

GOVERNMENT OF INDIA  
DEPARTMENT OF SPACE  
ISRO SATELLITE CENTRE (ISAC)  
AIRPORT ROAD, VIMANAPURA POST  
BANGALORE 560 017

**TENDER NOTICE NO. 12 DATED 12.02.2010**

On behalf of President of India, Head, Purchase & Stores, ISRO Satellite Centre (ISAC), Bangalore 560 017 invites sealed tenders for the supply of the following items:

SL. NO	TENDER REFERENCE	BRIEF DESCRIPTION	QTY	TENDER FEE INCL OF S.TAX Rs. Ps.
01	ISGE 2009015394	SIGNAL PROCESSING WORK SYSTEM	01 No.	Rs.225/-
02	ISPS 2009015821	DC BUS SIMULATORS	(as per Document)	Rs. 225/-
03	ISGE 2009015952	SPACE QUALIFIED ETCHED FOIL HEATERS	(as per Document)	Rs. 225/-
04	ISDO 2009015437 <b>(THIS IS A TWO PART TENDER)</b>	AUTOMATIC OPTICAL INSPECTION SYSTEM	01 No.	Rs 225/-
05	ISDO 2009015836 <b>(THIS IS A TWO PART TENDER)</b>	TURBO MOLECULAR PUMP WITH CONTROLLER	02 Nos	Rs. 225/-
06	ISDO 2009015941 <b>(THIS IS A TWO PART TENDER)</b>	PIEZO ELECTRIC ACCELEROMETERS WITH CABLES	(as per Document)	Rs. 225/-
07	ISDO 2009015958 <b>(THIS IS A TWO PART TENDER)</b>	CHARGE SIGNAL CONDITIONERS	12 Nos	Rs. 225/-

FOR SUBMISSION OF TENDER : 29<sup>TH</sup> MARCH 2010 AT 1600HRS (IST)

OPENING OF TENDER : 30<sup>TH</sup> MARCH 2010 AT 1000HRS (IST)

**NOTE: TWO PART TENDER SYSTEM IS APPLICABLE FOR SL. NOS. 04, 05, 06 & 07 ONLY. INSTRUCTIONS ARE PART OF THE TENDER DOCUMENTS.**

**NOTE:**

1. Tender documents are also available on ISRO Web site of [www.isro.gov.in](http://www.isro.gov.in) Tender Notice No.12 dtd. 12-02-2010. Interested tenderers may, at their option, download the tender documents from website and submit offers along with prescribed tender cost (in form of Bank Draft) as per details in the tender notification. The Demand Draft should be sent in a separate cover with a covering letter along with the cover containing the quotation.
2. Tender fee shall be payable only in the form of bank draft drawn in favour of Accounts Officer, ISRO Satellite Centre, payable at Bangalore. No other mode of payment for tender fee is acceptable.
3. Vendors/firms name and tender no. shall be indicated on the reverse side of the Demand Draft.
4. While requesting for tender documents, please do not superscribe tender number and due date on the envelop. Instead indicate "Request for Tender Documents".
5. Detailed specification, terms and conditions are furnished in the tender documents.
6. DD should not be dated prior to the date of advertisement / intimation / website. Separate requests and demand drafts shall be sent for each tender document.
7. ISAC will not be responsible for non-receipt of tender documents/offers due to postal delay / loss in transit.
8. Quotations received without payment of tender fee will be treated as unsolicited.
9. Indian agents while quoting on behalf of their principals are requested to provide necessary authorisation letter from their Principals.
10. The offer should be valid for the period of Ninety days from the date of opening.
11. Quotations received after the due date and time will not be considered.
12. While submitting your offer please superscribe tender no and due date on the envelope. Addressed to Head Purchase & Stores, ISRO Satellite Centre, Airport Road, Vimanapura Post, Bangalore-560 017.
13. If tender opening date happens to be public holiday tender will be opened on the next working day & interested Vendors may depute their Representatives to attend the Public Tender Opening.
14. Request for the extension of the due date will not be considered.
15. Head, Purchase and Stores, ISAC reserves the right to accept or reject any tenders in part or full without assigning any reasons thereof.
16. Those who do not utilise the website shown at clause 01 above can also buy the Tender documents from Purchase Officer, Purchase & Stores Division, ISRO Satellite Centre, Airport Road, Vimanapura Post, Bangalore-560 017, INDIA on payment of Non-refundable tender fee as indicated above, on all working days between **1400Hrs to 1600Hrs**.

# SPECIAL INSTRUCTIONS FOR 2 PART TENDER

This should consist of two sections viz., (a) Technical and  
(b) Commercial

## **PART I (TECHNICAL AND COMMERCIAL PART):**

(a) Technical : This section should consist of:

- All technical specifications of the items options and accessories offered by you.
- Relevant leaflets and literature and any other technical matter pertaining to the items offered.

(b) Commercial: All the commercial points to be indicated (other than prices) should come in this section for example:

Delivery terms and delivery period , Payment terms (our standard Terms i.e. 100% Payment within 30 days after receipt and Acceptance)

- Validity period of the offer (120 days required)
- Warranty / Guarantee applicable
- Installation details such as installation is done Free of cost or not
- If not indicate “installation charges indicated in Price part”.
- Whether training is required; if so, free of cost, if not indicate “training charges indicated in price part”/

“Approximate weight of the consignment”.

Note: (1) Part 1 prepared as above should be Enveloped and Superscribed Technical & Commercial part 1

**Reference No:**  
**Due date :**

Note: (2) Part 1 should not contain any price details

Contd.../-

: 2 :

## **PART II (PRICE PART)**

This part should consist of:

- Prices of the unit and total amount for the items offered (with break-up wherever required):  
Price of option and accessories Installation charges & Training (if not free)

Where the quotation is on Ex-works basis Packing forwarding and inland freight charges if any Price part (Part II) thus prepared should be Enveloped separately and superscripted as.

Price part II

**Reference No:**  
**Due date :**

Note: (3) Both the envelopes (Part 1 and Part II)

Prepared as above should be placed in another envelope and superscribed as follows:

**Reference No:**  
**Due date :**

Part 1 & Part II individually enveloped inside:

TO:  
THE HEAD, PURCHASE AND STORES  
ISRO SATELLITE CENTRE  
GOVERNMENT OF INDIA  
DEPARTMENT OF SPACE  
AIRPORT ROAD  
VIMANAPURA POST  
BANGALORE-560 017.

Note: (4) The above should reach us on or before the due date and time.

