

**continuous  
emissions  
monitoring**



**LAND**

**Combustion & Environmental Monitoring**

An **AMETEK**® Company

# FGA<sup>II</sup>

Advanced CEM technology for accurate measurement and high reliability - to meet today's regulatory requirements and ready for future legislation

The FGA<sup>II</sup> continuous emissions monitor uses Advanced Dual Sensor Technology (ADST) to measure specific flue gas components. Land's pioneering technique ensures stable long-term operation with high accuracy, ultra-low drift and above all measurement confidence. Engineered for ease of maintenance and packaged for the industrial environment, FGA series analysers are simple to install and trouble-free in operation. Add the benefit of intelligent remote diagnostics capability and it is clear to see why the FGA<sup>II</sup> is now the analyzer of choice.



## Worldwide approvals for compliance monitoring

- Meets USA requirements for USEPA Part 60, 63, 75, 266, 267 & 503 applications
- German TÜV approved to the 13<sup>th</sup>, 17<sup>th</sup> and 27<sup>th</sup> BImSchV and TA Luft
- UK MCerts certified Continuous Emissions Monitoring System
- Mexico INE-CENICA/OFICIO/128/2002 acceptance for continuous process emissions monitoring
- Meets the International requirements of ISO 12039, ISO 10849 & ISO 7935
- Meets European Large Combustion Plant Directive 2001/80/EC
- Meets European Waste Incineration Directives 2000/76/EC
- Meets European EN 14181 QAL1 requirements for most processes

## Features & Benefits

- Fully integrated system - *Up to 7 gases in a single compact analyzer*
- Wide measurement range - *from 0 - 10 ppm up to 0 - 50,000 ppm*
- Remote diagnostics capability - *Built-in hardware and software for remote diagnostics and system configuration*
- Widely accepted, certified performance - *complies with the latest monitoring standards*
- Simple installation & maintenance - *requires no specialist skills or training, all maintenance carried out on-site*
- Highest measurement performance - *ADST ultra-low drift measurement technology*
- Measured Total NO<sub>x</sub> (NO + NO<sub>2</sub>) - *separate sensors for true NO<sub>x</sub> monitoring*
- Record and store vital emissions data - *Internal data logging function*

NO NO<sub>2</sub> NO<sub>x</sub> SO<sub>2</sub>  
CO CO<sub>2</sub> O<sub>2</sub>

## Engineered for the future

- **Excellent low level emissions capability**  
*Wide range of sensor options operating in a controlled environment, to provide the precision necessary for the level measurements required by legislative limits*
- **Wide ambient temperature range without air conditioner**  
*Measurement sensors are temperature controlled*
- **Heated sample line not required in most applications**  
*Sample gas is cooled and dried inside the probe*
- **Suitable for outdoor installation without a protective shelter**  
*Weatherproof, stainless steel NEMA 4X / IP65 enclosure*
- **Low maintenance requirement**  
*A complete service takes less than an hour*
- **Recover lost emissions data and assist fault diagnosis**  
*Internal data log can recall lost emissions data where a DAS fails, plus store vital instrument operating history to assist fault diagnosis*
- **Easy to install anywhere**  
*The analyzer is only 600 mm / 24" square and weighs less than 50 kg / 110 lb (single stream version)*



## Accurate & Reliable SO<sub>2</sub> Analysis

FGA<sup>II</sup> is an accurate and reliable SO<sub>2</sub> analyzer. Importantly, it is a low cost alternative to infrared or UV systems, using the latest ADST technology. The accuracy and reliability of the FGA<sup>II</sup> in the measurement of SO<sub>2</sub> begins with the sample conditioning system. A two-stage cooler and acid resistant sample path inside the ChillerProbe™, ensure there is no significant loss during gas transportation. High accuracy sensors inside the analyzer produce a reliable, stable output.



## Ideal for Low NO<sub>x</sub> Measurement

FGA<sup>II</sup> is designed for very low level NO<sub>x</sub> measurement, now obligatory in some countries. Importantly, the analyser measures both NO and NO<sub>2</sub> separately, these are combined to give a true NO<sub>x</sub> measurement output. *E.g. very useful information for SCR operation on IC engines* The inherent problems with catalytic NO<sub>2</sub> convertors are therefore completely avoided.

