

## EXHAUST GAS ANALYSER

## Mk8 EGA EVO

- »»» Continuous Emissions Monitoring
- »»» Monitor & Reduce Boiler Emissions
- »»» O<sub>2</sub>, CO<sub>2</sub>, CO, NO, NO<sub>2</sub>, SO<sub>2</sub> Analysis
- »»» Temperature, Pressure, H<sub>2</sub>O content
- »»» Stores 3 Years of Emissions Data
- »»» 3 Parameter Combustion Trim
- »»» Maintain Safe, Efficient Combustion
- »»» 12" HD Touch-Screen
- »»» Safe Combustion Limits
- »»» Emissions Data Totalisation
- »»» Extract All Data to PC Instantly
- »»» Live Emissions Reporting
- »»» Modbus Connectivity
- »»» EPA Self Calibration Model
- »»» Proven Over 30+ Years
- »»» Ideal for Boilers, Diesel Engines, kilns, Dryers & Generators
- »»» MCPD Compliance
- »»» Integrated, Cost Effective Solution

## Overview

For decades, boiler houses, manufacturing plants and other industrial environments have relied on our EGA systems to monitor flue gas emissions for the purpose of compliance with environmental regulations and to reduce fuel usage & emissions.

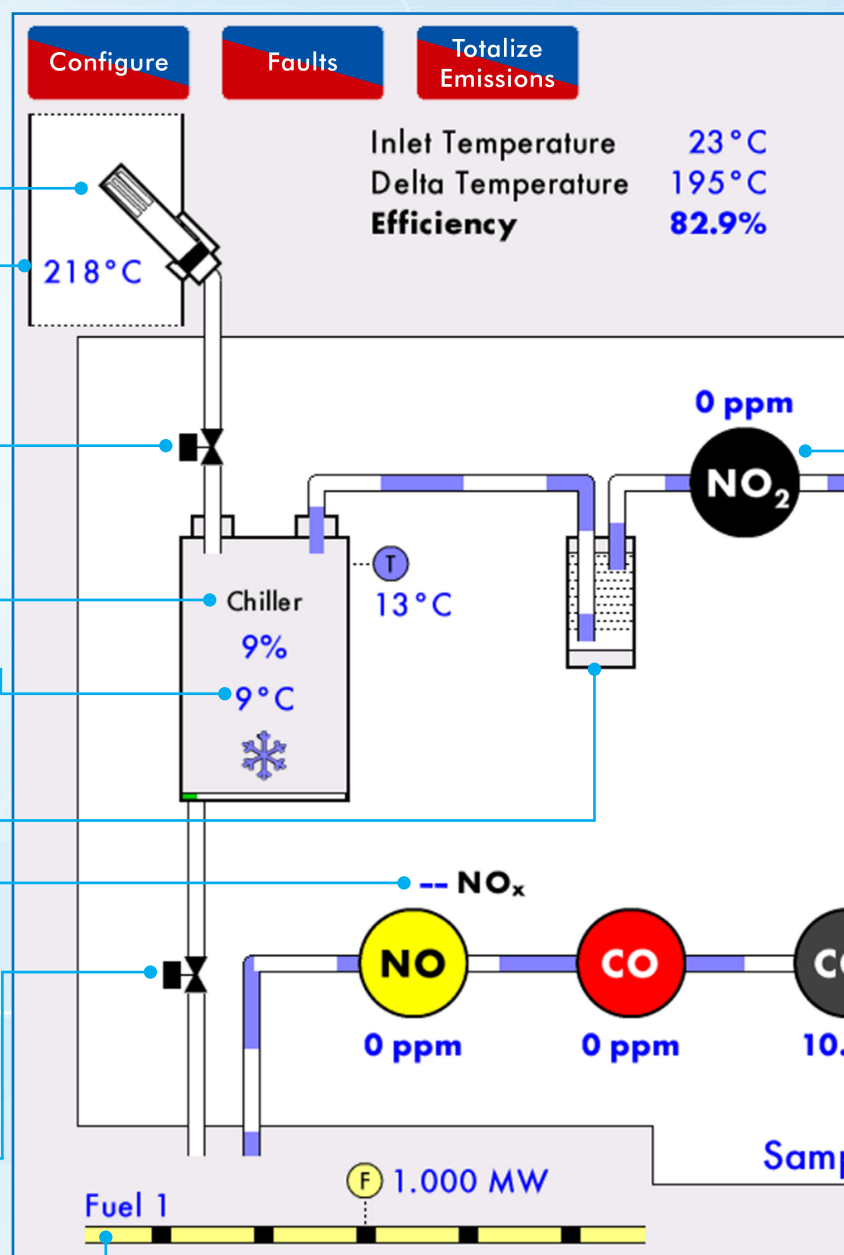
The EGA can operate as a standalone, independent continuous monitoring system, or it can be setup to feed back its readings to an Autoflame MM Controller, allowing the MM to trim the combustion; optimising the system's efficiency & performance.

