

PCME QAL 181

PROSCATTER™
INSIDE

Particulate

Measurement

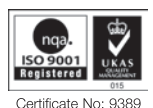
System



QAL1 Approved
and PS-11
compliant PM CEM



- Ex category 3G/2D, extended length and robust high temperature options for challenging stack conditions
- Automatic self-checks for high quality assurance and instrument reliability, with minimum detection limit of $< 0.05 \text{ mg/m}^3$ and measurement range of $0\text{-}300 \text{ mg/m}^3$
- Certification range of $0\text{-}15 \text{ mg/m}^3$ and $0\text{-}100 \text{ mg/m}^3$ complies with Waste Incineration Directive and Large Combustion Plant Directive EN 13284-2 / EN 14181 (Europe) and PS-11 (US)
- Reduced cross-sensitivity to changing particle type and size due to low angle forward scattering principle (*ProScatter™* Forward Scatter technology)



Certificate No: 9389

technology/applications

System Description

The **PCME QAL 181** is suitable for measuring particle emissions after both bagfilter and electrostatic precipitator arrestment plant, it also satisfies the need for high quality assurance on emissions data. The instrument is suitable for measuring both low ($0.1\text{mg}/\text{m}^3$) and high particulate concentration levels ($300\text{mg}/\text{m}^3$). It has reduced sensitivity to changing particle type and is unaffected by changes in velocity. From a regulatory perspective its high quality assurance features (MCERTS and TUV approved) makes it suitable as a compliance device. Typical application areas include Cement Kilns, Boiler Plant (including Coal Fired plant with FGD and high temperature Biomass boilers) and Waste Incineration Plant.

The PCME QAL 181 is offered with two different probe lengths:

- The standard probe provides high quality measurement for many incineration, cement, and steel, and variable fan speed bagfilter applications.
- For applications with thick stack walls, long flange stand-offs and large stack diameters (for example power plant and main stack applications), the long probe length ensures the measurement volume is further into the stack

Both probes are provided with a stack penetration length adjustment mechanism.

For refineries and other Ex gas zone applications, the Ex version of the standard sensor holds ATEX/IECEX 3G/2D certification.



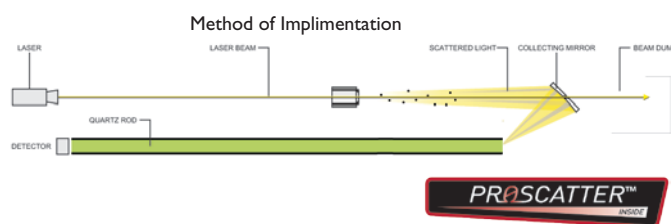
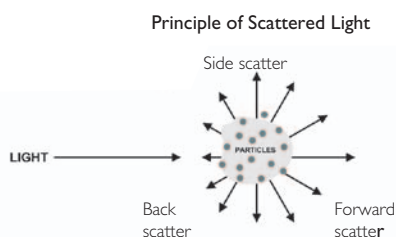
As an approved particulate CEM (Continuous Emission Monitor) complying with monitoring standards EN 14181, EN 13284-2 and US EPA standard PS-11, the instrument holds QALI approvals to the requirements of EN 15267-3 with both MCERTS version 3 Class 1 and TUV BlmSchV 17, 13, 27: latest revision approvals. As such, the instrument provides a precise and robust monitoring solution for monitoring according to EN 14181 with special relevance to the European Waste Incineration Directive (WID) and Large Combustion Plant Directives (LCPD).

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 must be connected to a reliable source of dry compressed air or supplied with its own air blower unit. The **PCME QAL 181** also operates reliably at elevated temperatures (optional to 500°C), having the advantage of no active electronic components exposed to stack temperature or moving measurement components. The instrument's 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 position critical).

