



# भारतीय प्रौद्योगिकी संस्थान (भारतीय खनि विद्यापीठ), धनबाद

धनबाद, झारखण्ड, भारत, पिन-826004

(मानव संसाधन विकास मंत्रालय, भारत सरकार के अधीन राष्ट्रीय महत्व का एक संस्थान)

INDIAN INSTITUTE OF TECHNOLOGY (INDIAN SCHOOL OF MINES), DHANBAD

DHANBAD, JHARKHAND, INDIA, PIN-826004

(An Institute of National Importance under Ministry of H.R.D., Govt. of India)

STORES & PURCHASE SECTION Phone:(0326) 2235678 || Email : purchase@iitism.ac.in || Website : www.iitism.ac.in

No. Mech-INS-247-18-19

Date: October 05, 2018

## NOTICE INVITING TENDER

### **Subject: Supply & Installation of Multistage Air Compressor Test Rig.**

Indian Institute of Technology (Indian School of Mines),Dhanbad invites quotations for the following to be supplied and delivered in Applied Physics Department.

| S No | Full Description of items/ store                                                                                              | Qty   | Delivery        |
|------|-------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|
| 1.   | <b>Supply &amp; Installation of Multistage Air Compressor Test Rig.</b><br><i>(Specifications attached at separate sheet)</i> | 01 No | At the Earliest |

### **Tender Schedule**

| Particulars                                  | Date & Time                                                                                              |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Tender Costs                                 | Rs 1180.00 (Rupees One Thousand One Hundred Eighty Only) <b>Pl. see the Terms &amp; Condition No. 03</b> |
| Bid Security or Earnest money deposit        | Rs. 18,000.00 (Rupees Eighteen Thousand Only)                                                            |
| Last date and time for submission of tenders | <b>26.10.2018 at 3:00 P.M.</b>                                                                           |
| Date and time of opening of tenders          | <b>26.10.2018 at 4.00 P.M.</b>                                                                           |

1. You are requested to quote your lowest rates for the supply of above items in the attached format for Financial Bid (Annexure – II)
2. You may send your representative in the office of the undersigned at the scheduled date and time of opening of tender.
3. Tender should be submitted in sealed cover only superscribed with Enquiry No. and Due date at the following address only:

***The Assistant Registrar (P&S)***  
***Indian Institute of Technology (Indian School of Mines),***  
***Dhanbad – 826 004 Jharkhand***



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## Terms & Conditions

- 1) The rates should be quoted for each item separately.
- 2) Conditional offer will not be accepted.
- 3) **Tender Cost:** Tender cost shall be paid through SB collect only, tender cost payments through other modes viz Cash/DD/MEFT/RTGS etc, shall not be accepted. Tender cost is non-refundable and non-transferable. Venders/contractors/suppliers can pay the Tender Cost through the link: <https://www.onlinesbi.com/prelogin/icollecthome.htm?corpID=272342> the receipt of tender cost must be attached with the Tender documents, **without receipt tender will be rejected.**
- 4) IIT (ISM) does not issue any Form 'C' or 'D' towards sales tax concessional rate. Hence, full rate of GST applicable should be quoted.
- 5) **Bid Security or Earnest money deposit (EMD):** EMD should be submitted in form of A/c payee demand draft drawn in favor of Registrar, IIT (ISM) Dhanbad and payable at any other bank/branch located in Dhanbad. It should not be clubbed with tender cost EMD of unsuccessful bidder will be refunded only after placement of purchase order on the successful bidder.
- 6) **Educational discount,** if any, should be clearly mentioned.
- 7) You are requested to submit your quotation strictly as per the specifications mentioned in the NIT.
- 8) Your tender must be valid for **minimum 90 days** from the date of opening of tender.
- 9) Please mention warranty/ guarantee in your offer clearly. Material/ equipment to be supplied must have minimum warranty/guarantee of **24 months** from the date of installation
- 10) **Performance Security/Performance Bank Guarantee:** Performance Security has to be submitted from the successful bidder. Performance Security should be 10% of the ordered value. Performance Security may be furnished in the form of Bank Guarantee/Demand Draft from any Nationalized Bank and. Performance security should remain valid for a period of two months beyond the date of completion of all contractual obligations of the successful bidder(s). No interest will be payable by IIT (ISM) Dhanbad on the Performance Security deposited. In case the contractor fails to provide satisfactory service, the Performance Security submitted by the bidder(s) is liable to be forfeited. An undertaking to this is to be submitted.
- 11) Each page in the bid document must be numbered properly and duly signed & sealed by the bidder on every page of the bid.
- 12) **The items/ materials shall be required to be delivered at Mechanical Engg., Department/ Section IIT (ISM) Dhanbad** at the risk and cost of the tenderer.
- 13) Unloading and installation shall be the complete responsibility of the supplier.
- 14) The stores are required to be preferably delivered within 30 days. Late delivery may not be accepted.
- 15) The items offered should be of good quality confirming to BIS standards, wherever applicable.
- 16) **Advance payment or part payment or part shipment is not admissible.** Payment shall normally be made within 4-6 weeks subject to receipt and acceptance & installation (as per Purchase Order Terms) of the ordered materials/items and submission of original bills/invoice, challan, installation report, warranty certificate etc, and PBG followed by it confirmation.
- 17) In the event date on which the tender is opened for acceptance is declared to be a holiday, the tenders shall be deemed to remain open for acceptance till the next working day. IIT(ISM) reserves right to extend the date & time of submission/opening of the quotations.
- 18) Please send your offer by Regd.Post/ Speed Post/ Courier along with Courier receipt. Tender/ quotation will be received during IIT (ISM) working hours only (i.e. Monday to Friday). **At any circumstances by hand delivery is not acceptable.** Late or delayed tenders shall be summarily rejected.
- 19) Any other information that you may like to obtain, you are free to contact IIT (ISM) before submission of tender.
- 20) IIT (ISM) reserves the right to accept and/or to reject any/ all tenders without assigning any reason.

