

## **Equipment of the computer for exhaust gas analysis with automatic CO sensor monitoring for pre-definable limit values and CO sensor flushing active in the background with the help of a second gas pump**

Modern exhaust gas analysers are equipped with automatic CO-sensor monitoring. This equipment has become important for new devices today, because of its excellent reliability especially in case of controls such as oil servicing and gas firing for the standard equipment of our analysis devices for professional chimney sweep or heating master builders.

### **Now, what are the advantages of this technology?**

The continuous exhaust gas analysis establishes the 1<sup>st</sup> Federal German Pollution Control Act (FGPCA) in accordance with the principle exhaust gas loss through the measurement of exhaust gas temperature, combustion air temperature and oxygen content (CO<sub>2</sub>). These details concerning the determination of carbon black content are also sufficient for the simple evaluation. Knowing that during the optimization of combustion processes, the fuel-air ratio comes very close to stoichiometric combustion, i.e. processed with the least lean mixture, the best possible set point results for the burner at the point, where the transition to oxygen shortage leads to the first CO formation during combustion. At the time of oil firing, this CO formation is, as is known, the first step in the formation of carbon black (soot) and as a result the second dimension of evaluation defined by the 1<sup>st</sup> FGPCA as carbon black formation with a target carbon black count of less than or equal to 1. Carbon black is not indispensable at the time of setting a furnace. On the other hand, this soot not only precipitates in the boiler and chimney, but also displaces the gas path in the exhaust gas analyser. However well they have been filtered in the analysis computer, these exhaust gas will still contain a large amount of carbon deposits and can lead to blocked gas pumps and displaced sensors, which may involve extravagant repair costs.

Not every burner system is same and therefore one cannot indicate a flat rate: 100 ppm CO is equal to carbon black 1. However, it has just been shown that in case of conventional oil burners, this 100 ppm CO as the threshold value for monitoring CO formation is a significant advantage while setting different furnaces.

If the exhaust gas concentration exceeds the CO measurement set at 100 ppm during the burner setting or control measurement, for instance; then the CO measuring arm is switched off through the magnetic valves from the current analysis program and the exhaust gas containing CO is flushed out of this measuring arm with a separate gas pump. Now, the clean measuring path switches on again automatically for continuous measurement. During this flushing, you can react on the burner as per your test method. The computer for exhaust gas analysis continues to continuously provide you with the important analysis parameters such as O<sub>2</sub>, CO<sub>2</sub>, loss. Lambda..., while the CO measuring path is briefly flushed, as shown in the background.

Now, you are in the position to find the favorable preset point for the burner during this CO sensor flushing phase. If the new flame-exhaust gas balance of the burner is reached, then the CO measuring arm is already active again in the measurement program of the exhaust gas analysis computer and you can switch off the fine adjustment on the burner.

Consequently, the advantages of this new technology lie not only in the increase in the life span of your analysis computer, but mainly also in the significant simplification and reduction of the burner adjustments, which has a positive effect particularly in the transitional period and in the warm summers.

The analysis computer always activates after the automatic CO sensor monitoring and flushing restarts with one of the threshold values, pre-set by you.

## What are the specialties in the measurement program?

Based on our experiences, the CO measuring range should be limited to 100 ppm for work on the fuel oil yellow burner. In case of a multitude of products, intensive carbon formation already begins, which requires quick action at the time of setting the furnace.

The limitation of the CO measuring range at 300 ppm generally suffices for adjustments in blue flame or gas burner systems.

The measuring equipment now functions according to your configuration for the CO measurement channel in the measuring range of between 0 and the threshold value set by you, e.g. 100ppm. This CO sensor setting is maintained in the measuring equipment as the pre-set safety function for later measurement tasks even after switching off.

However, should the CO measuring range pre-defined by you not be adequate for the present, necessary measuring tasks for various reasons, you can reactivate the CO measuring range selection with the ⇐ key any time during the measurement and enhance the measuring range to up to 10000 ppm.

Such a measuring range enhancement is an advantage, especially if, for instance, a distinct, rough classification of the burner setting is to be made with the help of the exhaust gas for the calorific value of fuels or a trend is to be established for correcting the parameter settings. Exhaust gases with such high CO concentrations are already aggressive for the analysis computer. Therefore, you should not neglect activation of the pre-defined CO sensor threshold value in ranges less than 300 ppm after successful burner setting or control measurement.

Also use the option of completely cutting off the CO measuring channel from the analysis process. The CO measurement channel is connected when, for instance, one has to count on high CO formation for the impulsive, step by step, uninterrupted adjustment of multistage burners. Even the burning of the flame or similar intensive CO forming processes should be protected by pressing the ↓-key (CO-Off) for quickly restoring the CO measuring channel's readiness for operation by immediately switching off the sensor. This function can be reset with the ↑ key (CO-On).

In order to rule out mix-ups between the switched off CO measuring range and the CO free exhaust gas, the switched off CO measuring channel is marked with "---".

Equipments develop a special form for the evaluation of exhaust gases up to 100,000 ppm (10%) CO. An automatic adjustment to the higher CO measuring channel takes place if your measuring equipment has been equipped with such a measuring range (e.g. Solid fuel equipment evaluation, reducing combustion...).

With all the technical refinements that we provide you with in the exhaust gas analysis computer to make your work on combustion engineering perfect, you should not forget that we are concerned with operating conditions considered to be extremely drastic for sensors and thereby for the entire measuring system. We would like to analyze gases and not solids (carbon flakes) or liquids (residues from combustion condensate are acids, which are active, even when no one is attending to the measuring equipment). No matter how good a measuring equipment system is, it cannot replace the fuel technology manufacturer's expertise in combustion processes as well as the specific requirements and setting instructions provided by him.

Our computer for exhaust gas analyses is designed as a robust measuring tool for expert electrical engineering. You receive your measuring equipment in an already operational state with conscious actions and regular maintenance carried out the combustion equipment. Regardless of which, you should send you analysis computer to our service department or to the test bench of your Chimney Sweep Guild once a year.

Please approach us if you have further questions regarding the use of our analysis computer. Our office and field staff would be pleased to discuss the specific applications of our scientific equipment with you.