	stability	0.3% or better	

20. Walkie Talkie Communication Device

SL. No.	Specification	Description	Compliance by vendor
1	Type	License Free Wireless Walkie Talkie	
2	No. of Channels	15 minimum	
3	Communication Range	500m minimum	
4	Accessories	Battery charger, Belt clip and User manual in English	

21. Network Switch

SL. No.	Specification	Description	Compliance by vendor
1	Quantity	2nos	
2	Form factor	19 inch rack mountable , 1U size	
3	No of ports	16 or better	
4	Transfer rates	10/ 100/1000 Mbps	
5	Unidirectional link detection	required	
6	Indication	Link, active connection	
7	Basic layer -3 protocol	IPv4	

8	Power supply	12/24V DC, 230V AC, 50Hz	
9	Standards	IEEE 802.3 10 BASE-T Ethernet IEEE 802.3ab 1000 BASE-T Gigabit Ethernet IEEE 802.3u 100 BASE-TX fast Ethernet ANSI/ IEEE 802.3 N way auto negotiation IEEE 802.3x Flow control	
10	compatibility	LXI/ USB	
11	Forwarding types	Store and forward	
12	USB ports	1 or more	

22. RJ-45 Male connectors

SL. No.	Parameter	Specification	Compliance by vendor
1	Performance category	CAT -6	
2	Housing material	Polycarbonate	
3	contacts	Gold plated contacts	

23. Ethernet cable (Length : 100m)

SL. No.	Parameter	Specification	Compliance by vendor
1	Performance category	CAT -6	
2	Type	Unshielded twisted pair	
3	Insulation jacket	PVC	

Annexure 3

Connector Details

SL No	Connector type	Connector pin type	Wire gauge	Qty
Mating connectors on Package - TVC				
1	D-Type- rectangular (example part number for reference: : AM24308/24-35F (MALE)-50pin male)	9 PIN (Female)	24 AWG	1
2		25 PIN (male)	24 AWG	1
3		50 PIN (male)	24 AWG	1
4		9 PIN (male)	24 AWG	1
5	Circular connector	D38999/20FG16PN(16 Pin male)	20 AWG	1
6		D38999/20FE08SN (8 Pin female)	20 AWG	2
Mating connectors on Package -PSOM				
1	D-Type- rectangular (example part number for reference: : AM24308/24-35F (MALE)-50pin male)	9 PIN (Female)	24 AWG	1
2		50 PIN (male)	24 AWG	1
3		15 PIN (Female)	24 AWG	1
4		25 PIN (male)	24 AWG	1
5	Circular connector	D38999/20FE08SN (8 Pin female)	20 AWG	1
6		D38999/20FE08PN (8 Pin male)	20 AWG	1
Mating connectors on Package - PM				
1	D-Type- rectangular (example part number for reference: : AM24308/24-35F (MALE)-50pin male)	9 PIN (Male)	20 AWG	1
Mating connector on Valve				
1	Circular connector	D38999/20FE012SN (12 Pin female)	4pin – 20AWG 8pin – 24AWG	1
Checkout connectors at backend of Rack				
1	Circular connector	D38999/20FG16PN(16 Pin male)/or female	20AWG	1

		(power supplies and high current relay lines)		
		D38999/20FG16PN(16 Pin male)/or female (Data acquisition and relay lines)	24AWG	4
Checkout connectors at backend of Rack- mating				
1	Circular connector	D38999/20FG16PN(16 Pin male)/or female (power supplies and high current relay lines)	20AWG	1
		D38999/20FG16PN(16 Pin male)/or female (Data acquisition and relay lines)	24AWG	4
TOTAL				**25**

Note:

1. This is the reference for making of connectors interfacing with valve and Checkout harness. Apart from this any additional connectors harness can be provided from checkout (Optional) as per redundancy purpose.
2. The number and type of circular connectors can be selected by the vendor as per their configuration.

Annexure 4

Multi Core Cables

1. 2 Core 20 AWG Un armoured cable (length: 500 m)

SL. No.	Specification	Description
1	Conductor size	Multi strand, 20 AWG, 19 strands(19 X 0.20mm, 0.60mm^2) Silver plated Copper Conductor
2	No. of cores	2
3	No. of pairs	1 twisted pair
4	Insulation	PTFE insulation on individual bunched conductor, two core twisted to form pair
5	Thickness of Insulation (Nominal)	0.25±0.05mm
6	Conductor resistance at 20^{o}C	≤35Ω/km
7	Insulation Resistance at 500VDC	1500MΩ/km
8	Core Colour	Cores of Red + Black
9	Inner sheath	PTFE
10	Overall screening	Braided with silver plated copper conductor of 0.12mm dia strand. Coverage are of screening ≥90%
11	outer sheath	PTFE. Thickness 0.35± 0.05mm