Note: (5) HEAD, PURCHASE AND STORES, ISRO SATELLITE CENTRE, GOVERNMENT OF INDIA, DEPARTMENT OF SPACE. AIRPORT ROAD, VIMANAPURA POST, BANGALORE - 560 017. RESERVES THE RIGHT OF ACCEPT OR REJECT ANY OF THE QUOTATION IN FULL/ PART THEREOF WITHOUT ASSIGNING ANY REASONS

# **ISGE 2009015394**

## **SPECIFICATION FOR SIGNAL PROCESSING SOLUTION**

The Signal Processing tool should support the development of DSP Algorithms, various Filters like FIR, IIR, etc., Finite State Machines and should be able to generate the VHDL and Verilog code of the developed algorithm.

It should have the following specification:

### **1. Block Diagram Editor:**

- System design should facilitate by block capture of System Library Block.
- System design should facilitate hierarchical block diagram and should give the option to change system parameters and view source code.

### **2. Library Browser:**

- Should provide readable list of library blocks.
- Search function to search entire library.
- Should have model documentation.

### **3. Signal Analysis:**

- Post analysis on the signals like Eye diagram, Histogram, FFT, Scatter Plot should be available.
- Capability to plot Bit error rate (BER) and block error rate (BLER) curves automatically.
- Variety of data types, including floating point, fixed-point and complex.
- Appending and manipulating existing signals to analyze the designs for various frequencies should be available.
- MVL9 signal format support should be there to analyze HW signals.
- Enable importing, creating, editing and analyzing signals, including sine, square, triangle, sawtooth, phasor, impulse, step, ramp constant, random bits, uniform noise, or Gaussian noise.
- Common Signal analysis like addition, subtraction, division, multiplication, power calculations etc should be available in the GUI.
- The GUI should support Macro's to run customized analysis program.
- Import MATLAB signals and export the generated signals to MATLAB.
- Automatic start of MATLAB analysis from simulation results.

### **4. GUI based Import of the following legacy IP:**

- It should have straightforward infrastructure to import:
  - Legacy C/C++ IP.
  - Legacy Verilog and VHDL IP.
  - Legacy MATLAB IP.
  - Legacy Verilog-AMS blocks.

**5. GUI based Filter Design which generates RTL:**

- Support IIR design methods as well as FIR designs and user-defined filters.
- Support floating-point as well as fixed-point filter and view the filter response.
- Automatic generation of VHDL and Verilog code from the generated fixed point filter.

**6. Direct flow from Algorithm to RTL generation:**

- The assembled system should facilitate automatic generation of VHDL and Verilog code.
- The generated Verilog and VHDL code should support RTL simulators from Mentor and Cadence as well as RTL synthesis products from Synopsys, Cadence and Xilinx.
- The assembled system capable of generating Verilog and VHDL code should be able to simulate both in C/C++ mode and in direct co-simulation mode with RTL simulators like Modelsim (from Mentor) and NCSIM (from Cadence).
- The generated HDL code should support all industry-standard Synthesis tools and post-synthesis Verilog/VHDL netlist should be able to be simulated in direct co-simulation mode with simulators like Model Sim (from Mentor) and NCSIM (from Cadence).
- The generated HDL code should support all industry-standard PnR tools and the final PnR Verilog/VHDL netlist along with SDF should be able to be simulated in direct co-simulation mode with simulators like ModelSim (from Mentor) and NCSIM (from Cadence).

**7. Should provide the capability to import Xilinx – FPGA IP.**

**8. Communication Library:**

- It should have a prebuilt collection of commonly used communication functions, including basic capabilities like modulators, demodulators, adaptive equalizers, error correction, filtering and channel models, etc.
- It should have a prebuilt collection of smart antenna models supporting 2G, 3G and 4G communication-based designs, including Training Sequence Method with Spatial Array Processing Blocks, Constant Modulus Algorithm (CMA) with support for LMS, LS-dd, LMS-DD, CDMA post-correlation processing (PCP) with spatial array processing blocks etc.

**9. Radar & RF Library:**

- It should have a prebuilt collection of Radar blocks, including CFAR, CFAR 2D, Barker, Chirp, Doppler Shift, fd sampler, iq sampler, jitter noise, median filter, phase, phase detector, pulse canceller.
- It should have a prebuilt collection of parameterizable building blocks, such as amplifiers, mixers and oscillators with phase noise, which can be used in a cascaded stage analysis of the RF design.

**10. GUI based Finite State machines which generate RTL:**

- It should be able to design and simulate control algorithms and architectures with a state diagram editor which should automatically generate VHDL and Verilog code.

**11. Wireless application libraries (optional):**

- (like WCDMA, CDMA2K, GSM, LTE, WiMax, etc), and Multimedia application libraries (like JPEG, MPEG, etc).

**12. SystemC model export:**

- Should support the generation of SystemC models which can then be simulated with Processor cores, Memory models, Bus Models and other Peripherals.

**13. Data Management with various tools like RCS (Revision Control System), CVS (Concurrent Versions System), and Clearcase.**

**14. Interactively monitor the waveforms at run time:**

- Should support dynamic access to simulation results.
- Should support multitrace oscilloscopes, signal generators should also have the capability to build custom instrumentation.

**15. Additional Specification:**

- **Parameter Sweep** – Any parameter should be able to be swept over a range. And, multi parameter sweep should also be possible.
- **Polymorphic Capabilities** – The polymorphic blocks should be able to simulate in Floating or Fixed Pt. mode. These blocks should also be used for other data types, like double, vector-double, Matrix, Complex, Vector Complex, etc.
- **Post-Synthesis simulation capabilities** – There should be capability to automatically import and simulate the post synthesis Verilog and post synthesis VHDL code with the golden test bench.
- **Post-PnR simulation capabilities** – There should be capability to automatically import and simulate the post PnR Verilog and post PnR VHDL code along with the golden test bench (with the supplied SDF).
- **Hierarchical design and should allow the propagation of top level parameter** – The top level parameter should be able to propagate to lower levels of hierarchies without any limitation either on the hierarchy levels or on the number of parameters.
- **Sharing of C/C++ Code** – Each block should have visible and editable C/C++ code to assist the designer.
- **Scalable and should handle complex designs** – Each design should be scalable without any limitation on number of hierarchies OR number of blocks in any hierarchy.
- **The generated RTL code (Verilog and VHDL) should be efficient** – The expected post – synthesis QoR should be within  $\pm 10\%$  of that of hand written code.
- **Fast simulation** – The simulation should be very fast, should be in compiled mode and should support the data flow model.