The EGA operates by continuously extracting a wet sample from the exhaust gas using the sampling probe, this sample is cooled down in the chiller to extract the moisture from the sample, the sample then passes through filters to extract any remaining moisture and particulate before passing through a series of individual cells to analyse the content of the exhaust gas in the sample.

## Features

- Simultaneous & continuous sampling of up to 6 exhaust gases ( $O_2$ ,  $CO_2$ ,  $CO$ ,  $NO$ ,  $NO_2$  &  $SO_2$ ) at a fraction of the price of alternative systems.
- Operating as a Standalone unit or with Autoflame Mk8 or Mini Mk8 MM.
- Enabling 3 parameter trim control on a Mk8 or Mini Mk8 MM to improve fuel efficiency and reduce emissions.
- Continuous Emissions Monitoring System (CEMS) for display & data trending.
- Specifically designed for current regulations on emissions monitoring.
- 12.1" multi-touch full colour screen.
- Stored information is updated every minute.

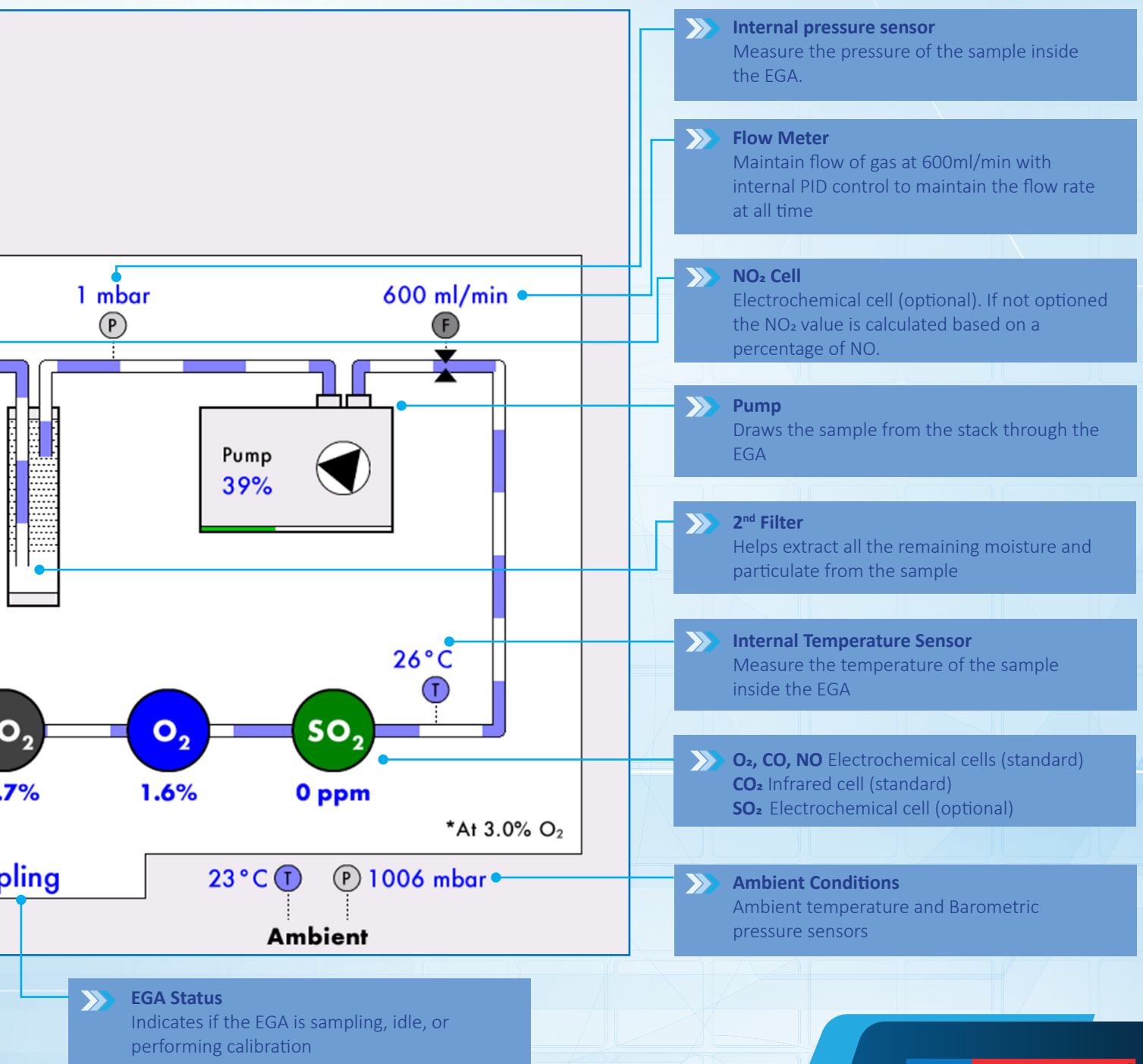
- EGA Probe**  
 Wet sample Taken from the exhaust using the EGA probe – Extractive Method
- Exhaust Temperature**  
 Thermocouple built into the probe to measure exhaust temperature
- Pinch Valve**  
 to stop sampling when the cells are calibrated using fresh air
- Reducing Sample's Temperature**  
 The chiller is used to lower the temperature of the sample to extract the moisture from the sample
- Chiller Temperature Sensor**  
 monitors the temperature of the sample to ensure its low enough
- 1<sup>st</sup> Filter**  
 The sample passes through a filter to extract any particulate and moisture
- NO<sub>x</sub> value**  
 Calculated based on measured NO and NO<sub>2</sub> values
- Drain Valve**  
 Solenoid for draining accumulated moisture out of the EGA



