Particulate Monitoring Systems

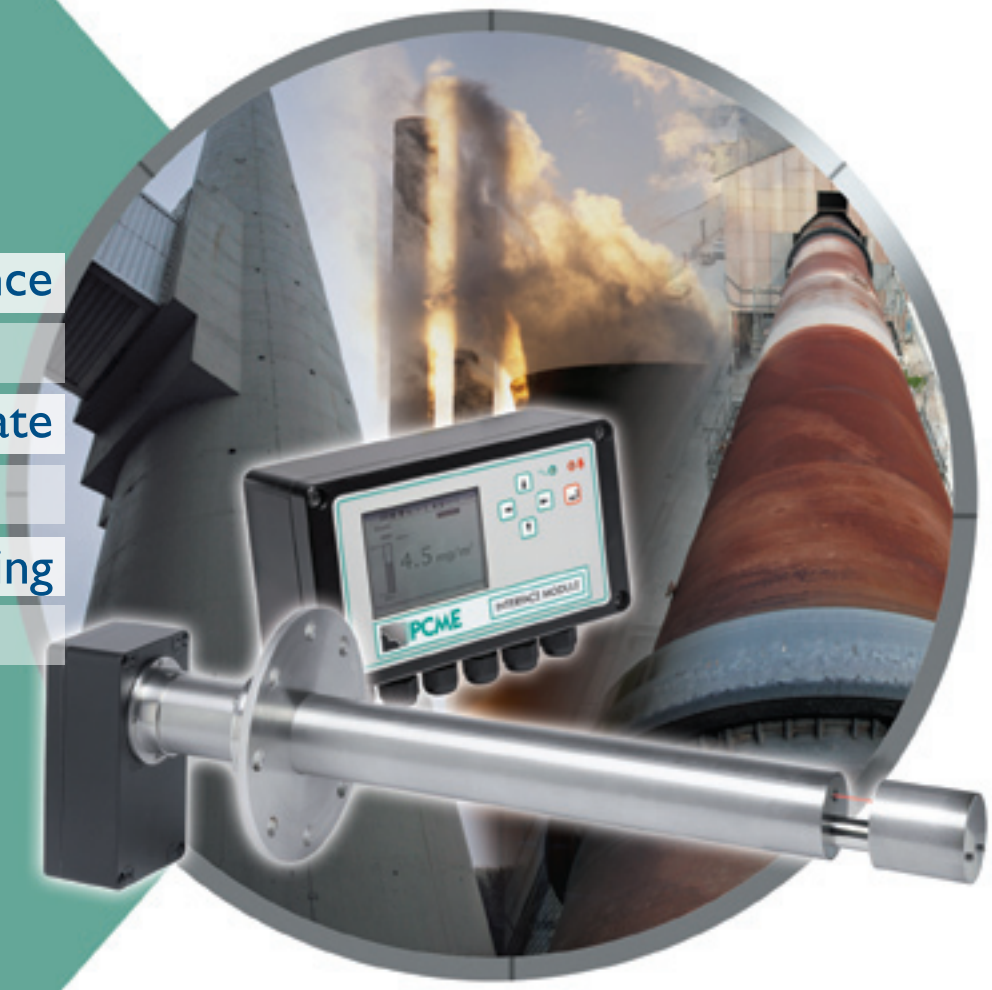
Automated Monitoring System for Particulate Emissions

compliance

particulate

emission monitoring

QAL 1



- Forward Light Scatter (Pro-scatter) measurement technology
- QAL1 certification range of 0 - 15 mg/m³
- Minimum detection limit of < 0.1 mg/m³ and operational ranges of 0-10 mg/m³ to 0-100 mg/m³
- Automatic upscale (span) and zero checks for self-auditing (QAL 3)
- Complies with new Waste Incineration Directive and Large Combustion Plant Directive EN-13284-2/EN-14181 (Europe) and PS-11 (US)
- Rugged probe design, tolerant to contamination
- Industrially hardened control unit options with graphics interface and advanced configuration

applications

Continuous Stack Measurement

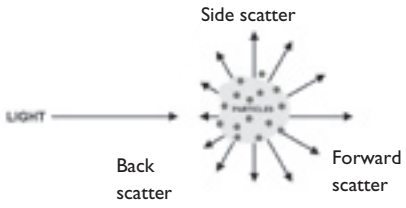
The LMS181 is suitable for measuring particle emissions after both bagfilter and electrostatic precipitator arrestment plant and is especially relevant where it is critical to obtain reliable, accurate and robust emissions data. The instrument has reduced cross-sensitivity to changing particle type and is unaffected by changes in velocity making it of interest to operators of all types of industrial processes where emissions are challenging to monitor using conventional methods. From a regulatory perspective, its high Quality Assurance features makes it also suitable as a compliance device to satisfy new standards for Incinerators, Power Stations and Cement Kilns. Specific requirements satisfied by the instrument are:

- High quality dust measurement with minimal cross-sensitivity from particle type
- Compliance to US EPA standard for PM-CEMS (PS-11) – *see separate application note*
- Designed to meet CEN standard, EN-13284-2/EN-14181 for Incinerators, Power Plant and Cement Kilns

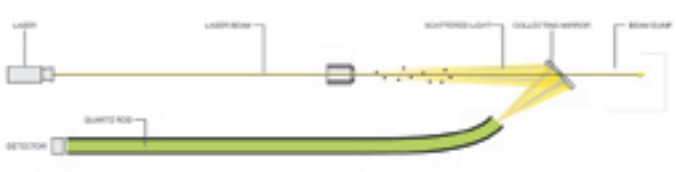
Principle of Operation

The LMS181 measures the scattered forward light from a laser source. The measurement volume in the sensor probe is positioned in a representative location within the stack. The scattered light response is directly proportional to dust concentration. The instrument optimises its resolution and zero drift characteristics, meaning accurate measurement below 0.1 mg/m^3 as well as rugged operation in stacks where emissions exceed 100 mg/m^3.

The Pro-Scatter technique used in the LMS181 collects the total cone of scattered light from particles in the measurement volume, resulting in a more representative measurement than point type scattering systems. This patented measurement method increases the instruments signal to noise ratio giving high stabilty at even low dust concentrations (< 0.1 mg/m^3).



Principle of Scattered Light



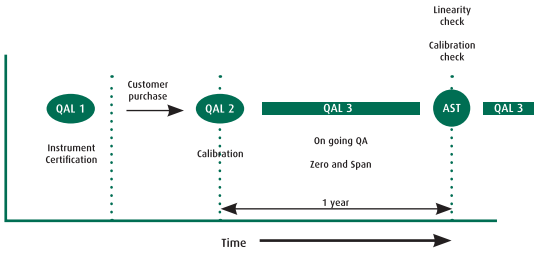
Method of implimentation

EN-14181 (13284-2) for Incinerators, Power Plant and Cement Kiln

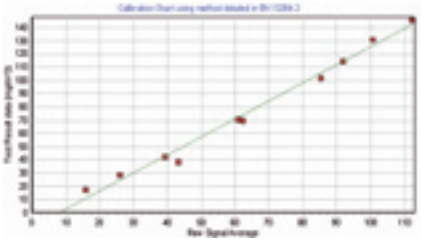
The LMS181 provides users of processes regulated under the European WID and Large Combustion Power Plant Directive, a precise and robust solution for meeting EN-14181 (EN-13284-2) while reducing cost of ownership. Instrument standards require a QAL 1 assessment (with stated uncertainty) and suitable QAL 3 features for ongoing Quality Assurance (zero and span checks with appropriate statistical treatment).

The LMS181 is designed to meet these requirements and also providing suitable audit and reference materials for the Annual Surveillance Test (AST).

The instrument provides a precise measurement of particulate concentration. Its calibration is less sensitive to changing particle type than higher angle light scattering and electrodynamic techniques. This feature can significantly reduce the need for expensive recalibrations (QAL2).



Issues satisfied when used to meet EN-13284-2



Calibration to QAL 2

Workplace Monitoring

The instrument can also be mounted in an open factory or ambient environment to continuously monitor the levels of particulate. The instrument is suitable for measuring stationary airstreams as well as an air volume from which a sample is drawn. The instrument is capable of monitoring the very low levels of particulate associated with particle contamination and clean work environments as well as the more substantial dust levels associated with explosive dust levels. The instrument has a unique and predictable response to known types of dust, meaning that its output can be pre-calibrated in mg/m^3.