- **RTL CO-simulation (Verilog and VHDL)** – The RTL co-simulation should have direct co-simulation link for simulating the hardware designs with Mentor or Cadency tools.
- **Operation Mode** – It should have Capability to operate in both batch mode and interactive mode.
- **Data Collection** – There should be facility to directly add the probes in the design through the simulation.
- **Remote Simulation** – Should support running multiple sweep simulations on remote hosts.

# **ISPS 2009015821**

## **I DC BUS SIMULATORS**

### **SPECIFICATIONS:**

#### **1.0 Input**

- 1.1 Input Voltage : 190 to 264 Volts RMS single phase (230V nominal) 50 Hz Frequency.
- 1.2 Power Factor : Active, better than 0.98

#### **2.0 Output Rating**

- 2.1 DC Bus Simulators : **QNTY**  
Rated output voltage/current : Type 1 : 60V 25A DC, CV/CC - 32 Nos  
Type 2 : 100V 33A DC, CV/CC - 02 Nos  
Type 3 : 100V 15A DC, CV/CC – 08 Nos  
Type 4 : High Current Simulator :  
15V 220A DC, CV/CC - 02 Nos
- 2.2 Power : Minimum 1500 W for types 1 & 3, 3300W  
for type 2 & 4
- #### **3.0 CV Mode**
- 3.1 Line Regulation : 0.01% of rated output voltage +2 mV  
for  $\pm 10\%$  change in line voltage
- 3.2 Load Regulation : 0.01% of rated output voltage +5 mV  
at a given input voltage
- 3.3 Ripple and noise : 60mV for type 1 & 4, 80mV for types 2 & 3  
(pp,20MHz) :
- 3.4 Temperature Co-efficient : 100ppm/ $^{\circ}\text{C}$  from rated output voltage ,after  
ppm/ $^{\circ}\text{C}$  30 minutes warmup.

- 3.5 Temperature Drift : 0.05% of rated output voltage over 8 hrs interval.
- 3.6 Transient response time : Less than 2 mSec for o/p to be within 0.5% of Vout over 10% to 90% Current change
- 3.7 Remote sense compensation / wire : 3V for Type 1 & 4, 5V for Type 2 & 3

#### **4.0 CC Mode**

- 4.1 Line Regulation : 0.01% of rated output current +2mA
- 4.2 Load regulation : 0.02% of rated output current +2mA
- 4.3 Ripple rms 5Hz-1MHZ : Type 1: 75mA, Type 2: 90mA, Type 3: 45mA, Type 4: 440mA,

#### **5.0 Protections**

- 5.1 Fold back Protection (overload) : Output shutdown when PS changes from CV-CC. User pre-settable.
- 5.2 Over-Voltage protection : Unit shutdown.Pre-settable Reset by On/Off
- 5.3 Under-voltage protection : Preset by user

#### **6.0 Front Panel**

- 6.1 Vout/Iout Control : Seperate Encoders (Coarse/fine adjustments)
- 6.2 OVP/UVL Control : Manual adjust by adjust encoder
- 6.3 Output (DC) On/Off : Switch provision on front panel
- 6.4 AC On/Off : Switch provision
- 6.5 Display      Vout : 4 digit accuracy 0.5 %  $\pm 1$  count  
                     Iout : 4 digit accuracy 0.5%  $\pm 1$  count
- 6.6 Indications : OCP, output ON, OVP.

## **7.0 Environmental Conditions**

- 7.1 Operating temperature : 0 to 50°C, 100% load
- 7.2 Storage temperature : -20°C to 70°C
- 7.3 Humidity : 30% to 90% RH

## **8.0 I/O Connections**

- 8.1 AC Input : Asian Standard power chord of suitable rating
- 8.2 DC Output : Standard connector or Binding posts or  
busbars on rearside with proper insulation meeting  
safety standards. If busbars are provided, suitable  
bolt and nuts to be supplied.

- 9.0 Mechanical** : Standard 19" rack mountable lab model

- 10.0 Safety/EMC** : FCC class-15A/FCC class-15B  
EN 55022A/EN 55022B

- 11.0 Remote control** : Standard RS-485/RS-232 interface

- 12.0 Others** :
- : Operational/Technical manuals to be quoted separately.
  - : Party should provide the evaluation results of similar units.
  - : Burn-in test will be carried out for 168 hours at rated power. User has right to reject the order in case of any deviation / nonconformance.

### **Note:**

- 1. Quotations without data sheets/catalogues/evaluation reports will be rejected.**
- 2. Quotations from off the shelf products alone will be considered.**
- 3. If the user desires, the vendor should be ready to demonstrate the unit's performance / compliance to specifications at user's place.**

# **ISGE 2009015952**

## **TECHNICAL SPECIFICATIONS FOR SPACE QUALIFIED ETCHED FOIL HEATERS**

- 1) Heaters shall be manufactured and tested according to  
Option A: ESA/SCC 4009 - 4009/002  
Option B: NASA-GSFC-S-311-P079 (E)
- 2) Heating element should be non-magnetic for the temp. range of  $-60^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- 3) Heaters should be supplied without mounting adhesive.
- 4) Heater insulation material should be KAPTON and cladding adhesive should be FEP.
- 5) Heater lead wires:
  - a) Terminal leads are according to ESA/SCC 3901/001(2 $\mu$  silver plated copper wire, kapton insulated) OR MIL-DTL-81381/7
  - b) Length: 1000mm
  - c) Gauge: 26 AWG
- 6) Heater size, resistance and quantity:

SL.NO.	SIZE (MM)	RES.(OHM)	QUANTITY
01	39x20	875	300
02	72x16	980	200
03	60x13	408	150
04	82x20	490	400
05	65x15	1225	150
06	60x25	2450	150
07	40x25	613	100
08	85x20	655	100
09	60x13	882	100
10	58x25	760	100
11	39x20	434	50

- 7) Resistance tolerance for all heaters:  $\pm 10\%$
- 8) Effective area should be mentioned for each circuit of heater.

