



WHITE PAPER

Demystifying Flue Gas Analyser Calibration

▶ For plumbers, heating engineers and boiler manufacturers, staying abreast of the products and concentrations of pollutants created within any given environment is incredibly important. The crucial work undertaken is key to ensuring yourself, your colleagues, wider teams and customers, as well as the environment you work within, are protected from the potentially toxic pollutants created within HVAC systems.

Flue gas analysers are a key way to do this and this white paper will explore how those in the HVAC sector can keep their team safe when using fossil fueled heating, air conditioning and ventilation appliances.



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FGAs: a vital tool

A flue gas analyser (FGA) is a vital tool for any Gas Safe Register, OFTEC or HETAS qualified engineer when installing, commissioning, fault finding, repairing or servicing heating appliances. On modern gas appliances you cannot see the burner flame. However previously, where the burner flame was visible, in theory, it was possible to get an indication of the combustion “health” from the colour of the flame and other visual indicators.

Nowadays the burner is not visible, due to being enclosed, and so it is necessary to determine what’s happening in the combustion process in a different way.

The Risks

As most heating and cooling systems burn some type of fossil fuel for energy there is a heightened risk of toxic gases being emitted into the environment in which they are being used, which can have a devastating impact.

The risk posed, by Carbon Monoxide specifically, to those working in the heating, ventilation and air conditioning industry can be extreme. Workers may have even noticed feelings of dizziness or nausea, or had a headache, during or after a specific job. This could be the impact of CO.

There are a range of specific events that are common in HVAC settings that may lead to toxic gas exposure. Those working within confined spaces such as basements or lofts are at specific risk. As are those working with heating appliances that are malfunctioning, in a poor state of repair, or that have broken or worn seals and blocked, cracked or collapsed flues and chimneys. All of these faults allow products of combustion to enter the working area.

Those working on open-flued appliances, especially if the flue is spilling, ventilation is poor or the chimney is blocked, could be at risk, alongside those working on flueless gas fires and cookers, especially where the room volume is of inadequate size and/or the ventilation is otherwise poor.



Flue Gas Analysers and calibration

This is where flue gas analyser calibration comes into the picture. A flue gas analyser or combustion analyser is a portable tool that measures the gases present within the flues of combustion devices. As HVAC equipment can produce potentially dangerous amounts of toxic gases, the measurement of these and continual monitoring of the area is a necessity to keep the people in the vicinity safe.

Ensuring the flue gas analyser (FGA) you utilise, as a plumber, heating engineer or boiler manufacturer, is regularly maintained is obviously very important. Calibrating a combustion analyser or FGA involves testing the sensors to make sure they are

accurately measuring a known concentration of certified calibration gas. The first step in doing this is to adjust the reading to match the gas concentration through an initial sensor calibration of the new or existing unit.

Then a calibration drift should be undertaken by using existing instruments to bring the reading back after the drift occurs. Measuring the amount of drift in the gauge is a chance to see how far into inaccurate territory it has moved, and rule out measurement errors moving forward.



Why is FGA calibration needed?

As sensors degrade over time, regular calibration is the best way to stay on top of whether your device is providing inaccurate readings, whether it is an electrochemical, catalytic bead or infra-red sensor. Regular calibration raises the gain to the correct levels and brings the sensor back in line to avoid dangerous incorrect readings.

After a certain period of wear and tear, the sensor reaches a point of degradation and as a result cannot be brought back into the correct position. This is when a new sensor needs to be installed.

The process of calibration involves a certified calibration centre setting the device to calibration mode. This feeds a test gas of a known concentration onto the sensors to see how they respond. The gain levels are adjusted within the sensor to match the readings to the concentration fed in, whilst mitigating drop off. The new settings are locked into the device's firmware and a calibration report is produced, creating a PASS or FAIL result.

Similar to the process of placing probes in the exhaust of a car, to sample the gases to determine the condition of the engine; taking a sample from the flue, the boiler's exhaust", to decide the state of any fuel burning appliance runs in parallel.

The samples drawn by the FGA from the working appliance plays a valuable role in measuring the critical gas produced in the combustion process, and provides important metrics that determine if it is operating efficiently and safely.

The concentration of carbon monoxide (CO) and carbon dioxide (CO₂) can be determined in this process to assess environmental safety; as can other measurements such as oxygen (O₂) concentration, XS air and flue temperature.

When reading the manufacturer's instructions for the appliance, you can see if the flue gas measurements are in specification for the device, and gain confidence that the unit is left in a safe working condition. If the gas readings do not correlate with the manufacturer's instructions you have evidence that there is a potential problem.

There can be multiple reasons for the issues that may be thrown up during the calibration process. Some typical examples to look out for could centre around a problem with the installation or integrity of the flue, an issue with a restricted gas supply to the appliance, a fault on the boiler or perhaps a poorly adjusted air/gas supply valve.

The FGA you use should help you to diagnose and identify the issue, make the necessary adjustments to correct it and then confirm and document that your corrective actions have been effective in getting the appliance back within specification, to prove compliance.