Typical applications include:

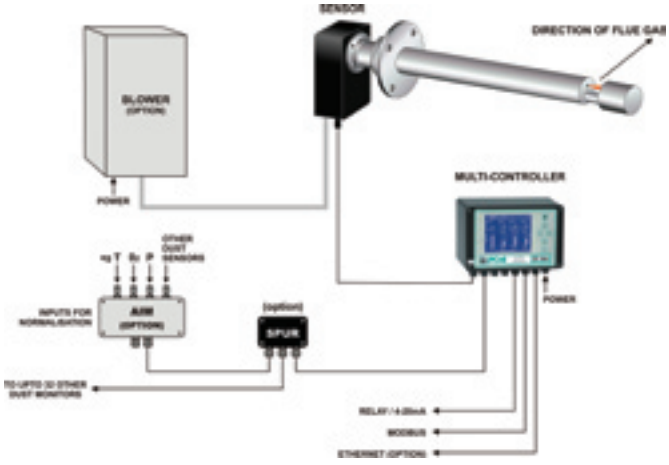
- Personal dust exposure monitoring
- Automatic control of air extraction plant based on ambient dust levels
- Contamination control
- Monitoring dusts against LEL and HEL explosive ambient levels
- Tunnel Monitoring

product features

Connection Schematic

The LMS181 comprises the pro-scatter sensor which is mounted directly in the stack plus a powerful user interface module which provides power and digital communication for the sensor. The standard control unit provides set-up functionality, graphical displays and recording of emissions and QAL3 data for a single sensor system. This maybe extended up to 32 sensors and to include ethernet compatility (option). The control unit can also provide simmultaneous recording of the pulse data (for arrestment plant cleaning diagnosis), short term data (for process control) and long term data (for external emissions reporting). Both control units support inputs from external oxygen and temperature meaurements for on board normalisation. The sensor, which supports industry standard modbus communication, can be connected directly to a PLC or CEMs management system.

QAL Reporter PC software is fully compatible with the instrument to provide secure and powerful emissions reporting and automated QAL3 reporting in full compliance with EN-13284-2.

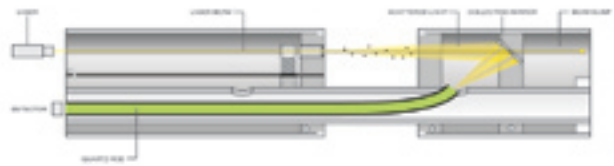


Reliability and Contamination Resistance

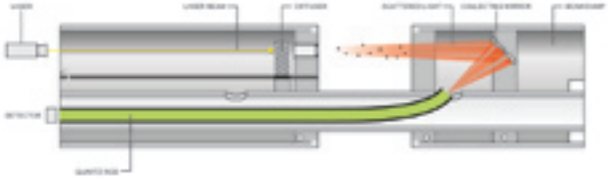
The instrument will work reliably in high dust applications due to the use of extended air curtains which protect all optical surfaces from the flue gas. The instrument can be connected to instrument compressed air or supplied with its own air blower unit which generates sufficient air for the instrument. The results of the automatic upscale (span) check can optionally be used to compensate for the effects of any contamination. The LMS181 also operates reliably at elevated temperatures (optional to 400°C) having the advantage of no active electronic or optical components exposed to stack temperature. The instruments patented design is inherently reliable by avoiding the use of fibre optics (which age with temperature) and the need for the movement of detectors for the self checks (which are postion critical).

Self-checks for Compliance Measurement

The LMS181 includes automatic self-checks designed to ensure appropriate quality assurance and to meet the QAL 3 regulatory requirements for particulate compliance monitors installed on Incinerators, Cement Kilns and Power Plant in Europe (EN-13284-2). Appropriate zero and upscale (span) tests are included as standard.



Measurement mode



Span check with diffuser performs QAL3

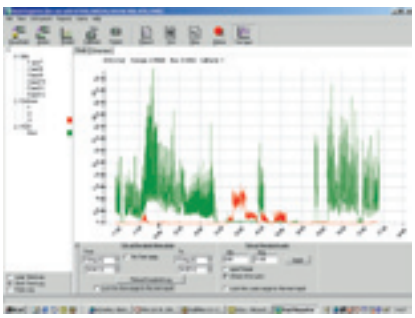
These checks 'challenge' the instruments performance, checking the operation of the transmitter and receiver optical and electronic components are within specification as well as the instruments accuracy in measuring scattered light. This permits any instrument failure or mis-measurement to be rapidly diagnosed and corrected. The diffuser introduced during the automatic span check simulates a scattered signal, meaning the check is a true check of the instruments ability to measure scattered light, rather than just attenuated light.