### **9) TEST REQUIREMENTS:**

Heaters should be of level B and tested as per chart 2 and chart 3 of ESA/SCC 4009 for heaters supplied as per option A

Or

Heaters should be tested as per table –II of NASA-GSFC-S-311- P079 (E) for heaters supplied as per option B

**10) DATA PACKAGE REQUIREMENTS:**

- a) The data by variables pertaining to all the measurements taken at various stages of testing should be supplied along with the heaters.
  - b) Latest qualification certificate of either ESA/NASA should be attached with quotation.
  - c) A certificate of conformance should be supplied along with the heaters. The certificate should clearly indicate that the supplied heaters conform to the ordered specifications.
  - d) Heater lot should be supplied along with summery sheet, which indicates conducted tests, conditions, No. of heaters tested, No. of heaters passed etc.
- 11) A design drawing should be generated for each type of heater and submitted to ISRO/ISAC for approval before fabrication of heaters.

**NOTE: Compliance shall be explicitly mentioned against each of the above requirement**

## ISDO 2009015437

### TECHNICAL SPECIFICATIONS FOR **AUTOMATIC OPTICAL INSPECTION (AOI) SYSTEM**

#### **Application / Scope**

The Automatic Optical Inspection (AOI) system under the scope of supply should perform high resolution Digitizing, Scanning, Inspection, In-line Verification, Re-scanning, enable Repair/Rework of Photo-tools, Inner and Outer layers and Finished PCBs for all intermediate processes during the production of Rigid, Flexible and Rigid-flex PCBs on all popular substrate materials. The total system should comprise of Inspection, Verification and Repair/rework (preferred) stations on single platform.

Supply of **Automatic Optical Inspection System (AOI)** as per the detailed specifications to cover the following areas of applications:

Identification of faults at various critical stages (intermediate stages) in the Printed Circuit Board manufacturing process, which includes the following areas of inspection.

Inspection/Identification of defects in Photo-tools

Inspection of Signal, power/ ground, mixed, cross shielding, normal vias, buried vias, etc in Inner layers

Inspection of Signal, mixed, cross shielding, drilled holes, Solderable pads (SMT/BGA/CSP), through vias, buried vias, blind vias, etc in Outer layers

Inspection of Laser-vias (conformal and non-conformal masks, post-drilling), photo-vias (with laser-via inspection option) in Sequential build-up PCBs.

Inspection of Inner layers & Etched panels (external layers), including Stripline and microstripline PCBs

Inspection of High density interconnect PCBs with microvias

Inspection of Tin/Tin-Lead pattern plated panels

Inspection of Drilled holes/laser formed vias

Inspection of Photo resist (blue/purple/brown) coated panels

Inspection of solder coated (hot air leveled) PCBs

Inspection of Solder masked (all popular solder mask materials) PCBs.

Inspection of Final PCB's for identification of various defects.

Verification of inspected panel for identified defects & stamping.

Real-time online measurement of dimensions of the conductor features, including Z-dimension (approximate thickness).

Manual rework of the identified defects (preferred on the same platform) and re-scanning / inspection of the reworked panels.

	Line width	1.5 mil (~38 $\mu\text{m}$ ) line/space or better
	Defect size	0.2 mil (5 $\mu\text{m}$ ) or less
	Panel thickness range	0.002" to 0.200" (0.050 – 5.0mm), approximate
	Effective area of Inspection	22" x 24" (Approx.)
	Panel types	Rigid, Flexible, Rigid-flex, Stripline, Microstripline, Metal (Aluminum or copper) bonded PCBs, etc.
2.6.	Substrate Materials/ Products/Surfaces to be Inspected	<p>All popular PCB materials including:</p> <ul style="list-style-type: none"> <li>➤ Glass-epoxy,</li> <li>➤ Glass-Polyimide,</li> <li>➤ Thermount-Polyimide / Epoxy,</li> <li>➤ All Polyimide flexible,</li> <li>➤ Flexible TFG / PTFE,</li> <li>➤ RT Duroid,</li> <li>➤ Kapton, etc.</li> <li>➤ Silver halide/polyester</li> <li>➤ Silver halide/Glass, Diazo</li> <li>➤ Copper surface (shiny, matte, dull and oxidized; scrubbed or chemically treated)</li> <li>➤ Copper over all types of popular PCB substrates</li> <li>➤ Etched, additive or plated copper,</li> <li>➤ Reverse treated foil (RTF)/Double treated copper,</li> <li>➤ Black/brown oxide over substrate</li> <li>➤ Gold plated conductors over copper or substrate,</li> <li>➤ Mechanical/Laser Drilled holes,</li> <li>➤ Photoresist over Copper,</li> <li>➤ Tin over copper</li> <li>➤ Electrodeposited Tin or Tin/Lead (Sn/Pb) over Copper,</li> <li>➤ Solder Mask over Copper,</li> <li>➤ Solder Mask over hot air leveled solder,</li> <li>➤ Finished Holes (Through hole, blind, buried &amp; different types of microvias)</li> </ul>
2.7.	Detectable defects	➤ Open and Short-Circuit;

		<ul style="list-style-type: none"> <li>➤ Nick,</li> <li>➤ Mouse Bite,</li> <li>➤ Protrusion,</li> <li>➤ Pinhole,</li> <li>➤ Island,</li> <li>➤ Line/Space Width Violations,</li> <li>➤ Extraneous and Missing Features,</li> <li>➤ Copper Splashes,</li> <li>➤ Missing or Excess Features,</li> <li>➤ Wrong Size and Position of Features (Holes, Pads, Clearances, Conformal Masks),</li> <li>➤ Clearance and Split Plane Violations,</li> <li>➤ Blocked Holes,</li> <li>➤ Dish-Downs,</li> <li>➤ Annular Ring Violations and</li> <li>➤ Any other defects encountered in PCB manufacturing</li> </ul>
2.8.	Laser drill inspection	Should feature inspection of conformal mask and laser drill application, vias down to 50 microns
2.9.	Detectable laser drill defects	Hole, clearance and pad violations dirt/debris inside laser drill
2.10.	Reference source data	CAM, golden board, artwork, and all other data files
2.11.	Ref. Data transfer	By Network, USB, DVD/CD, etc
2.12.	Reference data type	Gerber, TIFF, RS274X, EIE RPL, DPF, DXF, ODB++, Excellon-2, JPEG, PDF, Gif & all other Standard image formats
2.13.	Illumination	<ul style="list-style-type: none"> <li>➤ Compatible for both Transmitted/ reflective (Visible light: Diffused and Specular) light for all specified applications</li> <li>➤ Lighting from both top &amp; bottom (Reflected &amp; transmitted)</li> </ul>
2.14.	Laser pointer	Sharp and adjustable size laser pointer for indication of defect location, Preferably Red
2.15.	Ink stamper / Marker	For easy identification of the defects with multicolor and erasable ink.
2.16.	Inspection Method	Continuous or Stepped (Automation)
2.17.	Operation modes	Automatic, and manual joystick/ keyboard

