Specifications of Gas Mixing and Mass Flow controller (1 No.)

The scope of supply is mixing cum mass-flow controller (MFC) that is able to simultaneously mix any 2 different gases from a range of gases like Methane, CO_2, 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 and at a constant delivery pressure which can be set at any value in the range 5 to 10 bar and at the set (desired) concentration ratio. The system should have suitable devices like gas mixer and buffer tank at the exit with a pressure sensor also at the exit for measurement and feedback. The base gases will be available in cylinders under a maximum pressure of 200 bar and will be reduced before the MFCs. The supply pressure will be in the range of 7-15 bar.

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 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.

Table 1 Specifications and Supplier qualification Requirements (to be filled and enclosed along with the bid failing which the bid will not be considered.)

Sl. No.	Items &functions	Description	Remarks
1	**Mass Flow Controller-** 2 No.s 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 two specific gases chosen at a time of use.	Flow Range: 250 SLPM **LCD integratedtouchpad**: To simultaneously displayMass Flow, Volumetric Flow,Pressure andTemperature **Digital Input/OutputSignal** : RS-232/RS-485 Serial with DB9 Pin. **Analogy Input/Output Signal**: 0-5Vdc/1- 5Vdc/0-10Vdc/4-20mA **Maximum Pressure:** 160 psig Accuracy: ± 1%ofFullScale	

#	Item	Specifications	
2	**Digital Pressure Gauge-1 No.**	Absolute Pressure Gauges Range: 10 bar with display Gas Compatibility : Compatible with all non-corrosive gases Operating Temperature : -10 to +60 ºCelsius 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	**SS Buffer tank-1No.**	Volume	5 lit
		Gases	Dry air, Methane, Hydrogem, Air, Argon, Co2
		Temperature	-10^0 to $+60^0$ Celsius
		Pressure	10 bar

#	Item	Specifications
4	**Static Inline Gas Mixers-1 No.**	A specific gas blend (with pre-defined volumetric concentration ratios) within a chamber must be produced by a suitable gas mixing technique.
5	**Gas Mixing Software -1 No.** • Combine 2 gases automatically. • Instantaneous provision of required gas mixture with mouse click • Automated flow implementation based on concentration and pressure • Capable of automatically supplying 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 and at a constant delivery pressure which can be set at any value in the range 5 to 10 bar and at the set (desired) concentration ratio. The base gases will be available in cylinders under a maximum pressure of 200 bar and will be reduced before the MFCs. The supply pressure will be in the range of 7-15 bar.	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. The software must simultaneously control the concentration ratio and the supply pressure at the set levels automatically even when the output flow rate is varied.
6	**Accessories to be described**	SS tubing, fittings, on/off valve, Joints and fixture board
7	**Drawing of the proposed system (to be enclosed)**	**The drawing must include the layout of the different components to be supplied along with specifications of the MFCs, Gas mixing device / Buffer chamber and Pressure transducer**
8	**Warranty (Letter to be attached)**	Three years from the date of commissioning (letter to be attached)

Essential Vendor Qualification Requirements that must be met:

The vendor should have supplied 5 such mixing systems or mass flow rate control systems to reputed Government institutions/laboratories out of which at least 3 should be to IITs/IISC for the bid to be considered. Supporting PO copies without indicating financial terms have to be provided along with the bid