12	Outer sheath	Light grey
13	Overall diameter	4 ± 1 mm approx.
14	Voltage Grade	600V
15	Temp range	Up to 200 ^{O}C
16	Test standards to be followed	JSS 51034

2. 2 Core 24 AWG Un armoured cable (length: 1500 m)

SL. No.	Specification	Description
1	Conductor size	Multi strand, 24 AWG, 7 strands (7 X 0.20mm, 0.20mm^2) Silver plated Copper Conductor
2	No. of cores	2
3	No. of pairs	1 twisted pair
4	Insulation	PTFE insulation on individual bunched conductor
5	Thickness of Insulation (Nominal)	0.25±0.05mm
6	Conductor resistance at 20^{o}C	≤90Ω/km
7	Insulation Resistance at500VDC	1500MΩ/km
8	Core Colour	Red, Black
9	Temp range	Up to 200 ^{O}C
10	Voltage Grade	600V
11	Test standards to be followed	JSS 51034

3. 6 Core 24 AWG Un Armoured cable (length: 500 m)

SL. No.	Specification	Description
1	Conductor size	Multi strand, 24 AWG, 7 strands(7 X 0.20mm, 0.22mm^2) Silver plated Copper Conductor
2	No. of cores	6
3	No. of pairs	3 twisted pair
4	Insulation	PTFE insulation on individual bunched conductor, two core twisted to form a pair
5	Thickness of Insulation (Nominal)	0.25±0.05mm approx.
6	Conductor resistance at 20^{o}C	≤90Ω/km
7	Insulation Resistance at 500VDC	1500MΩ/km

8	Core Colour	Core of Red+ Black, blue + white & green + orange pairs
9	Inner sheath	PTFE
10	Overall screening	Braided with silver plated copper conductor of 0.12mm dia strand. Coverage are of screening ≥90%
11	outer sheath	PTFE. Thickness 0.35± 0.05mm
12	Outer sheath	Light blue
13	Overall diameter	6 ± 1 mm approx.
14	Voltage Grade	600V
15	Temp range	Up to 200 ^{O}C
16	Test standards to be followed	JSS 51034

4. 4 Core 24 AWG Un Armoured cable (length: 500 m)

SL. No.	Specification	Description
1	Conductor size	Multi strand, 24 AWG, 7 strands(7 X 0.20mm, 0.22mm^2) Silver plated Copper Conductor
2	No. of cores	4
3	No. of pairs	2 twisted pair
4	Insulation	PTFE insulation on individual bunched conductor, two core twisted to form a pair
5	Thickness of Insulation (Nominal)	0.25±0.05mm approx.
6	Conductor resistance at 20^{o}C	≤90Ω/km
7	Insulation Resistance at 500VDC	1500MΩ/km
8	Core Colour	Core of Red+ Black & green + orange pairs
9	Inner sheath	PTFE
10	Overall screening	Braided with silver plated copper conductor of 0.12mm dia strand. Coverage are of screening ≥ 90%
11	outer sheath	PTFE. Thickness 0.35± 0.05mm
12	Outer sheath	Light blue
13	Overall diameter	4 ± 1 mm approx.
14	Voltage Grade	600V
15	Temp range	Up to 200 ^{O}C
16	Test standards to be followed	JSS 51034

Annexure 5

Cost Details

Sl. No.	Item Description	Part no.	Qty	Unit cost	Total cost
1	42U Height Rack &its accessories		1		
2	17U Height Rack & its accessories		1		
3	19" Rack mount monitor with keyboard		1		
4	Printer		1		
5	Programmable DC power supply Type 1		2		
6	Programmable DC power supply Type 2		1		
7	Programmable DC power supply Type 3		2		
8	PXI chassis and rack mount kit		1		
9	Controller		1		
10	Multifunction I/O card(or) Separate analog input and analog output cards		1/2		
11	Relay		4		
12	Signal Switching relay module		1		
13	FRA (Frequency response analyzer) module		1		
14	DMM Instrument		1		
15	Micro meter (Depth gauge)		1		
16	Signal conditioner/Instrument amplifier		9		
17	DC source generator		1		
18	LEM current sensor		2		
19	Power supply for LEM		1		
20	Walkie Talkie Communication Device		5		
21	Network switches		3		
22	RJ -45 male connectors		10		
23	Ethernet cable		1		
24	Shielded wires		1 Lot each		
25	Connectors		25nos		
26	Custom Made Software Module with back up System design - Software design and development as per user requirement. (including licensed application software)				

