

Sl. No.	Technical Specifications for dual phase digital Lock-In amplifier
1.	The lock-in amplifier must have A/D Converter of 16 bits or better.
2.	<p><b>Input Signal channel:</b></p> <ul style="list-style-type: none"> <li>i) Both Single-ended and Differential voltage inputs must be possible.</li> <li>ii) Current input with <math>10^8</math> V/A must be possible.</li> <li>iii) Input impedance for voltage input should be <math>10M\Omega</math>, both AC and DC coupling should be possible.</li> <li>iv) Differential input must not have noise more than <math>7nV/\sqrt{Hz}</math> at 1kHz</li> <li>v) High Dynamic Reserve of 100 dB or better (without any prefilters) must be possible.</li> </ul>
3.	<p><b>The lock in must have a Reference Channel</b></p> <ul style="list-style-type: none"> <li>i) Reference Phase Resolution must be <math>0.005^\circ</math> or better.</li> <li>ii) Harmonic detection of up to 5<sup>th</sup> Harmonic must be possible.</li> </ul>
4.	Output time constant should have a range of 10 $\mu$ s to 10 ks.
5.	<p><b>The lock-in amplifier must have an internal sinusoidal signal generator with</b></p> <ul style="list-style-type: none"> <li>i) a Frequency range of at least 1mHz to 100 kHz with resolution of 100 <math>\mu</math>Hz.</li> <li>ii) amplitude in the range of 5 mVrms to 5 Vrms with a resolution of 2mV or better should be possible.</li> <li>iii) output impedance should be 50 <math>\Omega</math>.</li> <li>iv) sine wave output should be able to be phase-locked to an external reference.</li> </ul>
6.	<p><b>Inputs and Outputs</b></p> <ul style="list-style-type: none"> <li>i) sampling rate should be 256 k samples/s or better.</li> <li>ii) Both amplitude and phase (X,Y, R, <math>\theta</math>) data must be supplied.</li> <li>iii) Minimum of three auxiliary A/D inputs with at least 1 mV resolution and <math>\pm 10V</math> full scale must be available for user defined measurements.</li> <li>iv) Minimum of three auxiliary D/A outputs with at least 1 mV resolution and <math>\pm 10V</math> full scale must be available for user defined measurements.</li> <li>v) Output data should be provided in ASCII format.</li> </ul>

7.	<p><b>Displays:</b></p> <ul style="list-style-type: none"> <li>i) Dual Display (amplitude and phase) must be possible.</li> <li>ii) Numeric readout as well as bar graph should be possible.</li> </ul>
8.	<p><b>Computer Interfacing:</b></p> <ul style="list-style-type: none"> <li>i) GPIB as well RS232 must be possible.</li> <li>ii) A minimum of 1.5 meter long GPIB cable must be supplied.</li> <li>iii) A USB-GPIB adaptor must be supplied.</li> </ul>
9.	<p><b>Maintenance support:</b></p> <ul style="list-style-type: none"> <li>i) On-site warranty of 5 years from the date of purchase should be provided.</li> <li>ii) In addition, an AMC support for 1 year after warranty should also be provided for which bidder should mention its AMC charge per year separately. (The AMC charge will not be counted towards financial evaluation).</li> </ul>
10.	<p><b>Optional</b></p> <p><b>A low-noise voltage pre amplifier with following specifications:</b></p> <ul style="list-style-type: none"> <li>i) Input with AC or DC coupled, both differential as well as single ended must be possible</li> <li>ii) Input noise better than <math>5\text{nV}/\sqrt{\text{Hz}}</math> at 1 kHz or better must be demonstrated.</li> <li>iii) CMRR: 100 dB from DC to 1 kHz or better should be possible.</li> <li>iv) Gain: 1 – 30000 or more. Gain should be selectable.</li> <li>v) Maximum output of 10 V<sub>pp</sub> for 50 Ω should be possible.</li> <li>vi) Both low-pass and high-pass filter options must be available.</li> <li>vii) On-site warranty of 3 years from the date of purchase should be provided.</li> </ul>

## Terms and Condition

1. Technical and Commercial bids are required to be submitted in separate sealed envelopes. Both these envelopes can be enclosed in a single envelope which should be clearly labelled as “Quotation for High-Sensitive Lock-In Amplifier”.
2. Compliance chart (copy attached at Annex-I) conforming to the technical datasheet should be attached along with technical bid. A bid without compliance chart shall be rejected (Note: Compliance chart should match the Technical Datasheet). A detailed technical datasheet of the quoted instrument must also be submitted.
3. The model no. of the instrument must be mentioned in the Technical Datasheet.
4. The bidder must be a reputed OEM or an authorized local agent.
5. If the bidder is an authorized dealer of any manufacturer, the authorized Indian dealership certificate from the principals must be enclosed. Similarly, proprietary certificate for proprietary items (if exists) should be provided.
6. Validity of quotation should be at least 120 days from the last date of submission. Quotations with validity period of less than 120 days will be rejected.
7. Quotation must indicate a delivery schedule which must not exceed a maximum of 6 weeks from the date of placement of order.
8. IIT Delhi is exempted from paying custom duty under notification No.51/96 (partially or fully) and necessary “Custom Duty Exemption Certificate” can be issued after providing following information.
  - a. Shipping details i.e. Master Airway Bill No. and House Airway No. (if exists)
  - b. Forwarder details i.e. Name, Contact No., etc.Custom Duty Exemption Certificate will be issued to the shipment in the name of the Institute and Bills of Entry should be submitted to IIT Delhi later on.
9. Either the Indian agent on behalf of the Principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for the same item/product in the same tender. If an agent submits bid on behalf of the Principal/OEM, the same agent shall not submit a bid on behalf of another Principal/OEM in the same tender for the same item/product.
10. IIT Delhi is exempted from paying Excise Duty (ED) and necessary Excise Duty Exemption Certificate will be provided for which following information are required.
  - Quotation with details of Basic Price, Rate & Amount on which ED is applicable.
11. Please quote prices of imported items at FOB (Freight on Board) IIT Delhi inclusive of all taxes, freight, delivery, installation and onsite training charges. The quotation should provide the total price of the system including all taxes and transportation charges.
12. In case IIT Delhi is imposed with demurrage charge by customs due to import on CIF, the entire demurrage charge has to be borne by the Indian Agent of foreign supplier.