Principles of Operation

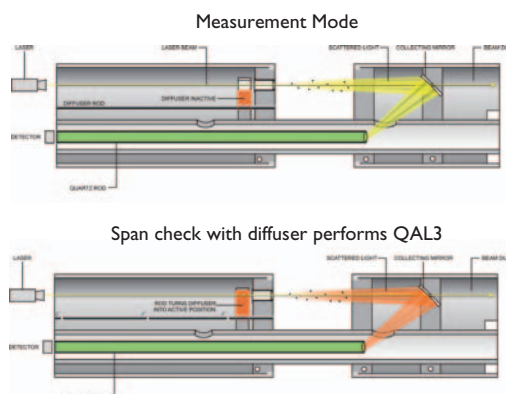
The **PCME QAL 181** measures the scattered forward light from a laser source. The measurement volume in the sensor probe is positioned in a representative location within the stack. The scattered light response is directly proportional to dust concentration. The instrument optimises its resolution and zero drift characteristics, meaning accurate measurement below $0.1\text{mg}/\text{m}^3$ as well as rugged operation in stacks where emissions exceed $300\text{mg}/\text{m}^3$. The ProScatter™ Forward Scatter technique used in the **PCME QAL 181** collects the total cone of scattered light from particles in the measurement volume. This patented measurement method increases the instruments signal to noise ratio giving high stability at even low dust concentrations ($< 0.1\text{mg}/\text{m}^3$). The instrument provides a precise measurement of particulate concentration. Unlike other probe-based light scattering instruments, the **PCME QAL 181's** measurement and detection volumes are larger, offering more resolution and better minimum dust level detection capabilities. In addition, ProScatter™ Forward Scatter technology reduces the effect of changing particle size to calibration.



Self-checks for Compliance Measurement

The **PCME QAL 181** includes automatic self-checks designed to ensure appropriate quality assurance and to meet the QAL3 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.

These checks 'challenge' the instrument's performance, checking the operation of the transmitter and receiver optical and electronic components are within specification as well as the instrument's accuracy in measuring scattered light. This permits any instrument contamination 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 instrument's ability to measure scattered light, rather than just attenuated light.



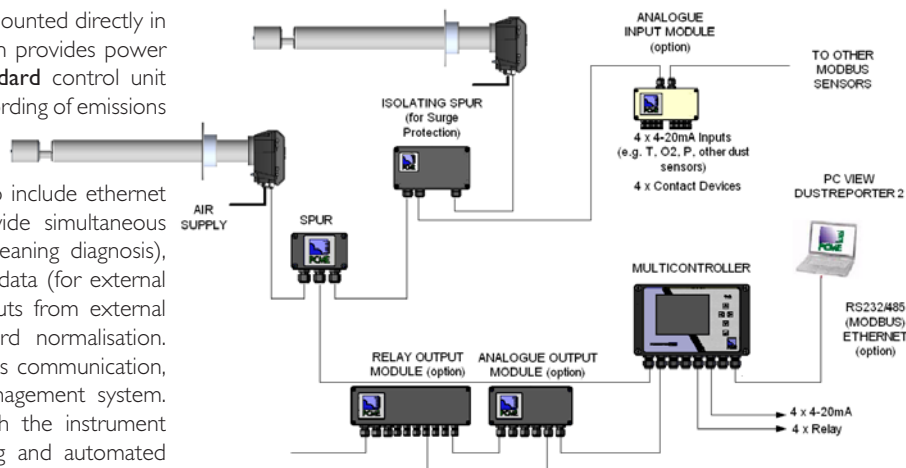
product features

Connection Schematic

The **PCME QAL 181** comprises the sensor which is mounted directly in the stack and 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.

The **PLUS** version of the instrument (with MultiController) extends this up to 16 sensors and to include ethernet capability (option). The control unit can also provide simultaneous 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 measurements for onboard 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 / EN 14181.

The **Entry** level Control Unit offers basic setup and a 4-20mA output scaled to dust concentrations.

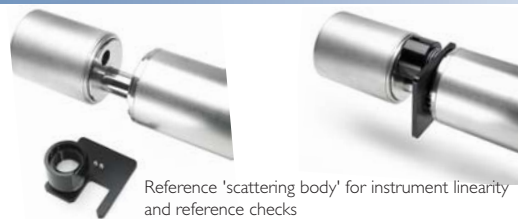


Process and Application Conditions

- Certification range: 0 -15mg/m³ (QAL1 approval).
- Extended certification range: 0-100mg/m³ (QAL1 approval).
- Measurement capability: 0-300mg/m³.
- Long term zero drift: <0.1mg/m³.
- Inspection frequency: 3 months.
- Air purge requirements: 30 to 40 litres/minute.
- For measurement in non condensing flue gases.
- Not suitable for applications with water droplets.