2.18.	Detection algorithm	DRC and reference comparison
2.19.	Detection criteria with parameter sensitivity adjustments	<p>Detection algorithm for automatic setting of inspection parameters for:</p> <ul style="list-style-type: none"> <li>➤ Minimum line/space</li> <li>➤ Substrate</li> <li>➤ Image control</li> <li>➤ Oxidized surface</li> <li>➤ Edge roughness</li> <li>➤ Drill area</li> <li>➤ Scale factor</li> <li>➤ Protrusion</li> <li>➤ Nick</li> <li>➤ Pinhole</li> <li>➤ Island</li> <li>➤ Sloped line, etc.</li> </ul>
2.18.	Video Optics	Up to 100X or better for inspection and verification, continuous zoom
2.19.	CCD Optics	<ol style="list-style-type: none"> <li>1. CCD camera &amp; related optics should meet the measuring feature accuracy of 5 microns or better and it should have high resolution</li> <li>2. CCD camera used for Display &amp; measuring purpose should have suitable pixels to facilitate accurate scanning of the work piece, and the scan data when compared with Gerber data should yield accurate inspection results. Manufacturer should provide calculation details for resolution</li> <li>3. The manufacturer should provide the complete Technical data of CCD camera and give calculations how the same is meeting measurement accuracy, resolution and scan data</li> </ol>
2.20.	Defect Verification and repair	Provision for verification and measurement (On-system), Provision for manual rework on the same platform (preferred).
2.21.	False alarms	The system should have Effective & proven

		"False alarm" detecting algorithms for which the manufacturer should give proper supporting document.
2.22.	Preset Resolutions	0.1 mil to 0.5 mil, selectable
2.23.	Feature measurement	Accurate local measurement of line & space width, pad size, point to point on full table size, in both Metric and British systems
2.24.	Tooling / panel clamping	Pin-less / pin-tooling compatible with Multiline 4-punch registration system Vacuum table with a provision to hold panels/film flat on the table
2.25.	Inspection Table	Vacuum table preferred with provision to hold panels/film flat on the table
2.26.	Panel flip	Key activated
2.27.	Operator Safety	Optical screen or better option
2.28.	Power Supply	230V, AC, 50Hz only
2.29.	Compressed Air	7 Atm, 700 L/Min
2.30.	Work Station with Software PC for AOI & CAM	<p>Latest PC station(s) for AOI &amp; CAM</p> <ul style="list-style-type: none"> <li>➤ All the Software should be provided in original.</li> <li>➤ The software should have lifetime license.</li> <li>➤ Updates should be easily added, as and when they are released</li> <li>➤ The equipment should be network compatible, preferably TCP/IP.</li> <li>➤ The system should be made for keyboard/Optical mouse operation as well as optional touch screen operation.</li> <li>➤ The equipment should be provided with DVD/CD RW drive and USB for data loading as well as backup.</li> <li>➤ Intel Core-2 Duo or Core-2 Quad processor CPU</li> <li>➤ 2.93GHz Clock Speed or higher</li> <li>➤ RAM-DDR3, 1333 MHz, 2GB x 3 No.</li> <li>➤ 500GB SATA Hard Disc x 2 No. (1 for redundant backup)</li> <li>➤ SATA DVD Writer</li> </ul>

		<ul style="list-style-type: none"> <li>➤ 24" High resolution LCD Wide screen with 1920x1080 pixels or higher resolution Monitor</li> <li>➤ PCI Express Graphics card with nVidia Chipset, chipset series- 9600</li> <li>➤ Video Memory 1-GB</li> <li>➤ Operating System (OS): Windows XP Professional, 32 bit licensed with CD media</li> <li>➤ Multimedia Speakers</li> <li>➤ Intel G45 Chipset Mother Board</li> <li>➤ 4 SATA Interface, 6 USB 2.0 High speed ports, Keyboard &amp; mouse interface (2 USB ports in the front)</li> <li>➤ Micro ATX Cabinet with 500W SMPS</li> <li>➤ Laser Jet Color Printer for printing the images of the defects</li> <li>➤ System should feature emergency backup facility for all-important data including calibration files for disaster management.</li> </ul>
2.31.	Safety	Conforming to International safety standards

**System specific features:**

**GENERAL FEATURES OF AOI**

The system should have an Automatic Optical Inspection station and a data preparation station

The construction of the machine should be shock and vibration free.

The noise level generated by the equipment should be less.

The total system should be dust proof with dust free and rodent free enclosure.

All fragile part should be firmly secured to prevent breakage.

All moving part should be secured against failure due to wear and tear.

The system should be optimized in height for ergonomic operation.

All metal parts should be rust-free and corrosion-free

Simple Platform for inspection, Verification & repair.

## **AOI SYSTEM FEATURES**

The user interface should be user friendly and easy to operate.

The equipment should be able to handle thin as well as flexible laminates down to 50 microns

It should enable easy and fast set-up of jobs.

The system should be provided with advanced algorithms to generate minimum false alarms.

It should be capable of detecting false alarms due to oxidation.

Event logging system should be provided.

System should have provision for Statistical data analysis with printing option.

Provision for data report per job should be available.

Algorithms capable to sort out inconsequential defects from real defects should be available.

System should have provision for selective area inspection.

System should have provision for masking non-inspectable area.

System should have provision for panel holding mechanism.

It should have provision to save defects & verify after rework.

System should support panel warpage upto 1.5%

Inspection System should be provided with high (12 Megapixel or better) resolution CCD camera and optical systems to meet the inspection requirements as specified in the System Specific Features

Accurate focusing of camera for effective visualization of features and faults

The system should be provided with marker, stamper for identification of faults.

The system should be provided with very good illumination to suit the variety of materials being inspected.

Auto-adjustment of illumination intensity to suit different substrates / surfaces.

Any fine movement mechanism including stepper or linear motors should be self-calibrating on system.

The machine should suit easy calibration for different applications specified.

The system should have automatic calibration feature with provision for simple, manual calibration of all parameters for performance and accuracy. The calibration procedure should be well documented.

## **DATA PROCESSING STATION**

- 5.1. The Data Processing station should consist of high end, state of the art hardware and CAM software
- 5.2. The user terminal should have high end, high speed processor with powerful Operating System, preferably Windows XP
- 5.3. The CAM software should have an easy to use interface.
- 5.4. Data preparation method should be simple and easy.
- 5.5. The system should be fast enough for editing jobs with complex designs upto 42 layers
- 5.6. The software should take the following minimum inputs
  - Gerber, TIFF, RS-274X, EIE RPL, DPF, DXF, ODB++, Exellon-2

## **OPTIONAL FEATURES**

Provision for impedance control checks.