Sl. No.	Item Description	Part no.	Qty	Unit cost	Total cost
27	Integration, wiring and testing of hardware		1 lot		
28	Documentation				
			Total		

Annexure 6

Power supply settings

Supply	Voltage(V)	Current limit	OVP(V)	Abort limit for current
DC- DC supply	26 – 32 Nominal- 32V	2A	36	0.5A
Power amplifier supply	26 – 32 Nominal- 32V	7A for PS1 valves 2A for PS0 valves	50	2A for PS1 valves 1A for PS0 valves

Note :

1. Powering sequence
    1. DC – DC Supply ON
    2. Power Amplifier ON
2. For PS1 and PS0 injection valves Always bring the valve command to 1V before setting 0V to avoid hitting of the valve seat at close command from a larger(>1V) opening command.

Part 2

Commercial Aspects

1. Important Instructions for Tenderers

a) All the tenderers are expected to go through the complete tender document carefully prior to submitting the offer.

b) The tenderers must carefully assess their capabilities with respect to managing a large and technically involved project on a fixed time and fixed price basis. They are expected to be extremely strong in system engineering and capable of sourcing high quality technical expertise for all requirements of this project.

c) The contractor shall only bid for the system if the contractor has supplied a checkout system to any aerospace industry and necessary proof for the same is to be submitted along with tender quotation and also it shall be presented during the pre-bid discussion going to be conducted in 15 days' time after floating the tender. If the contractor fails to provide the necessary proof regarding the supply of the system to any aerospace industry, LPSC reserves the right to disqualify the contractor without prior notice.

d) Contractor should have software proficiency certified engineers for any support requirement and the copy of certificates of the concerned engineers must be submitted along with the technical bid.

e) Contractor should produce a letter from the parties where they have established automated test setups stating the review of the contractor's service during and after installation.

f) The offer for the project should be made in two parts i.e., technical and commercial (without price bids) and price part (with price bid) separately.

A pre-bid meeting with the vendors will be arranged to clarify the project requirements and scope of supplies within 2 weeks from the date of publishing tender enquiry.

i. Also the vendors can present details on the quoted systems, fabrication / integration methodology, schedule etc. Clarification sought for during the pre-bid meetings shall be given within the stipulated time.

ii. The offer for the contract should be complete in all respects and should compulsorily cover confirmation of specifications with respect to subsystems and integrated system, plan of execution of the contract as per specifications. It must also include all aspects of commercial part. Any matter mentioned vaguely by the tenderer shall be treated as non-compliance to the tender requirements.

iii. The offer must indicate the proposed design approaches and description of total system as well as individual subsystem.

iv. Tenderer shall clearly specify non-compliance with specification, if any giving merits with supporting documents.

v. Tenderer shall clearly identify the detailed plan of procurement of various equipment including their sources of supply.

vi. Tenderer shall clearly identify their associates and collaborators under consortium mode of project execution. The extent of partnership and their involvement shall be clearly spelt out for each associate and collaborator.

vii. LPSC reserves the right to reject any or all the offers without assigning any reasons thereof and will not accept any responsibility regarding non receipt of delay in receipt of the offers sent by tenderers.

2.Service and maintenance requirement

a) All Breakdown maintenance call inclusive of software update and bug correction shall be attended within 72 hours of time.

b) Contractor should quote separately for AMC (non comprehensive) of the system for initial 5 years (1 AMC/ year) after the warranty period. Also Contractor has to suggest the list of spares and equipment with its price for AMC till the validity period.
c) Half yearly preventive maintenance (once in 6 months) and two breakdown calls visit per year at no extra cost.
d) Attend breakdown calls within 72 hrs. Apart from this , any additional visit if required shall be quoted separately.
e) Party has to provide the required upgradations for the software as and when required

3. Delivery, Supply &Installation

Delivery and installation shall be performed by the vendor, in already existing building at Liquid Propulsion Systems Centre (LPSC), Valiamala within 10 months (preferred date) from the date of acceptance of P.O. But before the final installation following are the milestones to be completed:

1. Design documents have to be submitted to LPSC within stipulate time (20days after releasing the purchase order) which will be mentioned by LPSC during technical evaluation phase and party should get approval for the same from LPSC.
2. Party has to deliver the items at LPSC within 6 months of date of acceptance of P.O.
3. Party has to install the total system in the premises of LPSC within 7 months of date of acceptance of P.O.
4. Software has to be developed by Contractor at LPSC within 8 months of date of acceptance of P.O.
5. System has to be qualified and installed at LPSC Valiamala in 10 months time period from the date of acceptance of P.O.

