

**continuous
emissions
monitoring**



LAND
combustion

the total efficiency concept

FGA^{II}

Advanced CEM technology for accurate measurement and high reliability - and ready for future legislation

The FGA^{II} continuous emissions monitor uses Advanced Dual Sensor Technology (ADST) to measure specific flue gas components. Land Combustion's pioneering technique ensures stable long-term operation with high accuracy and ultra-low drift. Engineered for ease of maintenance and packaged for the industrial environment, FGA series analysers are simple to install and trouble-free in operation.



Features

- Multiple gases in a single analyser
- ADST measurement technique
- Automatic calibration option
- Flexible modular I/O system, using DIN rail layout
- Complete sample gas management system
- Remote control and monitoring of sample probe
- Field upgradeable system

A complete emissions monitoring system
in a single compact box

Benefits

- **Fully integrated system in a single compact box** - *no additional components required*
- **Fully configurable** - *to meet exact user requirements*
- **Simple installation** - *locate the analyser anywhere*
- **Low maintenance** - *requires no specialist skills*
- **Proven measurement accuracy and reliability** - *capable of very low level monitoring*
- **Weatherproof stainless steel enclosure** - *no need for special cabinets or shelters*
- **Measured Total NO_x (NO + NO₂)** - *separate sensors for true NO_x monitoring*

NO NO₂ NO_x SO₂
CO CO₂ O₂

Engineered for the future

- **Excellent low level emissions capability**
Wide range of sensor options with precision for levels well below current 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 enclosure
- **Low maintenance requirement**
6 month service interval. A complete service takes about 20 minutes.
- **True total NO_x measurement**
Separate NO and NO₂ sensors give automatic, precise NO_x measurement
- **Easy to install anywhere**
The analyser is only 600 mm square and weighs less than 50 kg
- **Integrated remote communications technology**
Built-in hardware and software for remote diagnostics and system configuration



Ideal for Low NO_x Measurement

FGA^{II} is designed for very low level NO_x measurement, now obligatory in some countries. Importantly, the analyser measures both NO and NO₂ separately, these are combined to give a true NO_x measurement output. The inherent problems with catalytic NO₂ convertors are therefore completely avoided.

Accurate and Reliable SO₂ Analysis

FGA^{II} is an accurate and reliable SO₂ analyser. Importantly, it is a low cost alternative to infrared or U.V. systems, using the latest ADST technology.

The accuracy and reliability of the FGA^{II} in the measurement of SO₂ 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 analyser produce a reliable, stable output.

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^{II} system is operated from the control unit. In addition to analyser information, detailed operating and diagnostic data on the 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^{II} 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 higher 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
- Fully upgradeable
- Temperature controlled for highest accuracy
- Separate, exchangeable chemical filters

Modular Design

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

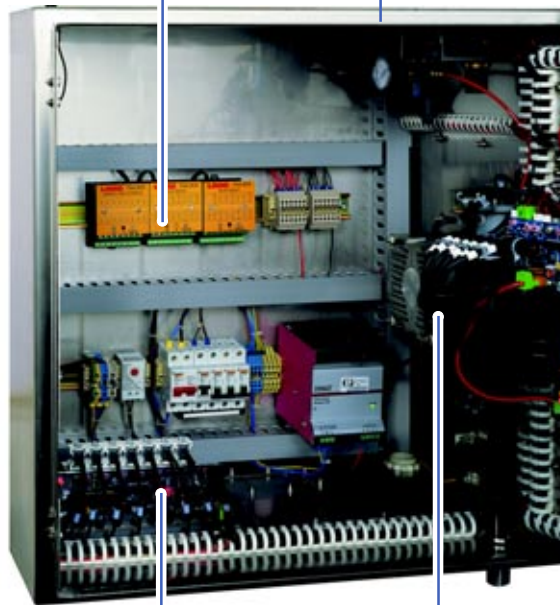


An internal digital data communications bus provides the basis for control and monitoring of all the system modules. New modules can be subsequently added simply using this design principle. The control system routinely checks all the modules, to ensure complete system integrity, giving fast, automatic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