Provision for automation of CAM data conversion to inspection data.

Online fault reporting and printing as well as saving to image file

The system should identify over-etching and under-etching to enable better process control.

The system should have a vacuum customization plate with and without holes for holding of thin and flexible laminates.

Safety lock mechanism should be provided for side doors.

Table movement using foot pedal.

Maintenance of the system by the vendor through Internet optional.

Provision for automation using loader and un-loader or to verification / repair station.

## **SAFETY AND SECURITY**

- 7.1. Multiple level with password should be possible to ensure safety and security
- 7.2. The electrical and electronic controls should be safely enclosed with safety lock mechanism in corrosion proof, humidity proof housing
- 7.3. Emergency stop button should be provided for immediate stoppage of the machine functioning in case of an emergency
- 7.4. Fire/Smoke Detectors are preferred.
- 7.5. Light barrier should be provided for operator safety.
- 7.6. In case of any critical system failure, the system should go to emergency stop mode with electrical power switched off.
- 7.7. Other safety functions such as interlocks, alarms (Audio & Video), fault indication should be incorporated in the system.

## **OFFERING FEATURES**

The bid should be made in two parts with separate technical and commercial quotes.

Separate illustrative drawings and schematics to be enclosed highlighting all-important details of the system.

Operating instructions, standard operating procedures (SOP's) / Maintenance manuals, trouble shooting flow chart, trouble shooting guidelines table for instrument as well as software should be provided along with supply of the instrument.

Complete information should be enclosed to describe every parts and mechanisms.

Original catalogs and photographs must be enclosed.

Details of the safety measures to be taken during operation of the equipment should be provided

Preventive maintenance and regular maintenance to be performed should be listed out with their periodicity

Training should be provided for operation as well as regular maintenance.

A compact disk (CD) may also be sent to support the specification. Technical demonstration of the equipment may also be arranged.

Complete tool kit for maintenance and service should be provided.

Technical capability and conformance to SPACE / ONBOARD specifications should be demonstrated on samples supplied and production lots in presence of ISRO Satellite Centre engineers.

The Bidder should demonstrate the capability of the equipment for manufacturing High density interconnect (HDI) PCB's with the samples provided by ISAC.

The offer should be complete with compliance statement for each of our specifications.

The offer should be complete in all respects and the details of the prices break up for individual parts must be given.

The offer should include all options and accessories to meet complete specifications highlighted above.

Detailed catalogs, mechanical, electrical, electronics schematics, drawings, instruction manuals, Operation manuals and other details must be supplied for all individual modules, accessories used on the system for installation, operation, trouble shooting, maintenance & service.

Separate quotations for installation, training, post warranty maintenance and service contracts (AMSC) should be offered. Offer should be made for both comprehensive and labour only.

The complete system should be field/design proven for long term, continuous and reliable operation.

The equipment must be guaranteed at least for two-year operation after the successful commissioning.

Spares/technical support must be available for minimum 10 years or 2 years after equipment end-of-life (EoL), whichever is later.

Customer list both in India and abroad, especially supplied to space departments or to the manufacturers of space quality PCBs should be enclosed.

Quote for the complete spare parts recommended and consumable spares shall be indicated separately at least for 2-year continuous operation.

Satisfactory training should be provided to ISAC staff and pre-dispatch inspection support should also be provided.

# **ISDO 2009015836**

## **SPECIFICATION**

Supply of Turbo molecular pump with controller horizontal construction to suit the chamber port size DN250-ISOF as per attached drawing.

### **A. General requirements**

1. Turbo molecular pump (TMP) should work with the existing two stage rotary vane pump as backing pump of capacity 60 M<sup>3</sup>/Hr.
2. Turbo molecular pump drive controller should be with display unit and electrical control cubicle should be provided on the station with all necessary inter connections; inter locks and remote control interfaces clearly identified.
3. Necessary vacuum gage head and vacuum meter for both primary and high vacuum should be provided.
4. Air vent valve provided should be of electromagnetic type(normally closed)
5. An air cooled unit is preferred, in case the system needs water cooling the details of water flow rate, pressure and inlet temperature etc, have to be specified.
6. The system should be provided with an inlet screen to prevent the entry of foreign material into TMP.
7. The system should be supplied along with standard maintenance kit.
8. Vendor has to clearly indicate the willingness to supply spare parts such as bearing, drive unit, and spare electronic boards etc from the original manufacturer so as enable us to carry out the servicing of the unit inhouse.
9. Centering ring with Viton “O” ring of size DN 250 ISO-F suitable to the inlet of gate valve should be supplied along with.
10. The TMP should be supplied with required charge of oil, if applicable.