Assistant Registrar



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## Annexure – 1

### Multistage Air Compressor Test Rig

The trainer should be designed to understand theory, constructional and operational features of compressor and study its performance characteristics under various operating conditions. **Size of the test setup** Should not exceed 2.25m (length) × 1.5m (width) × 2.25m (height) with all fitted accessories.

The kit enables user to carry out following experiments.

- To study the construction and operation of air compressor.
- To Study of air delivery characteristics with varying compressor speed
- To Study of air delivery characteristics with varying compressor pressures
- To determine volumetric efficiency, mechanical efficiency and isothermal efficiency.
- To study the effect of an intercooler
- To plot p-V diagram of the cylinder
- To plot intake volume flow rate versus delivery flow rate for varying speeds

There should be digital display with analogue measurement facility for all the parameters measures. This will enable students to note the readings, compare, calculate the performance manually and crosscheck with computed values by the software. There must be the arrangement of recording, transmitting, saving all data should in computer, details of which are described as follows.

| Sl No. | Component        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Remark |
|--------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1.     | Compressor       | Air-cooled, Oil-free lubrication, Two stage piston reciprocating type air compressor<br>Make: Elgi/Ingersoll Rand/ CEC/Anest<br>Iwata/Gardner Denver Piston Displacement:<br>Max Pressure: min 10 kg/cm <sup>2</sup> / 145 psi<br>Compressor Speed: min 925 RPM<br>Piston displacement: minimum 500 lpm, 17 CFM<br>Free air delivery: minimum 440 lpm, 14 CFM<br>Air receiver: min 220 Litre<br>Net weight: min 200 kg<br>Tested as per IS 5456 standard or equivalent |        |
| 2.     | Electrical Motor | 5.0 HP, 3 phase, 440 V, 50Hz<br>With DOL Starter<br>Make: kirlosker/Siemens /Crompton                                                                                                                                                                                                                                                                                                                                                                                  |        |
| 3.     | Safety           | Guard for rotating parts to avoid accidental injury to the user when the parts are rotating                                                                                                                                                                                                                                                                                                                                                                            |        |
| 4.     | Control Panel    | At least <i>ISO certified make</i> MS CRCA 14 gauge control panel to house the digital indicators, switches, etc. and wiring                                                                                                                                                                                                                                                                                                                                           |        |



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|                                                 |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                         |
|-------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.                                              | Temperature Measurement                          | RTD with 6 point Digital Temperature Indicator Range: 0- 200 <sup>0</sup> C (minimum 5 Nos.)<br>with Manual: ISO certified make Thermometer, 2set extra thermometer to be provided                                                                                                                                                                                                                                                                                                                                                                                                      | All the measurement is done using standard industrial instrumentation of a reputed make. Accuracy of all these measurement should be less than $\pm 2\%$ of FSD (full scale deflection) |
| 6.                                              | Air Intake Measurement                           | Hot wire anemometer calibrated to measure volumetric air flow in m <sup>3</sup> /sec.<br>A 7 segment, 3.5 digit LED display to display the air flow rate in m <sup>3</sup> /unit time.<br>with Manual measurement, like ISO certified make differential manometer                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                         |
| 7.                                              | Pressure Measurement                             | Range: -1 kg/cm <sup>2</sup> to 0 kg/cm <sup>2</sup> (1 no.)<br>Range: 0 kg/cm <sup>2</sup> to 20 kg/cm <sup>2</sup> (4 nos.)<br>Using ISO certified make pressure transmitter with 7 segment, 3.5 digit LED display.<br>In order to increase life of the sensor, there should be a facility to isolate the sensor to protect it from being subjected to pulsating pressure or equivalent.<br>with Manual Pressure gauge with glycerin filled (ISO certified make: Japsin Instrumentation/ Hi Tech Instruments / Tufit/ Stewarts/Perma-cal/), 1 set extra pressure gauge to be provided |                                                                                                                                                                                         |
| 8.                                              | Compressor/Motor Speed variation and Measurement | Facility to vary speed from 0 to 925 rpm in infinite steps using a knob (potentiometer). VFD may be used for motor speed variation or equivalent.<br>Proximity Type Sensor with 7 segment, 3.5 digit LED display , Range: 0 to 925 RPM, ISO certified make                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                         |
| 9.                                              | Power Measurement device                         | Power transmitter to measure input power to the electrical motor. Suitable for above motor rating.<br>Output: 4 to 20 mA with 7 segments, 3.5 digit LED display. Suitable ISO certified make dynamometer must be present to measure shaft power (analogue) as well as ISO certified make electrical power measuring device must be present.                                                                                                                                                                                                                                             |                                                                                                                                                                                         |
| 10.                                             | Manual                                           | Hard copy and CD copy of the self explanatory operating manuals with detailed theory as well as practical exercises.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                         |
| <b>Special Accessories: For P-V Measurement</b> |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                         |
| 11.                                             | Cylinder Pressure Measurement                    | ISO certified make Piezo Pressure Sensor, High temperature cable and amplifier. Output: 0 to 10 V dc, Range: 0 to 25 bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                         |
| 12.                                             | Crank Angle Measurement                          | ISO certified make Photo Interrupt Type, 1° resolution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                         |
| 13.                                             | TDC Marker                                       | ISO certified make Photo Interrupt Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                         |
| 14.                                             | ADC/DAC Interface                                | Input1: Charge Amplifier of pressure sensor<br>Input2: Crank Angle marker Input 3: TDC Marker                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Data acquisition should be 100 ms per channel for all the data other                                                                                                                    |