## Applications/Industries

- Gas turbines
- Combined heat and power plants
- Boiler systems - coal, oil and gas fired
- District heating plants
- Incinerators - domestic, hazardous, clinical and biological waste
- Crematoria
- Wood, sawdust, pellet and bark burners
- Thermal oxidisers
- Pulp and paper
- Cement & Lime manufacture
- Gas pipeline compressors
- Bio-fuel power generation
- Smokeless fuel manufacturing
- Petrochemical and refineries

## Easy Access

The control unit and all major system components are readily accessible. A swing-frame mechanism provides easy access for installation and routine maintenance. Electrical and signal connections are simple to make using input and output modules which clip on to DIN rails and connect to the internal data bus.

## Control Unit

The complete FGA<sup>II</sup> system is operated from the control unit. In addition to emissions information, detailed operating and diagnostic data on the analyzer, sample system and probe can be accessed here.

- LCD and keypad operation
- User configuration of the system
- Configuration and control of the sample probe

## Advanced Dual Sensor Technology

FGA<sup>II</sup> uses proven measurement technology to give high measurement accuracy and very low drift. Advanced Dual Sensor Technology (ADST)\* gives the ultimate in performance and reliability, incorporating well proven electrochemical technology into a truly continuous system, with automatic self-checking.



The sensors are housed in an environmentally-controlled enclosure, giving high measurement stability and precise readings. This also allows

a wide ambient operating temperature range for the analyser. Sensors can be replaced in seconds, without any specialist training.

- Up to 6 pairs of gas sensors (with one or two gas streams)
- Fully upgradeable
- Temperature controlled for highest accuracy

\* patent pending

## Modular Design

The analyzer system is built from functional modules rather than separate analysers. It can be expanded where future requirements necessitate additional gases or functionality.

An internal digital data communications bus provides



the basis for control and monitoring of all the system modules. New modules can be subsequently added simply using this design principle. The control system routinely checks all the modules, to ensure complete system integrity, giving fast, automatic diagnostics.

## Flexible I/O Modules

Serial data communications using Modbus are supplied as standard. Current loop and digital I/O can be configured to exact user requirements. Additional input, output and relay modules can be added in the field if expanded capability is needed. The entire system operates on the internal data bus, so modules can be added and configured quickly.

- Rail-mounted I/O and relay modules
- Current loop outputs
- Current loop inputs
- Status and alarm relays
- Auxiliary digital inputs
- Modbus communications

## Remote Diagnostics

The analyzer can be interrogated for diagnostics and setup information remotely using various types of system

- GSM wire-less modem
- Land-line modem
- Internet

## Calibration

FGA<sup>II</sup> can be supplied with manual or fully automatic calibration. Microprocessor-driven routines can direct the test gas through the entire probe and sample system; or a simple analyzer check can be made.

The time interval and sequence of automatic calibration is fully user configurable to meet the requirements set by local environmental authorities.

- Manual Calibration
- Automatic Calibration (option), with empty bottle detection
- Automatic Cross-interference correction
- 3-point linearity check
- Calibration using Certified or Protocol gases

## Operating Environment

FGA<sup>II</sup> is housed in a stainless steel enclosure to enable installation in most outdoor environments. The analyzer is fitted with a heater unit for very low ambient temperatures. The sensors are temperature controlled, giving high operating ambient temperature range, without the need for air conditioning.

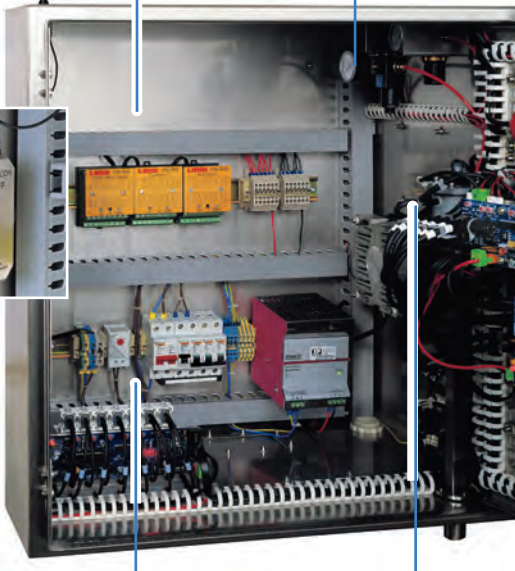


- Stainless steel enclosure
- Sensor module environment control
- Air conditioner not required
- Sealed to IP65 / NEMA 4X

## Sample Gas Management

FGA<sup>II</sup> has a sophisticated sample gas management system which continuously monitors and controls flow, pressure and temperature. This ensures that an accurate, stable measurement is always maintained.