13. Five years comprehensive warranty must be provided and AMC price beyond 5 years should be mentioned separately.

14. Payment Option:

Letter of Credit: 80% payment against shipping documents & balance 20% after satisfactory installation. Sight Draft: Payment against documents through bank.

15. The products will be used for educational purposes. Any applicable academic institution discounts should be offered and stated clearly.

12. Authority of IIT Delhi reserves the right to reject any or all quotations without assigning any reasons.

**Sealed quotations should reach the undersigned on or before February 10, 2015 by 5:00 pm.**

Dr. Pintu Das,

Department of Physics

Indian Institute of Technology

Hauz khas, New Delhi – 110016.

## Annex-I

### COMPLIANCE SHEET

Sl. No.	Technical Specifications	Compliance Y/N
1.	The lock-in amplifier must have A/D Converter of 16 bits or better.	
2.	<b>Input Signal channel:</b> i) Both Single-ended and Differential voltage inputs must be possible. ii) Current input with $10^8$ V/A must be possible. iii) Input impedance for voltage input should be $10M\Omega$ , both AC and DC coupling should be possible. iv) Differential input must not have noise more than $7\text{nv}/\text{VHz}$ at 1kHz v) High Dynamic Reserve of 100 dB or better (without any prefilters) must be possible.	
3.	<b>The lock in must have a Reference Channel</b> i) Reference Phase Resolution must be $0.005^\circ$ or better. ii) Harmonic detection of up to 5 <sup>th</sup> Harmonic must be possible.	
4.	<b>Output time constant should have a range of 10 <math>\mu\text{s}</math> to 10 ks.</b>	
5.	<b>The lock-in amplifier must have an internal sinusoidal signal generator with</b> i) a Frequency range of at least 1mHz to 100 kHz with resolution of 100 $\mu\text{Hz}$ . ii) amplitude in the range of 5 mVrms to 5 Vrms with a resolution of 2mV or better should be possible. iii) output impedance should be 50 $\Omega$ . iv) sine wave output should be able to be phase-locked to an external reference.	
6.	<b>Inputs and Outputs</b> i) sampling rate should be 256 k samples/s or better. ii) Both amplitude and phase (X,Y, R, $\theta$ ) data must be supplied. iii) Minimum of three auxiliary A/D inputs with at least 1 mV resolution and $\pm 10\text{V}$ full scale must be available for user defined measurements. iv) Minimum of three auxiliary D/A outputs with at least 1 mV resolution and $\pm 10\text{V}$ full scale must be available for user defined measurements.	

	v) Output data should be provided in ASCII format.	
<b>7.</b>	<b>Displays:</b> i) Dual Display (amplitude and phase) must be possible. ii) Numeric readout as well as bar graph should be possible	
<b>8.</b>	<b>Computer Interfacing:</b> i) GPIB as well RS232 must be possible. ii) A minimum of 1.5 meter long GPIB cable must be supplied. iii) A USB-GPIB adaptor must be supplied.	
<b>9.</b>	<b>Maintenance support:</b> i) On-site warranty of 5 years from the date of purchase should be provided. ii) In addition, an AMC support for 1 year after warranty should also be provided for which bidder should mention its AMC charge per year separately. (The AMC charge will not be counted towards financial evaluation).	
<b>10.</b>	<b>Optional</b> <b>A low-noise voltage pre amplifier with following specifications:</b> i) Input with AC or DC coupled, both differential as well as single ended must be possible ii) Input noise better than 5nV/√Hz at 1 kHz or better must be demonstrated. iii) CMRR: 100 dB from DC to 1 kHz or better should be possible. iv) Gain: 1 – 30000 or more. Gain should be selectable. v) Maximum output of 10 V <sub>pp</sub> for 50 Ω should be possible. vi) Both low-pass and high-pass filter options must be available. vii) On-site warranty of 3 years from the date of purchase should be provided.	

**Note: KINDLY PROVIDE THE TECHNICAL DETAILS IN SUPPORT OF ALL OF YOUR CLAIMS**

I have read all the terms and conditions and enclosed all relevant documents in support of my claims (as above), in the following pages.

**Signature of Bidder**

**Name :** \_\_\_\_\_

**Designation :** \_\_\_\_\_

**Organization Name :** \_\_\_\_\_

**Contact No. :** \_\_\_\_\_