**B. Functional requirements**

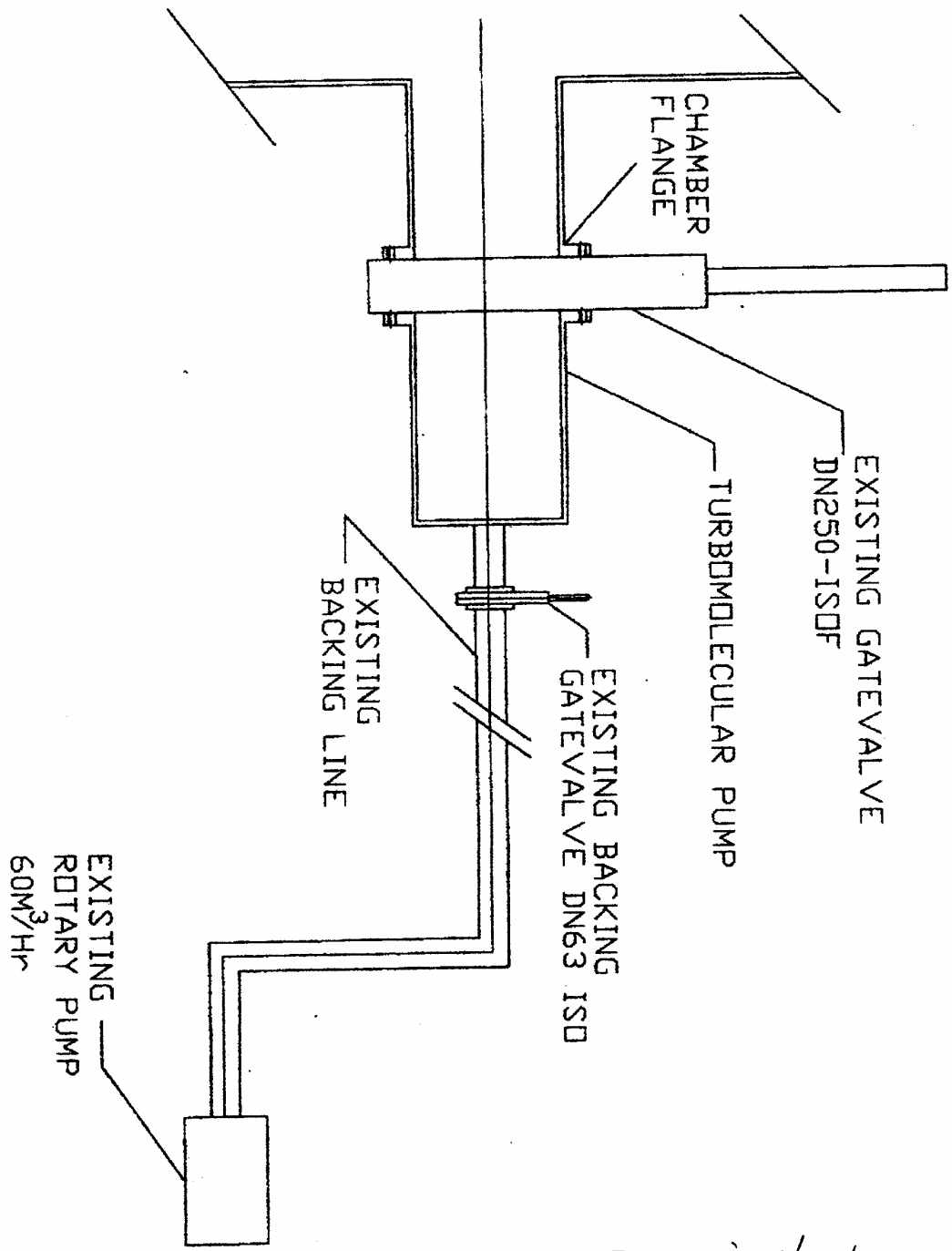
Turbo molecular pump

1. Pumping speed for N<sub>2</sub>- 2000+/- 10% liters/sec
2. Ultimate pressure - 1 x 10<sup>-9</sup> mbar or better
3. Inlet Flange - DN 250-ISO-K
4. Outlet flange - DN 63 ISO-K
5. Operating voltage - 230 Volts,50 Hz, single phase supply

Note:

1. All the necessary product catalogue or brochure in original should be supplied along with the quote.
2. Compliance statements for our specifications should be furnished along with quote.
3. Quote separately for spares and maintenance kits.
4. Scope of supply should be clearly indicated with part number, quantity etc.
5. Vender should indicate the setup which he proposes to make available in India for regular servicing of the quoted equipment.

x



*Amish Chandra*

## ISDO 2009015941

### Detailed Specifications for ACCELEROMETERS

Sl. No	Specifications	TYPE 1 Charge- Miniature	TYPE 2 IEPE- Miniature	Type 3 Shock- Miniature	TYPE 4 Tri-axial
	Quantity	25 No.	25 No.	20 No.	25 No.
1.	Sensor	Shear type Piezoelectric sensor	Shear type Piezoelectric sensor	Shear type Piezoelectric sensor	Shear type Piezoelectric sensor
2.	Type	Charge type	IEPE type	Charge/IEPE type	Charge/IEPE type
3.	Range	$\geq 1000$ g	$\geq 500$ g	$\geq 50000$ g	$\geq 500$ g
4.	Sensitivity (nominal)	1-10 pC/g	10 mV/g	0.1 mV/g	10 mV/g
5.	Environmental Shock limit	$> 5000$ g	$> 2000$ g	$\geq 50000$ g	$> 2000$ g
6.	Weight	$< 0.6$ gm	$< 1$ gm	$\leq 5$ gm	$\leq 15$ gm
7.	Size	Less than 10 mm (L), 7mm(W), 6 mm(H) excluding connector	Less than 10 mm (L), 7mm(W), 6 mm(H) excluding connector	Less than 12 mm(Base dia)X 20mm (Height) excluding connector	Less than 20 mm (L), 20mm(W), 15 mm(H) excluding connector
8.	Construction	Epoxy, Silicone or Hermitically sealed.	epoxy or hermitically sealed.	Epoxy or Hermetically sealed	epoxy or hermitically sealed.

Sl. No	Specifications	<b>TYPE 1 Charge- Miniature</b>	<b>TYPE 2 IEPE- Miniature</b>	<b>Type 3 Shock- Miniature</b>	<b>TYPE 4 Tri-axial</b>
9.	<b>Electrical connection</b>	Replaceable cable(< 1 metre) at the side of the sensor terminated at the other end with 10-32 UNF female connector	Replaceable cable(< 1 metre) at the side of the sensor terminated at the other end with 10-32 UNF female connector	Replaceable cable(< 1 metre) at the top of the sensor terminated at the other end with 10-32 UNF female connector	10-32 UNF female connector
10.	<b>Mounting arrangement</b>	Adhesive	Adhesive	Integral/ Removable stud	Screw/ stud mounting
11.	<b>Case isolation</b>	Signal ground isolated from case/ mounting surface.	Signal ground isolated from case/ mounting surface.	Signal ground isolated from case / mounting surface is preferred	Signal ground isolated from case / mounting surface
12.	<b>Frequency response</b>	2 Hz to 10 KHz with +1dB deviation in sensitivity	2 Hz to 10 KHz with +1dB deviation in sensitivity	10Hz to 20KHz with $\pm 1$ dB deviation in sensitivity	2 Hz to 6 KHz with +1dB deviation in sensitivity
13.	<b>Resonance frequency</b>	> 30 kHz	> 50 kHz	$\geq 100$ kHz	> 18 kHz
14.	<b>Amplitude linearity</b>	< 2% of full scale.	< 2% of full scale.	< 3% of full scale.	< 2% of full scale.
15.	<b>Transverse sensitivity</b>	< 5%	< 5%	$\leq 7\%$	< 5%
16.	<b>Operating temperature range</b>	- 50 ° C to + 120 ° C	- 50 ° C to + 120 ° C	- 10 ° C to + 60 ° C	- 50 ° C to + 120 ° C
17.	<b>Output impedance (for IEPE type)</b>	-	<300 Ohms	<200 Ohms	<300 Ohms
18.	<b>DC o/p Bias Voltage (for IEPE type)</b>	-	7-12 V	7-12V DC	7-12 V