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|                          |                                     |                                                                                                                                                                                                                                                                                       |                                                                                                                                 |
|--------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                          |                                     | Resolution: 12 bit<br>Suitable for engine speed of 5500 rpm<br>Communication: RS485, Baud Rate 36400 or better<br>Supply: 230 V AC                                                                                                                                                    | than data for P-V measurement. In case of P-V measurement at least 0.1 ms is allowed. Data should be recorded and stored in PC. |
| 15.                      | PC                                  | Operating System minimum<br>Windows 7 Professional 64 based, 4th Generation Intel(R) Core(TM) i7 octa-core processor [3.6GHz, 8MB Shared Cache] or equivalent, 8GB DDR3 RAM<br>Hard disk: 500 GB Min<br>Monitor: 20 inch LCD minimum<br>Make: reputed like HCL, HP, DEL or equivalent |                                                                                                                                 |
| 16.                      | UPS                                 | 230V Power-Saving Back-UPS, 1.5kVA, 865 Watts<br>Make: APC                                                                                                                                                                                                                            |                                                                                                                                 |
| 17.                      | Software                            | Windows 7 Professional 64 based and user friendly. Facility to view/print P- V diagrams along with tabular display of pressure values.                                                                                                                                                | Facility to calculate FSD in the software.                                                                                      |
| <b>Other Accessories</b> |                                     |                                                                                                                                                                                                                                                                                       |                                                                                                                                 |
| 18.                      | Digital Non contact type tachometer | ISO certified make Digital Non contact type tachometer of reputed make like Protomex/Kusam                                                                                                                                                                                            | For Manual reading of speed                                                                                                     |
| 19.                      | Table/Platform                      | Table/Platform to keep all the accessories required for this experimental setup. All component of this setup must have roller facility so that it can move. Also the compressor itself must have rolling facility to move.                                                            |                                                                                                                                 |

**Soft and Hardcopy of the Manual of the ‘multistage air compression test rig’ needs to be supplied with the setup.**

**Service to be provided during supply and installation:** Transit, unloading and erection of equipments at the site (Department of Mechanical Engg., IIT(ISM) Dhanbad) and any other items not mentioned above for full installation, functioning and commissioning including masonry, foundation, power supply switch (if required) of the setup.

## Document to be provided during submission of Quotation:

1. List of Institutes, where regular ‘multistage air compression test rig’ was supplied earlier, with photocopy Purchase Order.
2. Catalogue and website references (if available) of the regular ‘multistage air compression test rig’ supplied to different institution
3. Manual of the ‘multistage air compression test rig’ supplied to different institution.
4. Please mention the **make and model** of each and every part of the experimental setup, if make is not available, please mention it as ‘local made’. Please don’t mention “or equivalent” term, otherwise the item will be considered as “non-complied”.



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## Annexure - II

### Format for Financial Bid

NIT No.: Mech-INS-247-18-19

Date:

Bidders Ref: No.

Date:

GSTIN No.:

**Subject:** Supply & Installation of Laboratory equipments for under graduate Laboratory.

| Sl. No. | Full Description of Items with (HSN Code/SAC Code) | Qty. | Rate                          | Amount |
|---------|----------------------------------------------------|------|-------------------------------|--------|
|         |                                                    |      |                               |        |
|         |                                                    |      |                               |        |
|         |                                                    |      | Packing & Forwarding (if any) |        |
|         |                                                    |      | <b>Total</b>                  |        |
|         |                                                    |      | GST                           |        |
|         |                                                    |      | Freight (if any)              |        |
|         |                                                    |      | Installation (if any)         |        |
|         | Amount should be in figure as well as word         |      | <b>Grand Total</b>            |        |

#### **Note:**

- 1) All the details must be provided as per prescribed format only
- 2) Prices quoted by the bidders should include GST, HSN Code, SAC Code, duties, livies, transportation cost and insurance costs etc. if any