- Fuel Flow Metering**  
 Via MM or external 4-20mA input, up to 4 fuels

- Online monitoring of cell status to identify cell replacement requirement.
- Quick & easy installation using plug-in connectors.
- Designed to minimize maintenance.
- Six 4-20mA analogue outputs of all combustion data for remote logging, printing or chart recording.
- Warnings for cell failure, probe blockage & analyser failure .
- EGA's instantaneous online data can be transferred to a Building Management System (BMS) directly using the integrated Direct Modbus feature or over Ethernet or RS422 via the Autoflame Mk8 Data Transfer Interface (DTI).
- Totalise emissions for any period of time with a press of a button

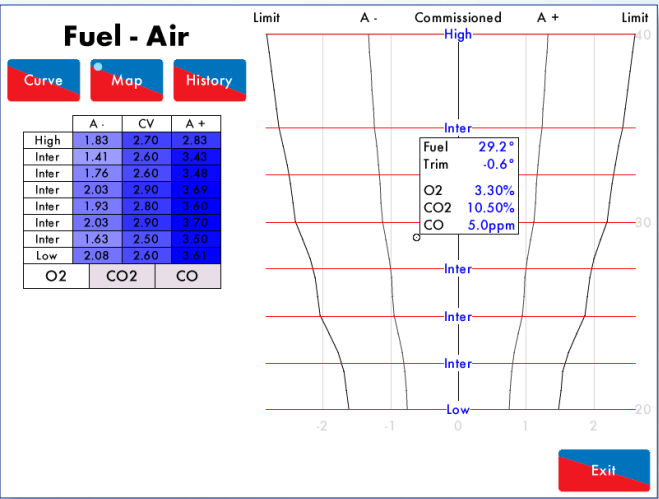
- Replacement cells contain calibration data and serial number for easier cell replacement during servicing.
- Diagnostics screen and system log for fault finding.
- Graphical calibration schedule.
- Multi language support.
- Full download and upload of settings using Autoflame Download Manager software. This allows for easier diagnostics as well as backing up settings and then installing the same settings on a new EGA.
- Download CEMS data to PC as an Excel spreadsheet, includes custom Excel-based application for easy analysis.
- Connect, display and monitor 4-20mA external exhaust gas opacity meter.
- Detailed on-board manual.