Quality Assurance/Audit

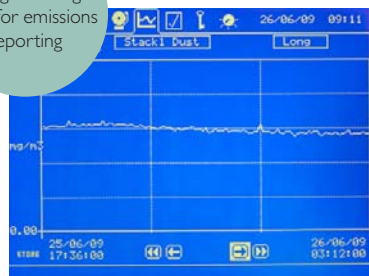
The instrument is supported by an optional *ProScatter*TM Audit unit which is an approved reference material for conducting linearity tests as part of AST, QAL2 procedures or absolute correlation audit (ACA). To audit the instrument, the sensor is temporarily removed from the stack and reference 'scattering bodies' are inserted into the measurement chamber. The resulting response is measured to ensure linearity and also to provide a reference check that there is no contamination affecting instrument performance.



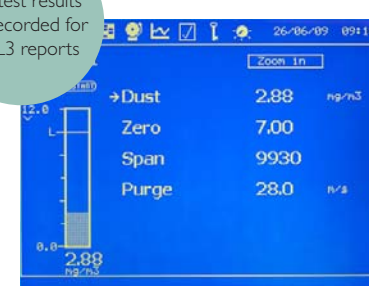
Reference 'scattering body' for instrument linearity and reference checks

Control Unit Options

Long term log used for emissions reporting



Self-test results are recorded for QAL3 reports



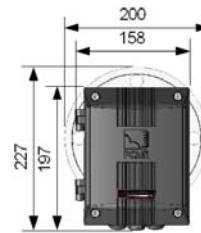
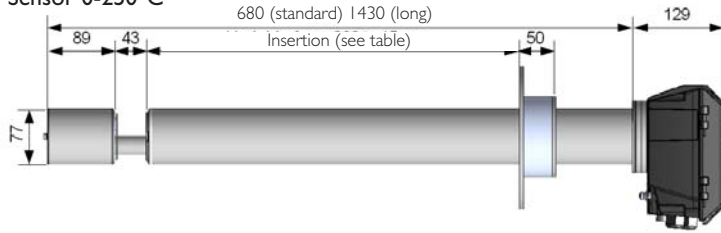
| | Entry System | Standard System | PLUS System |
|---------------------------------|---|---|---|
| Controller Type | Entry controller | Interface module | MultiController |
| No of Sensor Channels | 1 | 1 | 1-16 |
| ICON Driven Multilingual Menus | Not applicable (2 line LCD display) | Emission and Alarm levels Quality Assurance results Calibration screens Review data logs Show graph and bar chart Set up and password Advanced calculations (Mass, normalisation) | Emission and Alarm levels Quality Assurance results Calibration screens Review data logs Show graphs and multi bar charts Set up and password Advanced calculations (Mass, normalisation) |
| Filter Optimisation Diagnostics | None | Pulse log review for diagnosing location of leaking bags/or failing ESP plates | Pulse log review for diagnosing location of leaking bags/or failing ESP plates |
| Emission Data Logs | None | Capacity stated for 1 sensor (plus QAL3 channels) 2 months @ 15 minutes 7 days @ 1 minute 2 hours @ 1 second 500 entries | Capacity stated for 4 sensors (plus QAL3 channels) 2 months @ 15 minutes 7 days @ 1 minute 2 hour @ 1 second 500 entries |
| Ethemet Enabled Option | None | None | Ethemet (Modbus TCP) (optional) |
| Outputs | 1 x RS232 (Modbus RTU) 1 x 4-20mA (500 Ω) 1 x Relay (0.5A@110V) | 1 x RS485 (Modbus RTU) 1 x 4-20mA (500 Ω) 2 x Relay (2A@250V, user selectable) | 1 x RS485 (Modbus RTU) 4 x 4-20mA (500 Ω) 4 x Relay (2A@250V, user selectable) |
| Inputs | Input for plant off indication | 1 input for plant off indication, bag cleaning reference and multiple calibrations | 4 inputs for plant off indication, bag cleaning reference and multiple calibrations |
| Enclosure Size (mm) | 220 W x 123 H x 80 D | 220 W x 123 H x 80 D | 263 W x 160 H x 91 D |
| Power Supply | 100 to 240 VAC (50/60Hz), 1A | 100 to 240 VAC (50/60Hz), 1A | 100 to 240 VAC (50/60Hz), 1A |

Note: Additional 4-20 mA and Relay outputs also available from optional accessory components for Standard and PLUS system.