Operating Environment

FGA^{II} is housed in a stainless steel enclosure to enable installation in most outdoor environments. The analyser 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 IP 65 / NEMA 4X

Calibration

FGA^{II} 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 analyser 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

Sample Gas Management

FGA^{II} 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
- Optional fully-integrated precision diluter for high gas concentrations
- Condensate detection and removal

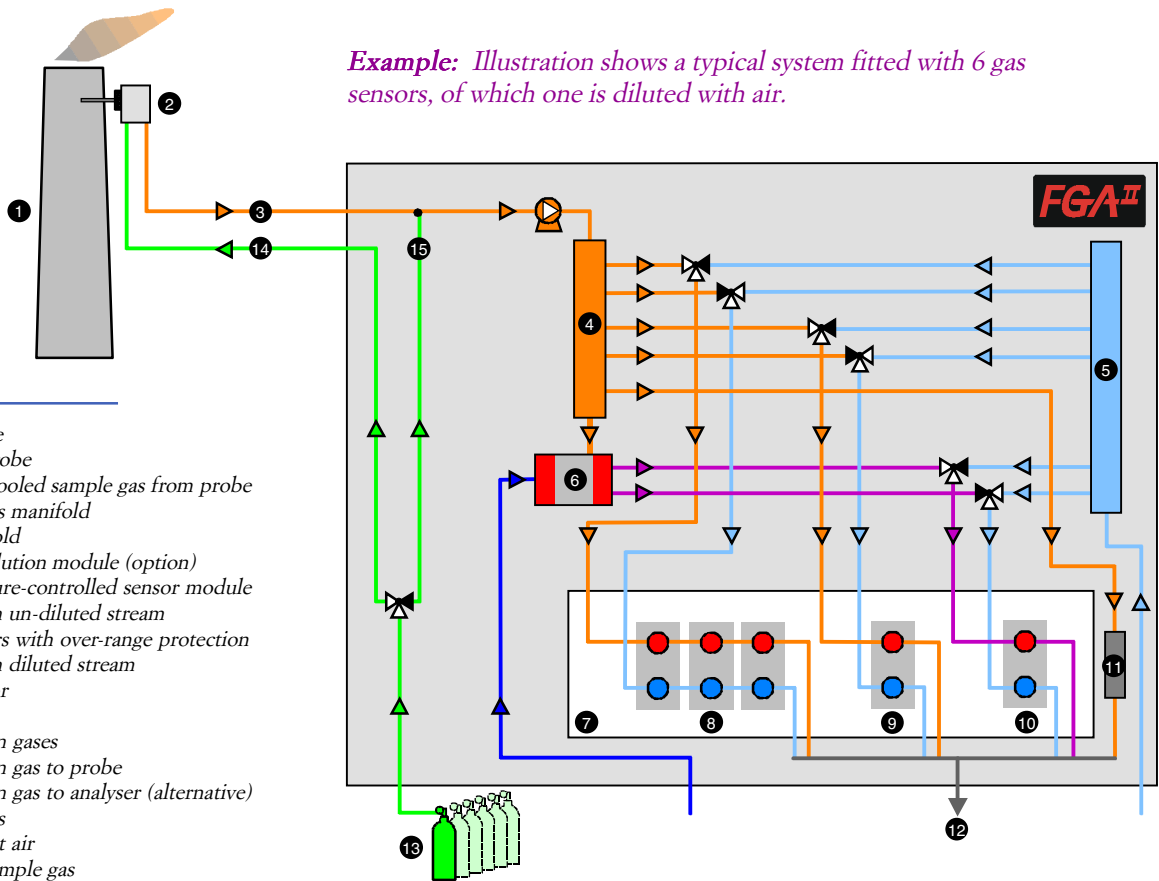
How the analyser system works

FGA^{II} is an extractive sampling multi-gas analyser system. The sample probe conditions the flue gas, giving a clean, dry and cooled sample gas direct to the analyser. The analyser then accurately controls the flow rate and pressure of the sample gas manifold. Each sensor is fed alternately with sample gas and air, using the latest ADST technique. The sensors generate an electrical output in proportion to a specific gas component. A microprocessor reads the voltages, and corresponding gas concentrations are displayed on the LCD.