## Operation with MM Controllers

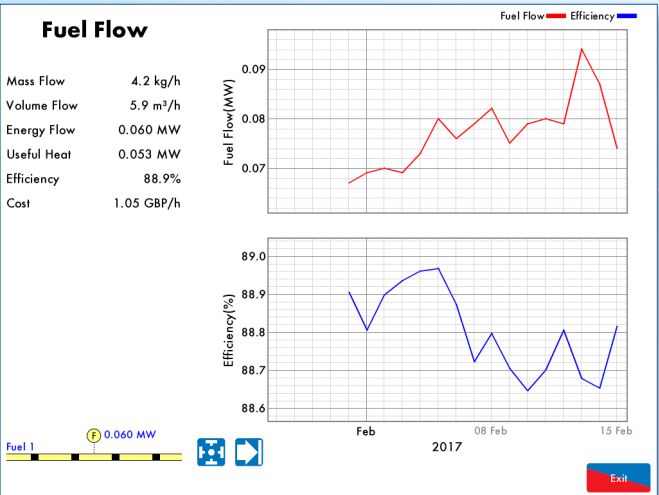
By connecting the Mk8 EGA to an Autoflame MM Controller, all of the following functions can be activated for improving combustion performance, reducing energy costs & improving safety:

- The EGA enables Autoflame's unique 3 parameter trim. The system sends output signals based on three exhaust gases (O<sub>2</sub>, CO<sub>2</sub> & CO) to enable the MM Controller to perform trim. The controller will impose corrections to the air damper (Mk8 MM & Mini Mk8 MM) or Variable Speed Drive (Mk8 MM only) in order to maintain optimum combustion performance for the system. These changes ensure that the original commissioned combustion data is maintained irrespective of any external factors such as changes to stack pressure, barometric pressure & temperature.
- The MM Controller may be set with upper & lower limits on O<sub>2</sub>, CO<sub>2</sub>, CO & exhaust gas temperature. The system can be optioned so that the burner locks out or a warning is triggered when limits are exceeded.



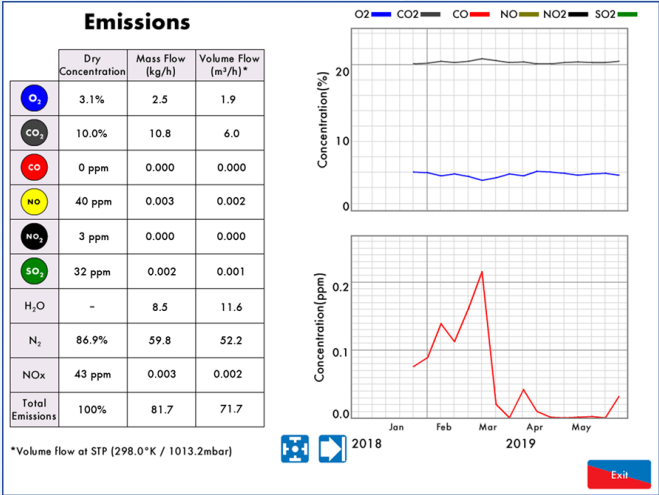
## Standalone Operation

When operating in standalone mode, the EGA can run combustion limits testing on measured emissions for O<sub>2</sub>, CO<sub>2</sub>, CO, NO and exhaust temperature. When a set limit threshold is breached the EGA can be set to output a warning/alarm, generate a 4-20mA signal or output an alarm via Modbus.