- Automatic, continuous gas flow control
- Sample gas pressure control
- Condensate detection and removal
- Available with twin gas streams  
*(Dual probe input to a single analyzer, with up to 6 gas measurements)*



## How the analyzer system works

FGA<sup>II</sup> is an extractive sampling, multi-gas analyzer system. The ChillerProbe (2) extracts and conditions the flue gas presenting a clean, dry and cool sample gas for transport to the analyzer. The analyzer accurately controls the flow rate and pressure of the gas prior to detection within the sensor module (5). The sensor module is also supplied with air allowing continuous measurement of the sample with a repeating cycle of zero and span drift checks.

Calibration with certified gases (9) can be direct to the analyzer or via the probe (2) and sample line. FGA<sup>II</sup> analyzers are fitted with automatic water detection and removal systems (3) to protect against sample conditioning failures, and standby mode (8) that protects the system by purging during periods when measurement is not required.

In addition, a twin stream version (10) is available allowing the sensor module to make continuous measurements from two sources. A maximum of 6 measurements (excluding CO<sub>2</sub>) is possible in any combination between the two streams. Additionally CO<sub>2</sub> is available for one or both streams.

### Key

1. Stack/Flue
2. ChillerProbe (others available)
3. Water Detection & Removal
4. Sample Gas Manifold
5. Sensor Module  
(for CO, O<sub>2</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>)
6. CO<sub>2</sub> sensor
7. Exhaust
8. Purge Air (Standby)
9. Local or Remote Calibration
10. Twin Stream option

Filter

Proportional Valve

Sample Pump

Peristaltic Pump

Calibration gas selection valves

Flow Monitoring

Pressure Control

Temperature control

Humidity control

Sample gas

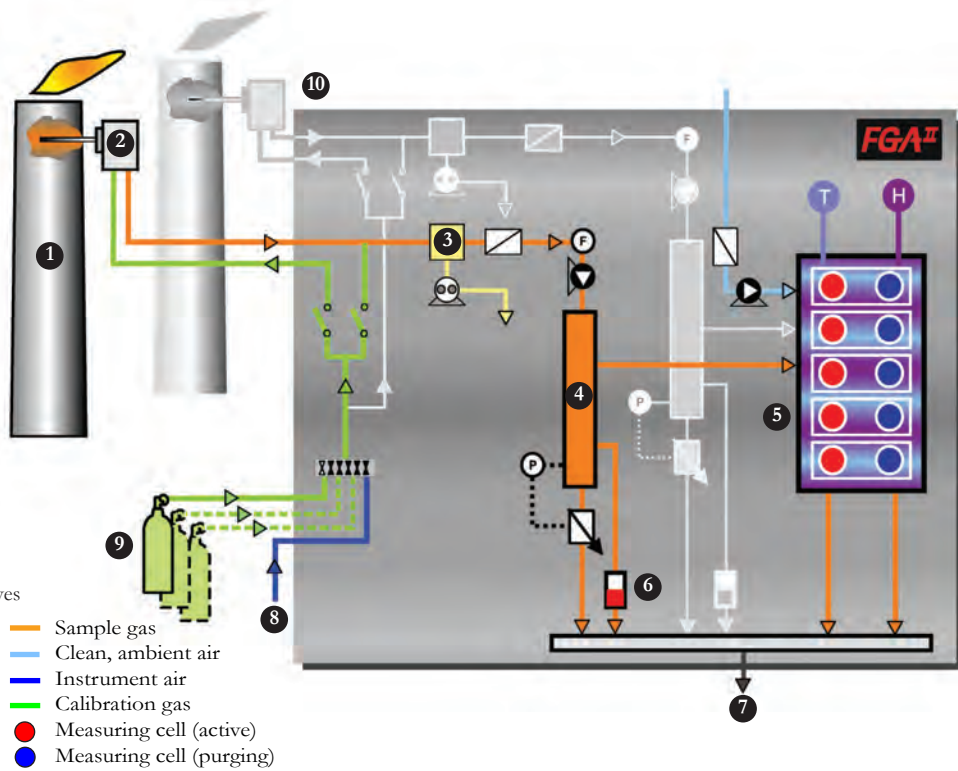
Clean, ambient air

Instrument air

Calibration gas

Measuring cell (active)