specifications

Dimensions

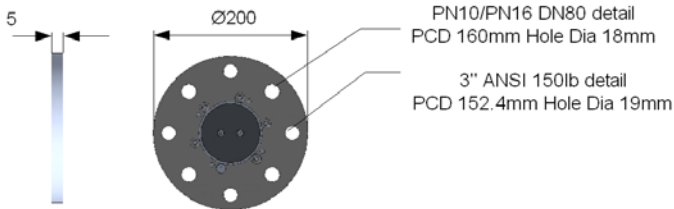
Sensor 0-250°C



Optional Insertion Distance for Measurement Volume

| | Nominal | Adjustable Insertion | Overall Length |
|----------|---------|----------------------|----------------|
| 181 | 550 mm | 80-550 mm | 680mm |
| 181 Long | 1300 mm | 550-1300 mm | 1430mm |

Flange



| | |
|------------------------------|--|
| Enclosure Temperature Rating | -25°C to +55°C |
| Enclosure Rating | IP66 |
| Enclosure Material | Die-cast aluminum (polyester powder coated) |
| Connection Required on Duct | Hole pattern to suit DN80 PN10/PN16 or 3" 150lb ANSI (hole ID at least 88mm) |
| Power Requirements | 24V provided by the control unit |
| Cable Entries | 3 x M20 gland/conduit entries |
| Air Purge Requirements | Requires continuous air purge at 30-40 litres/minute |

Order Codes

| | |
|--------------------------|--------------------|
| PCME QAL 181 PLUS | [multi channel] |
| PCME QAL 181 | [single channel] |
| PCME QAL 181 E | [entry controller] |

Control Unit Options

CON 181 - A B

| | | | |
|---|------------|---|-------------|
| A | Controller | PLUS version (MultiController) Standard version (Interface Module) Entry version (Entry Controller) | M I E |
| B | Ethernet | None Ethernet fitted (PLUS version only) | 0 ET |

Example: CON 181 M ET

Sensor Options

SEN 181 - 1 2 3 4 5 6 7

| | | | |
|---|--------------------------------------|---|-------------------------------|
| 1 | Stack Temperature | Up to 250°C Up to 500°C | 250C 500C |
| 2 | Air Purge | None Air Filtration Kit for use with instrument air line*1 Low Pressure Blower ² | 0 AIR-FFRCA AIR-B |
| 3 | Orientation | Vertical Horizontal | VERT HOR |
| 4 | ProScatter™ single filter Audit Unit | Not included Included | 0 AUD-I-LS |
| 5 | ATEX/IECEx Category ³ | None ATEX 2D (zone 21) ATEX 3G (zone 2) IECEx 2D (zone 21) IECEx 3G (zone 2) | 0 X21 X02 I21 I02 |
| 6 | Insertion Length | Standard (550 mm) - adjustable insertion Long (1300 mm) - adjustable insertion | 0 LONG |
| 7 | Sensor Material | 316 Stainless (standard) Chemical resistant coating (consult PCME) | 0 ACID |

System Options

| | | |
|---------------------------------------|--|----------|
| 4-core Cable | Specify length required (10m per sensor included as standard) | CAB4 |
| ProScatter™ 5-point Filter Audit Unit | Perform 5-point linearity check of sensors | AUD-5-LS |
| Spur | Divides cable into 2 branches | SPR |
| Power Supply/Repeater | Voltage and signal boost for extended cabling runs with multiple sensors | PWR |
| Auxiliary Input Module (AIM)** | 4 x 4-20mA inputs 4 x Digital inputs | AIM |
| Analogue Output Module (AOM)** | 8 x 4-20mA (500 Ω) | AOM |
| Alarm Output Module (ROM)** | 8 x Relay (1A @ 250V) | ROM |
| Isolating Spur | Provides Surge protection | SPR-X |

PC Software Options (PC-ME Dust Tools)

| | |
|---------------------------|---|
| Configuration Options | System Set |
| Real-time Data Options | Online Predict |
| Historical Data Options** | Data Downloader Data Viewer Data Reporter QAL Reporter Predict View |

*Requires continuous air supply of 30 to 40 litres/minute.

**Not applicable to entry system.

¹Preferred with +ve pressure stacks.

²Preferred with -ve pressure stacks.

³250°C standard length only

Example: SEN 181 250C AIR-B VERT AUD-I-LS 0 0 0

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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