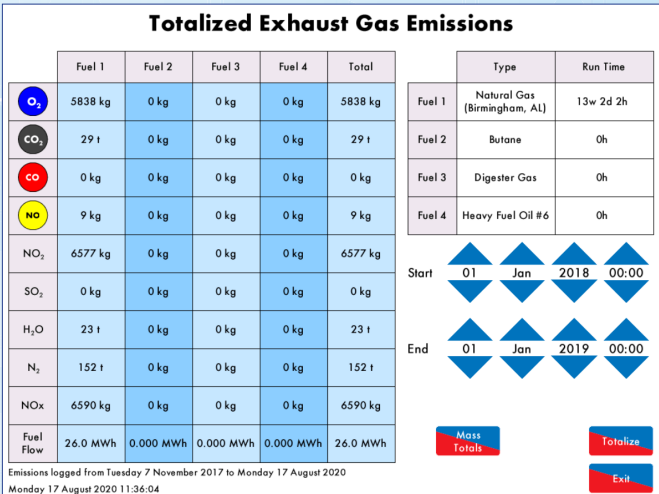
## Data Logging & Trending

- Online trending & logging of all combustion parameters, including totalised values.
- Historical data updated every minute.
- Emission data can be logged in hourly or daily resolution.
- Data graphs scalable from very narrow range (for example, the last 10 minutes) to extended periods (over the course of several days, weeks, months- up to three years).
- Three years of data stored within the EGA including gases, pressures, atmospheric pressure, temperatures, efficiency, & fuel usage.
- Up to 3-year-old data can be displayed on the EGA screen, older data can be viewed from the SD card using PC.
- EGA logs are stored on the internal SD card and can be exported using the included EGA Data Explorer PC software, via Download Manager software using IR Lead, or via DTI Manager (requires DTI).
- Long-term emission logs can be totalised over any given time period, either by mass or volume of emissions.



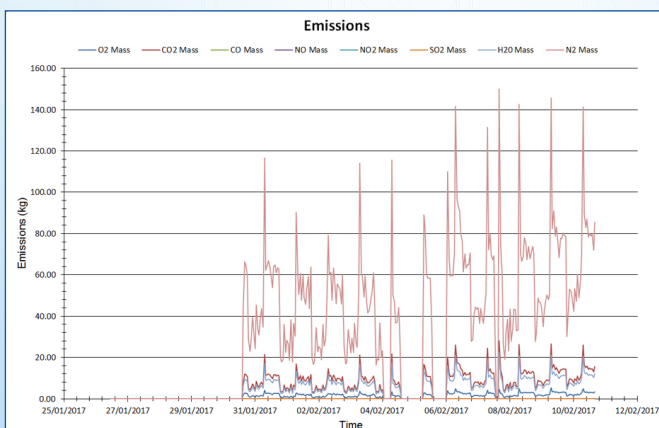
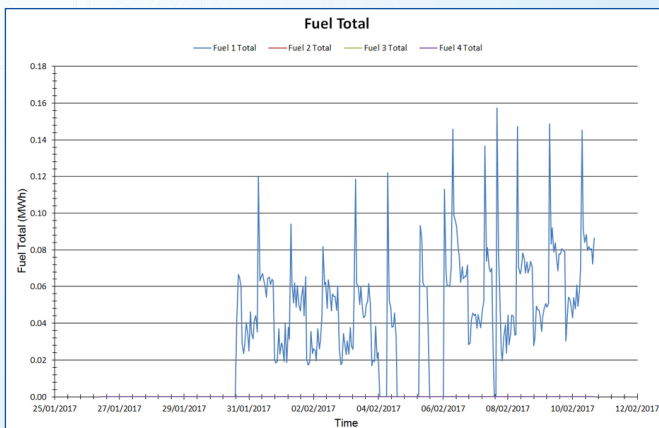
## Totalised Exhaust Gas Emissions

Output totalised emission data for any specified period of time with a press of a button.



## CEMS Auditing

- Ability to input accurate fuel composition data from the MM to improve CEMS analysis.
- 4-20mA input from a fuel flow meter for accurate fuel usage in CEMS calculation.
- View reports in Excel by user-definable time periods (one day, four weeks, 16 months, etc.) based on:
  - Total weight & volumetric emissions.
  - Total cost of fuel (calculated by current cost per tonne of fuel).
  - Weight & volumetric emissions per exhaust gas (O<sub>2</sub>, CO<sub>2</sub>, CO, NO, NO<sub>2</sub>, SO<sub>2</sub>) & per fuel.