Measuring cell (purging)



## ADST - latest technology

FGA<sup>II</sup> uses Advanced Dual Sensor Technology\* to give high measurement accuracy and repeatability. The main advantage to this technology is the automatic zero drift correction the analyzer performs every 30 minutes. In addition, ADST performs a measurement verification during the drift correction cycle.

Continuous emissions monitoring systems using ADST are in use worldwide and have been certified by the US EPA and gained both TÜV and MCerts approval.

*\*patent pending*

## Data acquisition systems

A fully-functional, user configurable data acquisition system is available for all emission monitoring systems. Each is specifically tailored to meet the exact requirements of the plant.

## CEM Project Management

Land has a dedicated team of project engineers, specialized in providing a complete service of design, installation and support for emissions monitoring systems. Long-standing and successful partnerships have been established with both contractors and end-users worldwide. All applications are considered on an individual basis, with each solution engineered to meet the specific requirements of the project.

## Outdoor protective shelter systems

A range of outdoor protective shelters is available, to accommodate the complete system e.g. analyzers, the data acquisition system, computer system & termination boxes.

## Specifications

### Measurement Ranges

Technique:	Advanced Dual Sensor Technology (ADST)
CO Ranges:	0 - 10 ppm up to 0 - 40 000 ppm (4 %)
NO Ranges:	0 - 10 ppm up to 0 - 50 000 ppm (5 %)
NO <sub>x</sub> Ranges:	0 - 10 ppm up to 0 - 1 000 ppm (0.1 %)
SO <sub>2</sub> Ranges:	0 - 10 ppm up to 0 to 10 000 ppm (1 %)
CO <sub>2</sub> Ranges:	0 - 3 Vol % up to 0 - 100 Vol %

Resolution:	0.1 ppm (CO, NO, NO <sub>2</sub> & SO <sub>2</sub> ); 0.1 % (CO <sub>2</sub> )
Linearity:	< 2 % of range
Zero drift:	< 2 % of range per month
Span drift:	< 2 % of range per month

O <sub>2</sub> Ranges:	0 - 5 Vol % to 0 - 25 Vol %
Resolution:	0.01 Vol %
Linearity:	< 0.2 Vol %
Zero drift:	< 0.2 Vol % per month
Span drift:	< 0.2 Vol % per month

### Calibration

Calibration method:	Manual or Automatic 2-point calibration span and zero Automatic Gas Selection (option) Microprocessor controlled
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### Display

Type:	LCD + LED backlight
Size:	125 x 35 mm / 5 x 1.5 in
Parameters:	5 function keys; alphanumeric and graphic

### Outputs/Inputs

Analogue outputs:	Isolated current loops One per gas (plus total NO <sub>x</sub> if applicable) expandable up to 32, in multiples of 8; 0, 2 or 4 to 10 or 20 mA
Relays outputs:	One per gas (plus total NO <sub>x</sub> if applicable) plus System OK, Warning, Calibrating, Maintenance expandable up to 20, in multiples of 5, including calibration gas status relays
Relay rating:	Isolated changeover contacts rated 0.5 A @ 125 V a.c.; 1 A @ 30 V d.c.
Digital inputs:	Calibrate, Standby, Optional fuel selection; Volt-free contact closure
Analogue inputs:	Isolated current loops; Up to 16, in multiples of 8, active or passive; 0, 2 or 4 to 10 or 20 mA
Communications:	RS485 Modbus serial digital data bus (2 or 4 wire)

### Environmental

Enclosure:	Stainless steel sealed to the requirements of IP 65 / NEMA 4X
Operating (ambient) temperature:	-40 °C to + 40 °C standard / -40 °F to 104 °F (-40 °C / -40 °F to + 50 °C / 122 °F most measurement ranges)