Sl. No	Specifications	TYPE 1 Charge- Miniature	TYPE 2 IEPE- Miniature	Type 3 Shock- Miniature	TYPE 4 Tri-axial
19.	Residual noise (for IEPE type)	-	<0.004g <sub>rms</sub>	< 0.5 g <sub>rms</sub>	<0.004g <sub>rms</sub>
20.	Input DC supply (for IEPE type)	-	18V to 24V @ 2-10mA	18V to 24V @ 2-10mA	18V to 24V @ 2-10mA

**NOTE :**

1. Quotes for technical and commercial bids are to be provided separately.
2. Detailed catalog with drawings should be provided for each model quoted.
3. All optional accessories for the respective types should be quoted separately.
4. Quantity discounts for ordering quantities of upto 10, 10-20, 20-30, 30-40, 40-50, 50-75, 75-100, and 100 and above should be quoted.
5. Calibration certificates (calibration data) and instruction manual should be supplied along with each sensor.

DETAILED SPECIFICATIONS FOR ISOLATION STUDS FOR ACCELEROMETERS.

SL.NO	SPECIFICATGIONS	ISOLATION STUDS
	QUANTITY	50 NOS.
01	THREAD SIZE	10-32 (both accelerometer side and mounting side)
02	MATERIAL	Stainless Steel
03	WEIGHT	<8 gm
04	DIMENSIONS	Base Dia:<16mm HEX
05	THREAD LENGH	Accelerometer side : 3.0 – 3.25mm Mounting side : 6.35 – 6.5mm
06	OPERATING	0 to 150 C

NOTE:

01. Quotes for technical and commercial bids are to be provided separately.
02. Detailed catalog with drawings should be provided.
03. Quantity discounts for ordering quantities of upto 10, 10-20, 20-30, 30-40, 40-50 and above should be quoted.

DETAILED SPECIFICATIONS FOR ACCELEROMETER CABLES.

SL.NO	SPECIFICATIONS	TYPE 1	TYPE 2
	<b>QUANTITY</b>	<b>50 Nos</b>	<b>50 Nos.</b>
01	CABLE TYPE	Low noise, coaxial cable for ENDEVCO 2222C accelerometer	Low noise, coaxial cable for PCB 353 22 accelerometer
02	CONNECTORS	1-64 UNC and 10-32 UNF	3-56 coaxial plug and 10-32 coaxial jack
03	NOMINAL CAPACITANCE	30 to 35 pF/ft	30 to 35 pF/ft
04	NOMINAL RESISTANCE	0.5 to 0.8 ohms/ft	-
05	CONDUCTORS SIZE	30-35 AWG	-
06	PRIMARY INSULATION	Teflon	-
07	SHIELD	Silver plated copper	-
08	JACKET	Teflon	Teflon
09	NOISE	1.5 pk-pk pc	-
10	LENGTH OF THE CABLE	3 ft / 1 meter	3 ft / 1 meter

NOTE:

1. Quotes for technical and commercial bids are to be provided separately.
2. Detailed catalog with drawings should be provided for each model quoted.
3. Quantity discounts for ordering quantities of upto 10, 10-20, 20-30, 30-40, 40-50, 50-75, 75-100 and 100 and above should be quoted.

## ISDO 3009015958

### Detailed specification for Charge Signal Conditioners

Sl. No	Parameters	Specifications
1	Type	<b>Stand-alone/Multi-channel/Modular signal conditioner to process charge output of Piezo-electric accelerometers.</b>
2	<b>Input Parameters:</b> 2.1 Inputs 2.2 Charge Input (PE mode) 2.3 Constant Excitation Current(IEPE) 2.4 Compliance Voltage (IEPE) 2.5 Source Resistance 2.6 Source Capacitance 2.7 Common Mode Rejection	Piezo-Electric (PE), IEPE 0.05 pC to 1,00,000 pC Typically 5mA 18 to 24V > 10 Meg Ohms < 30,000 pF > -60 dB from 10 Hz to 1 KHz
3	<b>Output Parameters:</b> 3.1 Full Scale Output Voltage 3.2 Max output current 3.3 DC offset 3.4 Protection	>10 Vpk AC 20 mA <30 mV Short circuit protected on all outputs
4	Input and output signal ground isolation	Ground/Isolation mode selectable
5	<b>Transfer Characteristics:</b> 5.1 Gain Range 5.2 Gain Accuracy 5.3 Linearity 5.4 Frequency Response with 5% deviation 5.5 Piezoelectric Noise	Selectable from 0.1 to 10,000 $\pm 0.5\%$ $\pm 0.1\%$ of full scale 0.5 to 50 KHz 0.01 pC rms per 1000pF RTI, 1 mV rms RTO
6	<b>Mounting Racks:</b> 6.1 Mounting Configuration  6.2 Field Expandable Feature	Multiple modules/amplifier units must be housed in 19" rack. Power supply for Modules/amplifiers must be through sockets provided in rack. Each rack must have powering switch, fuse, power indicator. In case of modular/multichannel configuration, it should be possible to add additional amplifier cards up to 16 or more at user place at later stage. Software supplied to control amplifier units housed in a rack must be able to control at least 16 such racks.

7	<b>Others:</b> 7.1 Operating Temperature 7.2 Input power 7.3 Connectors for individual channels PE Input AC Output 7.4 Parameter setting 7.5 Operation and Service Manual 7.6 Standard spares	0°C to 50°C 95 – 240 VAC, 50 to 400 Hz (Universal input)  10-32 microdot BNC From PC through USB/LAN interface Operation manual, service manual with detailed circuit diagrams and part list are to be provided. All standard spares are to be quoted separately
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**NOTE:**

- 1. Quotes for technical and commercial bids are to be provided separately.**
- 2. Detailed catalog with drawings should be provided for each model quoted.**
- 3. All optional accessories should be quoted separately.**
- 4. Quantity discounts for ordering quantities of upto 10, 10-20, and above should be quoted.**
- 5. Calibration certificates (calibration data) and supplied along with each sensor.**
- 6. Proven heritage with installation base in aerospace industry for similar applications.**
- 7. Technical compliance statement for the model quoted must be provided.**
- 8. Quoted items are to be demonstrated at ISRO Satellite Centre, Bangalore, if required.**