In the event of a suspected CO incident or alarm activation, FGAs have functionality to perform ambient CO testing in accordance with BS:7967 guidelines. These provide assistance to a suitably qualified engineer to build a picture of what might be causing the elevated CO situation.

An FGA is a vital piece of equipment for all those registered to work within the field, and is often so heavily relied upon that most are unable to perform essential and routine daily tasks without one.



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Why do I have to ensure it's working properly?

Without a functional flue gas analyser it is hard to ascertain if the HVAC systems in the environment that you, and your customers, work within are producing toxic gases. Without regular testing there is a very real risk of individuals becoming unwell or worse. To stay abreast of all issues that could arise, regular maintenance of your FGA needs to be undertaken to counter any of the possible day to day issues that could cause the unit to stop working and therefore impair your capacity to test the environment for toxic gases.

The FGA you use may come with servicing options to support those on the ground with keeping their device functional and reliable at all times, however if you are undertaking your own maintenance then here are some tips on best practice.

One of the issues that can affect the operational functionality of your FGA is moisture. As it is a by-product of combustion, it can become sucked into the FGA. Therefore it is important to clear out the water trap on a regular basis as water ingress is the primary cause of damage in flue gas analysers, so it is crucial to check, empty and replace the unit's inbuilt water traps and filters when required.

Purging the device in clean air before turning it off is a method in which you can rid the machine of trapped noxious gases. These may have become stuck there when drawn from the flue and passed over the sensors to gain a reading. Failing to purge the device in clean air, and releasing the noxious residue, can cause corrosion damage and shorten the life of the unit. As a result purging the machine is a great way to ensure a longer life span of your analyser unit.

Taking actions to prevent condensation build up, which can cause further water damage in your FGA, is a must. Ensuring units are taken inside into warm environments, instead of being left outside in a cold vehicle, is a great preventative step.

Those using flue gas analysers can also ensure they employ approved chargers with outputs tailored for the target device, as non-approved chargers can cause damage to the battery and lessen overall charge retention, or even impair the battery and IC chips themselves.

A final step to ensure that your unit is ongoingly functional, is to check the devices' probes and connector pipes to see if there are any splits or cracks in the rubber house. If there are splits and they go unnoticed then they can cause incorrect readings. Undertaking regular checks will help the device's hoses to remain in good operating condition.



Sprint Pro

It is important for those working within the HVAC environment to initially choose to work with accurate equipment. Ensuring that the FGA you and your team utilise alerts you as and when danger arises is a must, to ensure your personal safety. A high quality flue gas analyser (FGA), or combustion analyser, will provide accurate readings of the immediate atmosphere and appliance performance.

Many appliance manufacturers now make the use of a combustion analyser when installing, and maintaining their products a mandatory requirement. Crowcon's Sprint Pro offering is an efficient, reliable and robust solution for those working within environments that produce toxic and potentially harmful gases.

purchase, carry, store, charge and calibrate multiple devices is automatically removed. In turn, individuals save the transportation and maintenance of multiple bulky units that they require day to day.

A functional and reliable FGA, such as Sprint Pro, enables users to stay on the job for longer with fast start-up times and auto self-purging when powering down, which extends sensor life. Having troubleshooting capacity built in is a must for FGA's, as it allows users to perform the required tests quickly, safely and accurately.

Equipped with damage protection functionality, the Sprint Pro allows those using the unit to spend more time on the ground working, and less time waiting for repairs which is very convenient. The device comes with industry leading triple filter hydrophobic protection to prevent all instances of water ingress damage to the sensors. As water damage is the number one cause of flue gas analyser downtime, this is a useful time-saving feature. The Sprint Pro is constructed from the same material as motorbike helmets, and so is robust and hard-wearing to withstand a range of elements across diverse environments.

Crowcon also supplies a high quality maintenance free CO personal protection alarm called the Clip CO. This device can be clipped to a belt or shirt pocket and provides 2 levels of audible, visual and vibrate alarms to protect against unsafe CO levels in the working environment. It's a small, rugged and disposable unit that runs for two years from the point of activation with no maintenance overheads.

“The device carries a fast charging battery to ensure workers are supported and safe throughout all their shifts, by a long lasting battery unit that holds its charge long-term.”



With 50 years experience in the field we are ideally placed to meet your needs, offer peace of mind to you and your team and offer advice and suggestions for effective and secure gas detection within your environment.

Quality is key

Choosing a quality flue gas analyser that not only provides safety from toxic gases for those within the environment, but also promises to be reliable and robust so you don't have to deal with unnecessary downtime and maintenance issues, is crucial.

The intention of this information is to shed light on the crucial nature of FGA calibration and to illustrate the way in which regular device adjustments can revolutionise the usage of your unit, whilst ensuring continued functionality and accuracy.

For more information about Sprint Pro from Crowcon and FGA calibration please get in touch with our friendly team.

