

	<b>INDIAN INSTITUTE OF TECHNOLOGY MADRAS</b> <b>Chennai 600 036</b>  Telephone: (044) 2257 4676 E-mail: aramesh@iitm.ac.in	
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Prof. Ramesh A  
Project Coordinator

Ref: ME/2020/ARAM/MFC  
Dated: 17.04.2020

Limited Tender No: ME/2020/ARAM/MFC

**Due Date: 12.05.2020, 3:00pm**

**Pre-Bid meeting: - Not required.**

**Bid opening meeting on Due Date: 12.05.2020, 4:00pm**

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of  
**“Gas mixing cum mass-flow controller”** conforming to the specifications given in (**Annexure-I**).

**Terms and Conditions of Limited Tender**

1. **Preparation of Bids:** - The Limited tenders should be submitted under **one bid system** (i.e.) Technical-cum-Financial bid.
2. **Delivery of the tender:** - The tender shall be sent to the below-mentioned addresses either by post or by courier (duly sealed and super scribed on the envelope with the reference No and due date) so as to reach the following address before the due date and time specified in our Schedule:  
**Prof. Ramesh A,**  
**Department of Mechanical Engineering**  
**IIT Madras**  
**Chennai - 600 036**
3. **Price:** - The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges to **Department of Mechanical Engineering**.
  - a. The offer/bid should be exclusive of taxes and duties. The percentage of tax & duties should be clearly indicated separately. IIT Madras is eligible for concessional GST and relevant certificate will be issued.
  - b. In case of import supply, the price should be quoted without custom duty. IIT Madras is exempted from levy of IGST on Imports and eligible for concessional custom duty (not exceeding 5%) and the price should be quoted on EX-WORKS and CIP (stating the Cost, Insurance, Freight separately) and indicating the mode of shipment.
4. **Terms of Delivery:** - The item should be supplied to our Departments as per Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.
5. **Catalogue:** Original catalogue (not any photocopy) of the quoted model duly signed must accompany the quotation in the Technical-cum-financial bid
6. **Late offer:** - The offers received after the due date and time will not be considered

7. **Payment:** - No Advance payment will be made for Indigenous purchase. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e. (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done).
8. **Advance Payment:** - No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Vendor has to submit a Bank Guarantee from a Nationalized Bank of India equal to the amount of advance payment.
9. **On-site Installation:** - The equipment or machinery has to be installed or commissioned by the successful bidder within number of days (as prescribed by PI's) from the date of receipt of the item at site of IIT Madras.
10. **Warranty/Guarantee:** - The offer should clearly specify the warranty or guarantee period for the machinery/equipment.
11. **Validity:** Validity of Quotation not less than 60 days from the due date of tender
12. **Bid Opening:** The bid will be opened on **12.05.2020 4:00pm at the Department of Mechanical Engineering, IIT Madras.**
13. **Accept /Reject:** IIT Madras reserves the full right to accept / reject any tender at stage without assigning any reason.
14. **Settlement of Disputes:** Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.
15. **Risk Purchase Clause:** - In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.
16. **Unsolicited offers:** "This notice is being published **for information only** and is not an open invitation to quote in this limited tender. Participation in this tender is by invitation only and is limited to the selected registered suppliers. Unsolicited offers are liable to be ignored. However, suppliers who desire to participate in such tenders in future may apply for registration as per procedure." The Website for Registration of vendors is <http://web.iitm.ac.in/supplier/> and the mail address for queries is "[workflow@rt.iitm.ac.in](mailto:workflow@rt.iitm.ac.in)".

Yours sincerely,

**Prof. Ramesh A,  
Department of Mechanical Engineering  
IIT Madras  
Chennai - 600 036.**

**ANNEXURE – I**

**Specifications of Gas Mass Flow controller with mixing system (1 No.)**

The scope of supply is Gas mixing cum mass-flow controller (MFC) that is able to simultaneously mix 2 different gases from a range of gases like Methane, CO<sub>2</sub>, Propane, butane, Air, Nitrogen, Hydrogen, Acetylene, Helium and Oxygen at any desired mass concentration ratio (from 0 to 100% of each of the two gases) and supply the same under varying total flow rates ranging from 2 to 32 kg/h. The system should have suitable devices like gas mixer and buffer tank. The base gases will be available in cylinders under a maximum pressure of 200 bar and will be reduced before the MFC. The supply pressure will be in the range of 5-10 bar depending on the inlet pressure.