Advanced, robust user interface

The multicontroller (up to 32 sensors) is an industrially hardened display and recording system which provide advanced user interface and sensor configuration. These can be connected directly to a LAN or PC network for data management and recording via DustReporter 2 PC software.

Graphics screen assists interpretation of emission trends

On-board Normalisation for oxygen and temperature



Typical Emission Graph

Specifications

Sensor:

	Order Codes:	
Sensor Material	S R	316 stainless (standard) corrosion resistant for SO_2 (option)
Temperature Range	250 400	stack temperature 0-250°C stack temperature 0-400°C (option)
Stack Connection (see diagram)		3" 150 lb ANSI/PN6 DN80 or PN10 DN80
Insertion of interaction volume into stack		15mm to 600mm (user adjustable)
Minimum stack diameter		250mm
Enclosure Rating		IP-65
Output		RS-485/MODBUS to control unit
Power		24V DC (Provided by control unit)
Process Conditions		Non-condensing
ELV Range (Emission Limit Value)		0 - 10 mg/m³ to 0 - 100 mg/m³
Minimum Detection Level		<0.1 mg/m³
Resolution		0.01 mg/m³

Order Codes:

LMS181 - - SENXXXY

Temperature Range
Sensor Material

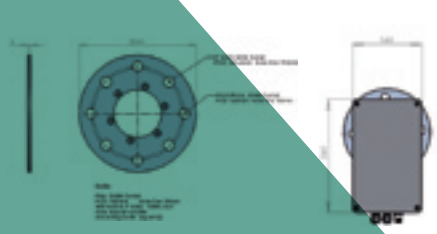
Blower (optional):

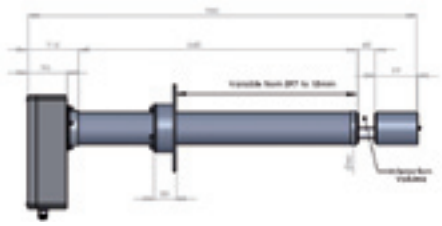
Voltage	115/230V 50/60 Hz
Enclosure Rating	IP65
Air Supply Volume	5 litres/min
Stack Pressure	1030 PA max
Flow Detection	Volt free contact
Order Code	Blower 1030-5

Control Unit (optional):

Order Code	Multicontroller (1-32 channels) Multicontroller with ethernet	LMS181M-CON LMS181M-CON-ETHERNET
Capability	Alarms Display of Readings Graphical Trending Recording Local 4-20mA output Modbus 485/232 output Reporting software DustReporter 2	

Sensor





Optional Components:

Component	Purpose	Specification	Size
Cable	Power and communication to sensors from control unit	4-core screened (2 for 24V DC, 2 for RS-485 COMS)	10m/sensor (included) Extendable to >5000m Belden 9402 (or equivalent)
AIM	Input data from external devices (eg for Temp and O_2 Normalisation)	4 x 4-20 mA inputs 4 x Digital Inputs (contact closure)	176mm x 80mm x 60mm
SPUR	Divides cable into 2 branches	3 cable connections	100mm x 64mm x 44mm
PSU/Repeater	Voltage and signal boost for extended cabling runs with multiple sensors	90 – 260 VAC input (50/60 Hz) 24V DC output	222mm x 125mm x 81mm
220 Sensor	Broken bag detector (alarm only)	Temperature up to 125°C (250°C option)	½" (or 1 ½" BSP) stack connection
Analogue Output Module (AOM)	Additional 4-20mA	8 x 4-20mA (500 ohms)	175 w x 80 h x 60 d
Relay Output Module (ROM)	Additional Relays	8 x Relay (1 Amp @ 250V)	250 w x 60 h x 80 d

About PCME Ltd

As a progressive environmental Company, PCME specialises in particulate measurement for industrial processes. With a worldwide reputation for reliability, innovation and technological excellence, the Company produces equipment for concentration and mass monitoring for regulatory, environmental and process control requirements. A dedicated team of qualified application and sales engineers is always on hand and should be consulted in the selection and usage of the most suitable equipment for any particulate application.

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