# Optical Density Measurement system

**Specifications**

| **Smoke Optical Density Measurement system for measuring opacity and optical density at duct section location in fire experiments with Display unit and simultaneously data logging in Portable ground work station computer placed in data-logger room in a windows based software as per figure attached.** | | **One** |
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| Sl No | Parameter | Description |
| 1. | Opacity meters | **ONE 0.5m path length in Duct section** |
| 2. | Light Transmission | Double Pass |
| 3. | Operating Wave length | 510-540 nm (green LED) |
| 4. | **Opacity** | |
| | Range | 0-100 % or 99.9% |
| | Accuracy | ±2% or better |
| | Resolution | 0.1% or better |
| 5. | **Optical Density** | |
| | Range | 0-1000 mg/$m^3$ or better |
| | Accuracy | ±2% or better |
| | Resolution | 0.1% or better |
| 6. | Logging Time interval | 1-60 s (user selectable) |
| 7. | Drift with temperature | ± 2 %FS of Temperature |
| 8. | Working path length | 0.5-10 m |
| 9. | Working temperature | 600 $^{o}$C±10%. (Heat insulation gaskets should be provided if required) |
| 10. | Calibration | Auto calibration check facility should be there |
| 11. | Input Power | 230V± 10%/50Hz/single phase |
| 12. | Display | Dual data display of Opacity and Density |
| 13. | Control unit | Independent control and display unit. |
| 14. | Interface option | Integration of analogue output signal from each control unit from Trans Receivers (TRX) placed at Duct section locations with USB /MODBUS/RS283/ 4-20mA interface. |
| 15. | Signal Transmission | Should be noise free and also shielded against any electromagnetic interference / earth leakage. |
| 16. | Operating time and memory | System should be capable in logging and storage of opacity meter data for 2hr with a minimum scan interval of 1 s or better. |
| 17. | Power backup | At least 1hr battery backup for complete system. |
| 18. | Integration | Complete integration should be capable to connect opacity meter, display unit and to PC. |
| 19. | Converter | USB connector should be provided to connect the data logger to the computer. |

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| 20. | Relay contact | 3A @ 30 Vdc (level and service alarm) |
| 21. | **Compressor kit.** | **One (should be free from dust, oil and moisture)** |
| | Air Supply volume | 18-50 $m^3$ capacity |
| | Air supply pressure | 40-100 mbar |
| | Accessories | Filter, fittings and hose to clean all the sensors/ lenses etc should be supplied by bidder. |
| | Connection | All accessories required for connection between compressor and system is in bidder scope. |
| | Cables for installation | Suitable cables for complete integration and installation of measuring units installed from duct section to data logger room should be done by bidder. |
| | **Accessories** | The following accessories should be provided. |
| 22. | Mounting flange and flange kit | 1.5'' dia flange pattern of 240 mm long extension tube including studding spring washers and nuts. |
| 23. | Weather cover | Hinged stainless steel weather protecting chamber. |
| 24. | Interconnecting cables | Cable for TRX to TX and RX to OI.6-core, screened pair, 20 AWG, length 60m. |
| 25. | Boxed PSU | Multi Ac input, 24 Vdc output 25 W, IP67 rated enclosures. |
| 26. | Latest High Configuration portable ground workstation computer for data acquisition of opacity and optical density data with respect to time should be displayed in the computer screen. | **Processor:** Intel Xeon W-2133 3.6 2666MHz 8.25 6C CPU or better, **Chipset:** Intel® C422 chipset or better, **RAM:** 32GB DDR4 2666 DIMM **Graphics Card**: NVIDIA Quadro P1000 4GB **Drive Controller:** Integrated SATA 6.0 Gb/s **Hard Drive:** 2TB 7200 RPM SATA 1st Hard Drive **Optical Drive:** DVDRW SATA Optical Disk Drive, **Bays:** Internal - One 2.5"; Two 3.5" Minimum external - Two 5.25"; One slim ODD, **Ports:** 1 headset connector; 8 USB 3.1 Rear: 1 audio-in; 1 audio-out; **Slots:** Minimum 2 PCIe 3 x4, 1 M.2 PCIe 3 x4, 1 PCIe x8, 2 PCIe x16 **Software:** pre loaded windows 10 or better **Softtware Network:** Integrated Intel® I219LM PCIeGbE and Intel® I210-AT PCIe controller, **Audio:** High Definition Integrated Realtek ALC221 Audio or better, **Operating System:** Windows 10, **Keyboard & Mouse:** OEM wireless keyboard and laser Mouse, **Monitor**: 23 |