Example: Illustration shows a typical system fitted with 6 gas sensors, of which one is diluted with air.

Key

- 1 Stack/Flue
 - 2 Sample Probe
 - 3 Clean & cooled sample gas from probe
 - 4 Sample gas manifold
 - 5 Air manifold
 - 6 Sample dilution module (option)
 - 7 Temperature-controlled sensor module
 - 8 Sensors on un-diluted stream
 - 9 CO sensors with over-range protection
 - 10 Sensors on diluted stream
 - 11 CO₂ sensor
 - 12 Exhaust
 - 13 Calibration gases
 - 14 Calibration gas to probe
 - 15 Calibration gas to analyser (alternative)
- Sample gas
— Instrument air
— Diluted sample gas
— Filtered, compressed air
— Calibration gas
- Measuring cell (active)
● Measuring cell (purging) } Dual sensor pair



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 and wood waste product burners
- Thermal oxidisers
- Pulp and paper
- Cement manufacture
- Gas pipeline compressors
- Bio-fuel power generation
- Smokeless fuel manufacturing
- Petrochemical and refineries
- Heavy fuel oil boilers

ADST - latest technology

FGA^{II} 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 analyser 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 TÜV approval.

ADST - reliability through simplicity

Specifications

Measurement Ranges

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 ₂ Ranges:	0 - 10 ppm up to 0 - 1 000 ppm (0.1 %)
SO ₂ Ranges:	0 - 10 ppm up to 0 to 10 000 ppm (1 %)
CO ₂ Ranges:	0 - 3 % up to 0 - 100 %
Resolution:	0.1 ppm
Repeatability:	± 2 % of range
Linearity:	< 2 % of range
Zero drift:	< 2 % of range per week
Span drift:	< 4 % of range per week
O ₂ Ranges:	0 - 5 Vol % to 0 - 25 Vol %
Resolution:	0.01 Vol %
Repeatability:	± 0.2 Vol %
Linearity:	< 0.2 Vol %
Zero drift:	< 0.2 Vol % per week
Span drift:	< 0.2 Vol % per week

Calibration:	Microprocessor controlled Automatic Gas Selection
Display:	Full function alphanumeric and graphic LCD with backlight

Outputs/Inputs

Modbus:	RS485 Modbus serial digital data bus
Analogue current loop outputs	One per gas (plus total NO _x if applicable) expandable up to 32, in multiples of 8 0, 2 or 4 to 10 or 20 mA
Relays:	One per gas (plus total NO _x if applicable) plus System OK, Warning, Calibrating, Maintenance expandable up to 20, in multiples of 5, including calibration gas status relays Change-over 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 current loop inputs:	Up to 16, in multiples of 8, active or passive 0, 2 or 4 to 10 or 20 mA

Environmental

Enclosure:	Stainless steel sealed to the requirements of IP 65 / NEMA 4X
Operating Temperature:	-40 °C to + 40 °C standard -40 °C to + 50 °C most measurement ranges

Compliance

EMC:	Conforms to EN61326 (Industrial)
Electrical Safety:	Conforms to EN-61010-2

Power

Power Supply:	93 - 132 V or 187 - 264 V a.c., 47 - 63 Hz
Power Consumption:	Analyser: 600 W Anti-freeze sample line: 15 W / m (5 W / ft)

Air Requirements

Pressure:	Instrument air 4 bar (60 psi) minimum
Flow:	10 l/min (0.4 cfm) maximum

Dimensions (H x W x D):	600 x 600 x 420 mm (24 x 24 x 17 in)
Weight:	50 kg (110 lb)

Note: Additional power and air required for ChillerProbe™

Options

Automatic Calibration
Dilution

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 179 Continuous emissions monitoring systems
Land has unrivalled experience in supplying total solutions to meet exact user requirements.



A Division of Land Instruments International

<http://www.landinst.com/comb/>

Land Combustion has a comprehensive range of Combustion and Environmental Monitoring Instrumentation.



Approval applies to products designed and manufactured in the UK

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