### Compliance

Measurement standards:	Meets the requirements of ISO 12039, ISO 10849 & ISO 7935 Meets LCP and Waste Incineration Directives 2001/80/EC and 2000/76/EC Meets EN14181 QAL 1 requirements for most processes Meets the requirements for USEPA Part 60, 63, 75, 266, 267 & 503 applications
Approvals:	TÜV approved to the 13 <sup>th</sup> , 17 <sup>th</sup> & 27 <sup>th</sup> BImSchV and TA Luft MCerts certified to Performance Standards for Continuous Emissions Monitoring Systems (Nov. 1998)
Electrical safety:	Conforms to EN-61010-2
EMC:	Conforms to EN61326 (Industrial)

### Power

Power supply:	100 to 120 V a.c. or 200 to 240 V a.c., 50 - 60 Hz
Power consumption:	Analyser: 600 W; Anti-freeze sample line: 15 W/m (5 W/ft)

*Note: Additional power and air required for ChillerProbe™*

### Gas and Air Requirements

Instrument air (zero calibration):	4 bar / 60 psi min. clean, dry & solvent free; 10 l/min / 0.4 cfm maximum
Calibration gas (recommended):	1 bar / 15 psi; 2 l/min / 0.08 cfm; 10 litres / 0.35 cu.ft. (16 litres / 0.56 cu.ft. for NO <sub>2</sub> ) per calibration approx.
Calibration gas type:	Specific to each gas type and measurement span

<b>Dimensions</b> (H x W x D):	Single stream: 600 x 600 x 420 mm / 24 x 24 x 17 in; Twin stream: 870 x 600 x 420 mm / 34 x 24 x 17 in
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<b>Weight:</b>	Single stream: 50 kg / 110 lb ; Twin stream 73 kg / 161 lb
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### Options

Automatic Calibration
Twin stream variant
Remote Diagnostics

*Continuous product development may make it necessary to change these details without notice*

## Continuous emissions monitoring systems

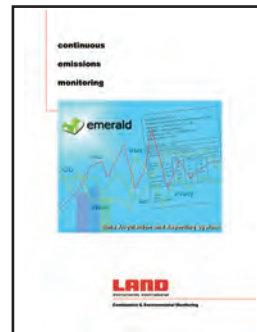
Land has a range of products specifically designed for continuous emissions monitoring applications. Detailed information on these products can be obtained by requesting further information.



PDS 199 ChillerProbe - advanced flue gas sampling systems  
*The ChillerProbe is a high performance sample system which uniquely filters and cools the flue gas inside the probe.*



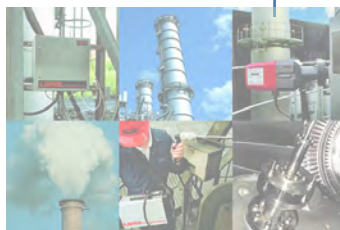
PDS 207 FGA 900 Series - emissions monitors  
*A range of analyzers for continuous monitoring of CO, O<sub>2</sub>, NO, NO<sub>2</sub> and NOx.*



PDS 201 Emerald - data acquisition and reporting system  
*Emerald is a highly flexible and fully configurable data acquisition and reporting system for continuous emissions monitoring. (options available for USEPA requirements)*

## Product Range

- Zirconia Oxygen Probes
- Carbon Monoxide Monitors
- Acid Dewpoint Monitors
- Dust & Opacity Monitors
- Portable Gas Analyzers
- Coal Mill Fire Detection
- Turbine Blade Temperature Monitoring
- Road Tunnel Monitoring
- Data Acquisition Systems



For further details on any LAND product - visit our website

## Product Approvals

FGA<sup>II</sup> analyzers and ChillerProbe gas sampling systems meet USEPA performance standards; and carry both UK MCerts and German TÜV approval.



**TÜV approved**  
 to the requirements of  
 the 13th, 17th and 27th  
 BImSchV and TA Luft



## Quality Assurance

LAND's Factory Quality Management System is ISO9001 Certified for both Sales and Service.

# LAND

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Applies in the UK

Applies in the USA