## Emissions Data Extraction

Output up to 3 years of raw data via:

- Directly from the on-board SD card (Require EGA Data Extractor PC software).
- IR Port (requires Download Manager PC software and IR lead).
- Via DTI (DTI required).

The data is downloaded to a PC for viewing and manipulation in Excel with Custom-designed emissions graphing spreadsheets to simplify analysis.

## Maintenance

It is recommended that the EGA is sent back to an Autoflame service centre for full service & recalibration every 12-18 months. System includes reusable packaging to simplify shipping.

## Monitoring & Live Reporting

Live EGA data can be accessed anytime using:

### Analogue Signal Outputs

The EGA has 6 individual 4-20mA outputs which are fully configurable and scalable to output live reading of exhaust gas, temperature, limit warnings, etc.

### Direct Modbus

When the EGA is set as a Standalone unit, the on-board Direct Modbus function via RS485 can be utilised to make all the EGA data available via Modbus, including the limit breaches warnings.

If the EGA is used with an MM then the exact same EGA data can be accessed using the MM's Direct Modbus functionality.

### Mk8 DTI (Data Transfer Interface)

By connecting the EGA to the Mk8 DTI, all the EGA screens, live data and historic logs become available via the DTI in real-time. This enables the EGA to be accessed from any PC connected to the DTI via LAN or over the internet from anywhere in the world. Up to 10 EGAs can be connected and accessed by the DTI at the same time.

The DTI also enables Modbus protocol via RS422 which allows EGA connectivity to BMS for live data monitoring or setting external alarms/warnings.



EGA Data (Viewable & Stored within the Mk8 DTI for 3 Years):

- O<sub>2</sub>, CO<sub>2</sub>, CO, NO, SO<sub>2</sub> & NO<sub>2</sub> percentage & ppm values.
- Exhaust temperature, combustion efficiency, fuel consumption & emissions auditing data.
- EGA error conditions.
- Flow-metering & on-line Exhaust Gas Analysis data, both instantaneous & totalised for: O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>O, NO, CO, SO<sub>2</sub>, N<sub>2</sub>, total emissions as a weight, & corresponding volume at exhaust exit temperature & pressure.
- Heat input, heat loss & net useful heat.
- Net efficiency, gross efficiency & temperature change
- Fuel flow per hour & fuel flow totalised.
- Calculated cost of fuel used.

# SELF-CALIBRATING EPA EGA

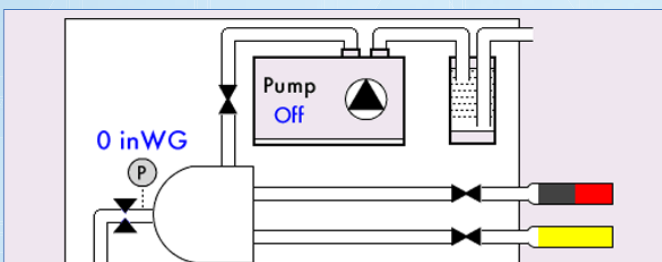


The US Environmental Protection Agency (EPA) has specific requirements for monitoring flue emissions (Specified in Performance Specification 2 in 40 CFR Part 60, Appendix B). The Mk8 EGA EPA Conformance model has been specifically designed to conform to these requirements. The EPA Performance Specifications are used for evaluating the acceptability of the CEMS system at the time of or soon after installation. The EPA EGA has been proven to comply to these performance specifications.

The EPA version of the EGA can be used on applications that require a Continuous Emissions Monitoring System that complies with the EPA requirements or where a self-calibration CEMS system is required.

The EPA EGA enables automated cell calibration on bottled calibration gas (4 bottles). During this process, the cells are calibrated using a zero value and a span value. The following configuration options are available:

- User-defined span gas configuration.
- Customisable timings for sample and purge of each span gas.
- The EGA can perform up to 4 automated cell calibrations per day. User-configurable to sample to certain times of day (eg, 9am & 9pm) or after a prescribed interval of hours.
- Ranging of 4-20mA signal from fuel flow meter to maximise accuracy.