The system must have the needed mechanical and electronic and electrical hardware and software. The only additional equipment that should be needed from the user should be a standard Laptop/Desktop with standard interfaces like USB/RS232. By using the suitable gas mixing Software provided by the supplier the user should be able to select any specific gas blend (mass ratio) that can be supplied from the buffer tank to the external device that consumes the gas. The outlet gas mixture flow rate can change with time as set by the user and under all conditions the gas mixing ratio must be maintained by the MFC as set by the user. The software interface that can be loaded on any Windows desktop or Laptop without any time limits shall be supplied. A copy of the software which can be loaded any time by the user on any other PC/Laptop has to be provided in a DVD or pen drive.

The software shall do the needed communication with the flow controllers, pressure transducer etc. given in the MFC and allow the user to change the gas mixing ratio. Fine tuning of the controller parameters shall be done by the user with the help of the software. Each MFC shall regulate the flow of one gas into the tank. The software should maintain the exact proportion defined above by constantly comparing MFC data with the control algorithm. Closed loop control of pressure and mixing ratio has to be maintained.

If the chamber pressure drops below the set point, the automated Software shall send a flow command to each Mass flow controller to resume gas flow into the tank manifold for continued gas blending. It should be fully automatic. The System should be expandable and upgradable to resize for different flow and concentration Ranges.

Sl. No.	Items & functions	Description	Remarks
1	<p style="text-align: center;"><b>Mass Flow Controller- 2 No.s</b></p> <p>The mass flow controllers should control the mass flow of following gases namely Methane, Carbon Dioxide, Propane, Air, Nitrogen, Hydrogen, Acetylene, Helium and Oxygen. The mass flow controllers shall have pre-programmed calibration data stored for the above gases. Suitable user selectable modes should be available for selecting any specific gas chosen at a time of use.</p>	<p>Flow Range: 250 SLPM</p> <p><b>LCD integrated touchpad:</b> To simultaneously display Mass Flow, Volumetric Flow, Pressure and Temperature</p> <p><b>Digital Input/Output Signal :</b> RS-232/RS-485 Serial with DB9 Pin.</p> <p><b>Analogy Input/Output Signal:</b> 0-5Vdc/1-5Vdc/0-10Vdc/4-20mA</p> <p><b>Maximum Pressure:</b> 160 psig</p> <p><b>Accuracy:</b> ± 1% of Full Scale</p>	

2	<b>Digital Pressure Gauge-1 No.</b>	Absolute Pressure Gauges Range: 10 bar with display Gas Compatibility : Compatible with all non-corrosive gases Operating Temperature : -10 to +60 °Celsius Monochrome LCD or Color TFT Display with integrated touchpad : Displays Pressure Digital Output Signal1 : Options RS-232 Serial / RS-485 Serial Analog Output Signal2 Options : 0-5 Vdc / 1-5 Vdc / 0-10 Vdc / 4-20 mA	
3	<b>SS Buffer tank-1No.</b>	Volume	5 lit
		Gases	Dry air, Methane, Hydrogen, Air, Argon, CO <sub>2</sub>
		Temperature	-10 <sup>0</sup> to +60 <sup>0</sup> Celsius
		Pressure	10 bar
4	<b>Static Inline Gas Mixers-1 No.</b>	A specific gas blend (with pre-defined volumetric concentration ratios) within a chamber must be produced by a suitable gas mixing technique.	
5	<b>Gas Mixing Software -1 No.</b> <ul style="list-style-type: none"> <li>Combine 2 gases automatically.</li> <li>Instantaneous provision of required gas mixture with mouse click</li> <li>Automated flow implementation based on concentration and pressure</li> </ul>	A graphical user interface Software should be connected either via RS232 or USB with the compatible Computer.  The software communicates to flow controllers and a pressure transducer mounted inside the buffer tank. Each MFC regulates the flow of one gas into the tank. The software should maintain the exact proportion defined above by constantly comparing MFC data with the mix equations. When the pressure reaches the set point, it should stop the mass flow controller.	
6	<b>Accessories</b>	SS tubing, fittings, on/off valve, Joints and fixture board	
7	<b>Warranty</b>	Three years from the date of commissioning	

**Vendor Qualification Requirements that must be met:**

The vendor should have supplied 5 such mixing systems with mass flow rate and blending ratio control systems to reputed Government institutions out of which at least 3 should be to IITs/IISC.