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| | | inch IPS Display **Power Supply**: Minimum 1000 W with 90% efficient **Warranty**: 2 years comprehensive onsite warranty. |
| | **General Terms & Conditions** | |
| 27. | The following document should be provided<br>(i) Instruction manual for operation<br>(ii) Instruction manual for software<br>(iii) Proper Calibration Certificates for the instrument | |
| 28. | Complete, Supply and Installation, demonstration, commissioning, system integration, technical training and routine servicing training of complete system (including installation of the transmitter and receiver heads on walls by thermally insulated techniques) should be done by the supplier at experimental facility site at CBRI, Roorkee. It should also include the supply and installation of wiring / cables etc in underground insulated conduit fitting for connecting the transmitter and receiver ends, and for signal transfer to data logging device placed in data logger room (25m distance) as per **attached figure**. The fabrication work, if any, for installation should be done by the supplier. All the facilities / materials for fabrication work, etc, if required, should be provided by the supplier. | |
| 29. | Warranty for complete system from the date of installation and successful commissioning should be two years complete in all respect. However if the standard warranty is for less than two years, the cost of warranty for additional period may be mentioned. | |

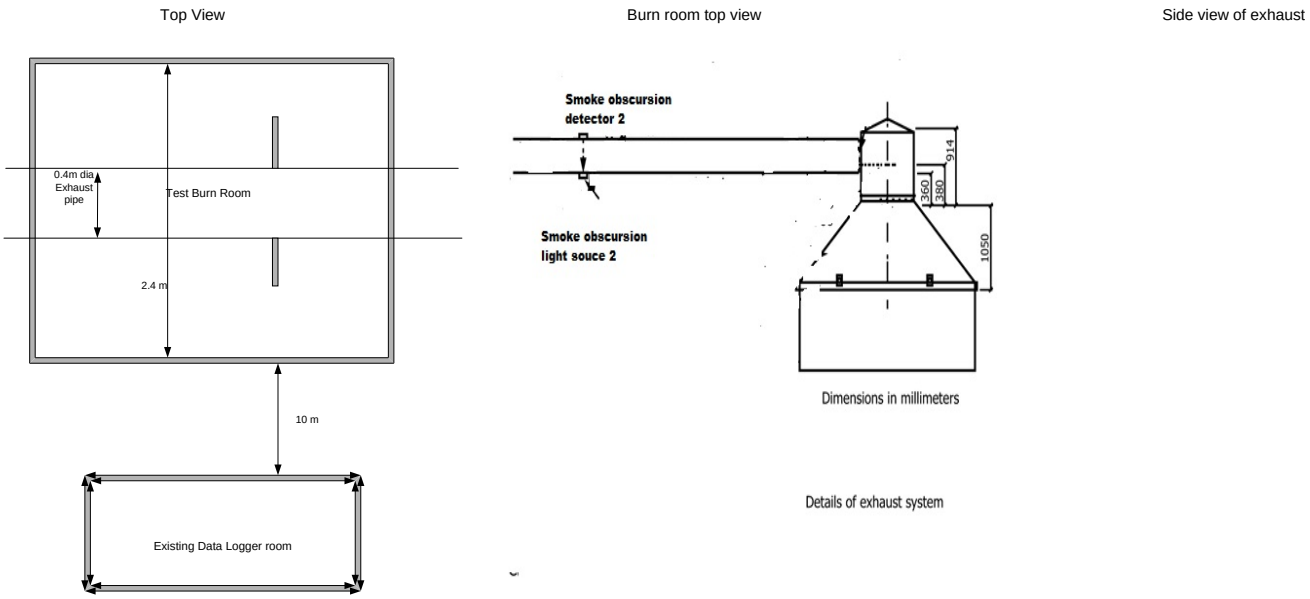


**Figure-1: Smoke opacity measurement location (a) Top view (b) Side View of exhaust duct.**