### Self-Calibration Bottle Setup

	Air	Bottle 1	Bottle 2	Bottle 3 (Disabled)	Bottle 4 (Disabled)
<b>O<sub>2</sub></b>	Span 20.95%	Zero 2.00%	-	-	-
<b>CO<sub>2</sub></b>	-	Span 12.00%	Zero 0.00%	-	-
<b>CO</b>	-	Span 50.0 ppm	Zero 0.0 ppm	-	-
<b>NO</b>	-	Zero 0.0 ppm	Span 200.0 ppm	-	-
Date of First Use	-	-	-	-	-
Calibrations Performed	-	0	0	0	0

Information

EGA State: Calibrating  
 Source Pressure: 50 inWG  
 Inlet Pressure: 0 inWG  
 Flow Rate: 36 in<sup>3</sup>/min

Source Pressure

Tuesday, 20 June 2017 08:08:51

Additionally, the EPA EGA present the following information:

- Graph indicating remaining life and accuracy of each cell.
- On-screen indication of self-calibration stage and which bottle is used.
- Logging of cell calibration, readings, and drift over time.
- Calibration drift measured over the space of 5 calibrations. If excessive calibration drift is measured, the last valid calibration data is used.

### Self-Calibration Setup

#	Description	Value		Air	Bottle 1	Bottle 2	Bottle 3	Bottle 4
1	O <sub>2</sub> : Zero Calibration Source	Bottle 1						
2	O <sub>2</sub> : Zero Calibration Gas Concentration	2.00%						
3	O <sub>2</sub> : Span Calibration Source	Air						
4	O <sub>2</sub> : Span Calibration Gas Concentration	20.95%						
5	Unused: Unused							
6	CO <sub>2</sub> : Zero Calibration Source	Bottle 2						
7	CO <sub>2</sub> : Zero Calibration Gas Concentration	0.00%						
8	CO <sub>2</sub> : Span Calibration Source	Bottle 1						
9	CO <sub>2</sub> : Span Calibration Gas Concentration	12.00%						
10	Unused: Unused							

	Air	Bottle 1	Bottle 2	Bottle 3	Bottle 4
<b>O<sub>2</sub></b>	Span 21.0%	Zero 2.0%			
<b>CO<sub>2</sub></b>		Span 12.0%	Zero 0.0%		
<b>CO</b>		Span 50 ppm	Zero 0 ppm		
<b>NO</b>		Zero 0 ppm	Span 200 ppm		

Sources

#	Description	Value
1	Air: Source Enable	Enabled
2	Air: Sampling Duration	240 seconds
3	Air: Purge Duration	0 seconds
4	Unused: Unused	
5	Unused: Unused	
6	Bottle 1: Source Enable	Enabled
7	Bottle 1: Sampling Duration	240 seconds
8	Bottle 1: Purge Duration	60 seconds
9	Unused: Unused	
10	Unused: Unused	

## Heated Sample Line (HSL)

- Ensures sample gas is not diluted by water (condensate).
- Maintains the exhaust gas temperature until the gases enter the EGA.
- HSL temperature is controlled to user-defined settings. This is continuously monitored and a warning is generated if the temperature goes outside the prescribed setting.
- Operates using a PI loop to maintain the set temperature.

## Self-Calibration Back Box Contains

- Air purge filter
- Test gas pressure sensor
- Test gas control solenoid valves
- Heated sampling line power supply
- Pump for air purge
- Connections for the gas bottles
- Test gas distribution manifold

# EGA SYSTEM COMPONENTS



## EGA Sampling Units

Dimensions (LxWxH): 408x335x150mm (16"x14"x6")  
Power Supply: 110 - 240V, 50- 60Hz  
Operation Temperature Limits: 5 to 40 °C (41 to 104 °F)  
Environmental Rating: P20 (NEMA1)

Mk8 EGA sampling unit, fitted with O<sub>2</sub>, CO<sub>2</sub>, CO & NO cells. MM82004/E  
Mk8 EGA EPA sampling unit, fitted with O<sub>2</sub>, CO<sub>2</sub>, CO & NO cells. MM82004/EPA  
NO<sub>2</sub> Cell (added to the EGA) EGA80008  
NO<sub>2</sub> Cell (added to the EGA) EGA80009