System has to undergo final acceptance test after installation.

4. Mode of Quoting

The offers shall be submitted on a two-part basis: Technical and commercial bid (other than price) & Price bid. Also the validity of quotation shall be 6 months minimum from the date of quoting. The contractor chosen on the basis of suitability of techno-commercial merits will have to sign a contract with ISRO. The scope of contract will cover the turnkey execution of the total system as per the technical and commercial terms mentioned in this document.

a. Technical Bid:

1. Confirmation of each specification as outlined in Part 1.
2. Conformance on all clauses of this RFP.
3. List and details of non-compliance of specification by the tenderer, if any.
4. Confirmation of scope of work by tenderer as outlined in point 2 of Part 2 of this document.
5. List of exclusion from scope of work by tenderer, if any
6. Overall plan of project execution with details of facilities/capabilities available for timely completion of the project in all respect.
7. Overall time schedule in the form of bar chart.
8. Monthly progress report showing the milestones/activities covered should be submitted.
9. Activity wise time schedule in the form of CPM/PERT network diagram.
10. Procurement plan including monitoring and control methods adopted by the contractor for selection of equipment/subsystem.
11. Procurement plan for imported items including list of items & probable suppliers.

12. Reliability and quality management plan proposed to be adopted during project execution.
13. Base design of each sub-system to meet overall specification of the system and explanation for their merits, demerits, alternatives and suggestion Etc.
14. All equipment specification and their source of supply and part number.
15. List of Indian associates or partners, foreign collaborators, consultants, subcontractors, major equipment suppliers, proposal to be involved in this project, the past experience, competence and extent of the involvement.
16. Major subsystem interface and the details
17. Details of utilities to be provided by LPSC/ISRO and time stages at which these are required by the contractor
18. Total electrical power required and its details and time stage at which these are required by the contractor.
19. List of items/ equipment/ to be provided by LPSC/ISRO and time stage at which these are required by the contractor
20. List of clarifications required from LPSC/ISRO.
21. Profile of the company clearly bringing out the areas of strength and weakness enclosing following information:
    a) Average financial turnover during last five financial years
    b) Copy of the latest income-tax clearance certificate
    c) Details of financial capacity of the firm viz., details of audited balance sheet including profit & loss account for the last five years.
    d) Self-assessment of technical and organizational competence to supply the system of this nature and magnitude.
22. Commercial Terms such as delivery date, taxes, duties payable, place of delivery, payment term, validity, guarantee etc. and scope of supply shall 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.

b. Price Bid:

The price bid shall contain the following prices.

1. This part shall contain PRICE details only.
2. Total system cost including design (comprehensive packed).
3. The price for the item should be indicated item wise in this part. All the items/specifications mentioned in the Technical Part should come here and prices indicate against each. The break –up for each item of supply or service should be indicated.
4. Breakup of each subsystem cost into various elements like design changes, direct material, direct labour, overheads, profit, transportation charges, taxes & duties applicable.
5. Whenever operation is quoted, the same should also be indicated with quantity and unit rate separately. The price is to be mentioned both in figures and in words.
6. Installation& Commissioning charges.
7. Start-up trials and acceptance testing charges inclusive of all consumables. Tenderer shall clearly specify list of consumable included.
8. Acceptance to furnish performance guarantee for a minimum period of 14 months from the date of acceptance of the total system by LPSC/ISRO from a nationalized Bank.
9. If more than one design options are proposed by the contractor for any subsystem or total system, break up of costs for different options is to be specified.

5. Price

The prices are FIRM and FIXED. On receipt of order, Contractor has to prepare detailed work break-up and schedule chart (in consultation with LPSC) and submit to LPSC for our acceptance.

6. Payment terms

100% of payment within 30 days of receipt, installation & acceptance of items.

7. Warranty

Warranty for all the equipments should be minimum 1 year from the date of final commissioning.

8. Insurance

You should take adequate precautions to ensure safe delivery of the consignment. No need of insurance

9. Liquidated Damages

If the Contractor fails to deliver and Install the items within the time specified or any extension thereof, Liquidated Damage at the rate of 0.5% (zero point five percent only) of the order value or part thereof of the undelivered components for each calendar weeks of delay shall be recovered from the bill. However, total Liquidated Damage shall not exceed 10 % (ten percent only) of the order value.

10. 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 the Contractor have any claim for damages against the other in respect of such non-performance or delay in performance.

11. 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.