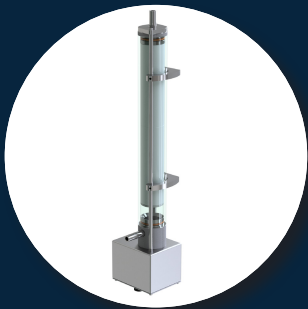


## EGA Sampling Probe

Exhaust gas sampling probe for stack mounting complete with internal filter, thermocouple & sampling tube. Custom length probes and high temperature ceramic probe are available. Please contact Autoflame with your requirements.

Material: Stainless Steel  
Probe Length: 334mm (32.2")

sampling line 3m (10ft) MM10033  
sampling line 5m (16ft) MM10033/5  
sampling line 10m (33ft) MM10033/10



## External Particulate Filter

Designed for use when there is excessive moisture from the flue gases, or if there is excess particulates in the flue gases which may affect the EGA. This filter stops excessive moisture from getting into the EGA as it has its own drain solenoid to remove any excess moisture.

This drain occurs at the same time intervals as the normal drain solenoid on the EGA.

We recommend that this external particulate filter be used for any heavy oil applications. The external particulate filter can be ordered with a new EGA or it can be ordered separately and fitted on site onto an existing Mk8 EGA Evo.

Part#. EGA80103/D



## EGA Chilled Enclosure

Autoflame manufactures a chilled environmental enclosure that uses a chiller module and control panel in order to maintain the EGA installed within the enclosure at a set temperature to protect the EGA from excessive heat.

The temperature is user-adjustable by means of a thermostat counted on the unit but is nominally set for 35°C (95°F), which ensures ideal operating conditions for the EGA. Autoflame also manufacture a heated enclosure for low temperature and for anti-condensing sites.

Dimensions (LxWxH) exc. chiller: 800x600x400mm (32"x24"x16")

Part#. EGAENC



## Heated Sampling Line (HSL)

- For use with EPA EGA only.
- Ensures sample gas is not diluted by water (condensate).

3m (10ft), 230V EGA80150  
3m (10ft), 110V EGA80150/110  
5m (16ft), 230V EGA80150/5  
5m (16ft), 110V EGA80150/5/110  
10m (33ft), 230V EGA80150/10  
10m (33ft), 110V EGA80150/10/110



Autoflame has partnerships with more than 100 Technology Centres worldwide. To maintain our reputation for quality, safety and reliability, Autoflame ensures they receive regular training to keep up to date with our latest innovations.

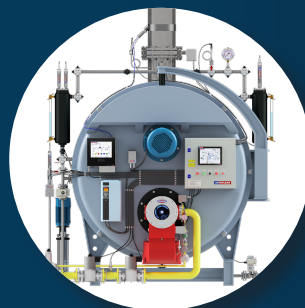
## COMPLETE SUPPORT

Autoflame focuses exclusively on boiler/burner combustion management systems. As a result, our range of additional services have evolved around meeting the unique needs of this market:



### Technical Support

You are always just minutes away from talking on the phone to a trained engineer in our Biggin Hill, England, headquarters. We pride ourselves in responding to all technical emails within one business day, and usually within the same day.



### Systems Customisation

Many of our innovations spring from meeting the unique requirements of our thousands of customers around the world. Come to us with unusual situations and we can often work out a solution together.



### Flexibility

After more than 45 years, we have earned our reputation for reliability and consistency across a broad spectrum of applications:

- Long-standing trust from customers like Intel, Boeing, Nestle, GSK, Jaguar - Land Rover and many others
- More than 100 Technology Centres worldwide.
- Won the British Queens Award For Enterprise on three occasions.
- Worldwide Vendor of Choice for a Fortune 100 microchip manufacturer.



### Innovation

Autoflame has introduced the Mk8 products generation. Our EGA, DTI and MM Controllers all have advanced touch-screen interfaces. Unlike competitors, our entire R&D budget is focused on Boiler Management Systems. By aligning with Autoflame, you are partnering with a company that will support you with the latest innovations in the boiler management industry.

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