12. Arbitration

In the event of any question, dispute or difference arising out of any terms and conditions of the order, the parties shall strive to find mutually acceptable solution, failing which, all questions, disputes or difference arising under or in connection with the order shall be settled through arbitration, (under conciliation and Arbitration Act of India 1996) through a person, not below the rank of Joint Secretary, nominated by the Secretary, Department of Space. The award of the Arbitrator so appointed shall be final and binding on both the parties to this order.

13. Applicable Law and Infringement thereof

This Contract shall be governed by and interpreted and construed in accordance with the law of India. The Department shall not be responsible if the Contractor infringes the laws or statutes in force during the currency of the Contract.

14. Performance Bank Guarantee

You shall submit Performance Bank Guarantee worth 3% of contract value in the form of Bank Guarantee in Rs.200/- non – judicial stamp paper obtained from Nationalized/ Scheduled Bank. This is towards the performance of the system. This PBG shall be returned after successful completion of the warranty period.

15. Security Deposit

An interest free amount equivalent to 3% of the total contract value shall submit towards Security Deposit in the form of DD or Bank Guarantee. This interest free security deposit shall be returned to you on successful completion of the contractual obligations or shall be adjusted/forfeited against non – fulfilment of any of the contractual obligations.

16. 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 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.

17. Format for technical & commercial Compliance Matrix

Sl no	Descriptions/Specifications (Technical & commercial Terms & conditions)	Compliance (Yes/ No)	If 'No' specify deviations explicitly	Remarks
1	Vendor should have previous experience of having successfully completed similar systems for Measurements, data acquisition and control of checkout system , in any establishments of Govt. / PSU or any other major private industries during last 8 years, ending on last day of month previous to the one in which applications are invited for this tender. The previous work experience should satisfy **either one** of the following criteria. i. One similar completed work costing not less than 75 lakhs. ii. Two similar completed works costing not less than 50 lakhs each. Details regarding the proof of experience of the vendor (copy of purchase order and installation & commissioning certificate from end user) shall be provided along with the quotations.			
2	Vendor should supply all the equipments / materials which are under the scope of supply of the vendor with the specification mentioned in Annexure 2. A specification compliance matrix with make, model and datasheet of the equipments shall be provided along with the quote for all standard electronic items and cables. In this compliance matrix , numerical values of specifications shall be provided in addition to yes/no.			

3	Minimum 1 year warranty shall be there for the total system(exceptfortheitemssuppliedbyLPSC)fromthedate ofcommissioning and acceptance by LPSC.			
4	Vendor should provide detailed engineering drawing of the wiring scheme, mounting of signal conditioners and other equipments after finalizing the equipments and items.			
5	Vendor shall deploy a person competent enough to address any technical issues during the operation of the facility at LPSC, for 3 months after commissioning of the facility.			
6	Support shall be provided form modifying application software for a period of 1 year after the commissioning of the system without any extra cost.			
7	In addition to the details of checkout two mentioned in technical aspects, vendor shall execute minor works and supply additional equipments/ material required for the completion of the work, If needed, with prior approval from LPSC. Payment shall be done for actual work/material supplied against the submission of the bill			
8	Vendor shall have to carry out necessary functional check like continuity, isolation and integrity check of end to end wiring, voltage simulation tests, calibration of channels etc. as part of the commissioning of the entire system. Vendor shall have to provide necessary validation certificate/ report for each channel.			
9	The technicians who are doing the wiring and installation work should have at least ITI qualification in the relevant field with minimum1 year of experience.			
10	Vendor shall bring tools like multimeters, crimping tools, screw drivers, spanners, label printers, Checkout rack fixing tools etc. for the completion of the work.			
11	The staff of the vendor shall take all safety precautions as per the safety standards while doing the wiring, installation and commissioning activities.			
12	Vendor will be responsible for the damage (if happened) of the items and equipment during the installation and commissioning phase of instrumentation systems.			

18. Format for Price bid

Vendor shall have to submit the unit price / cost and total price / cost of each to be Material supplied and Instrumentation Work. Quoted price/ cost shall be all inclusive of taxes, levies, duties etc. Cost format of Checkout Work to be done by the vendor refer **Annexure5.**

19. Instruction to the Bidder / Vendor

This is a two-part public tender. The bidder / vendor shall submit their bid on 2-part basis.Part-1: Technical and Commercial Aspects

Part-2: Price Details

The price quotation submitted by those parties who satisfy the technical & commercial requirement only shall be opened subsequently and selected. The vendor will be disqualified if they reveal the price in technical & commercial aspects (Part-1).

The vendor shall submit the technical & commercial quotation / compliance statement as per section 17.

Bidders have to submit quotation through EGPS only, other modes cannot be accepted.