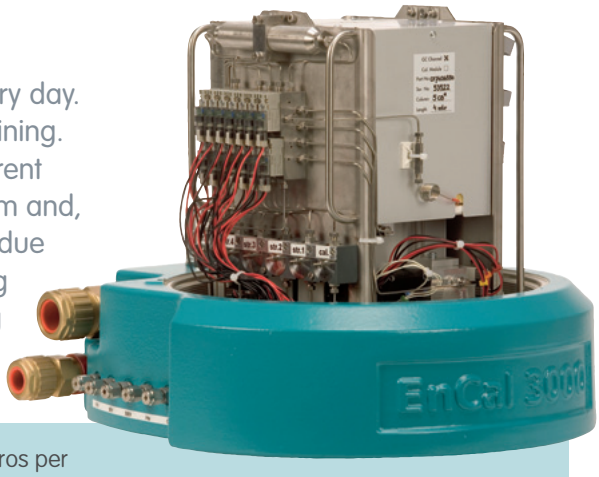
Is your fiscal measurement system accurate and traceable?

Why not let us evaluate it under ISO 10723?



Large volumes of natural gas are traded all over the world every day. While demands are increasing, natural gas resources are declining. Rising gas prices are the logical result of this. Gases from different sources and of varying quality are entering your pipeline system and, in the meantime, the number of trading partners is increasing due to the liberalisation of the gas market. In this highly demanding market, gas metering systems are indispensable in the trading partners' commercial transactions involving approximately 3 billion m^3 of natural gas traded every year.

Since the days when gas was only traded in volumetric units are long gone, total energy measurement systems are used to measure and calculate the total amount of energy transported in the volume of gas traded. This means that besides turbine or ultrasonic meters a gas quality meter or, to be more precise, a heating value analyzer must be used. The most commonly used type of analyzer is the gas chromatograph. A gas chromatograph analyses the gas composition and calculates the heating value, as well as other parameters such as density and the compression factor, in accordance with international standards, for example ISO 6976.

Since this gas chromatograph is a prerequisite for the enormous amounts of energy traded every day in the form of natural gas, it should be in every user's interest to know whether his energy measurement system provides traceability and a defined performance. A deviation of just one tenth of a percent in the heating value of the gas transported in the pipeline can correspond to more than a million euros per year! But it is not only about reducing direct financial risks. Whenever a dispute arises between two trading partners, it is crucial to be in a position in which the system's accuracy and compliance with international standards can be demonstrated.

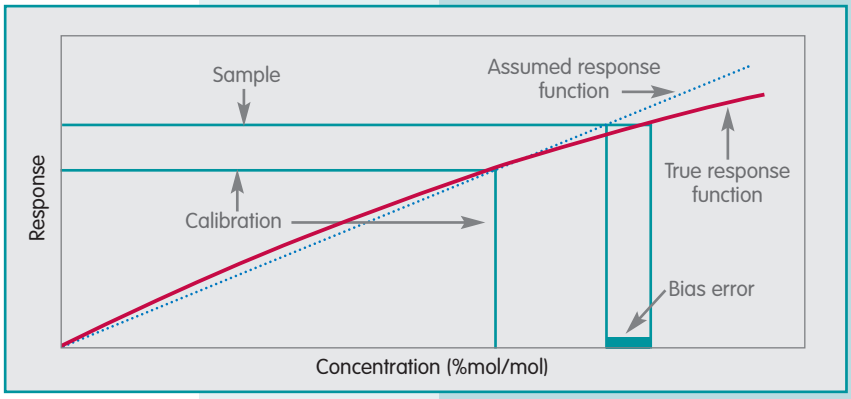
The performance of the measurement system depends on a variety of parameters including flow measurement and volume correction. However, we will not touch on those two in this article. The heating value measurement system itself also has an uncertainty which has several sources, a few examples being:

- Sampling
- Sample gas conditioning
- Calibration
- The actual analysis, analyzer performance

Without making a statement about the contribution of each individual source of uncertainty, this article will focus on the analyzer's performance and the value of the ISO 10723 standard entitled "Natural gas – Performance evaluation for on-line analytical systems". This standard specifies a method of determining whether an analytical system for natural gas is satisfactory.

In principle, this method uses several test gases whose compositions cover a range of gases. This range should be somewhat wider than the particular instrument's area of application. The gases are analysed by the instrument under test and the following performance parameters are tested:

- The system's ability to measure each individual component as specified
- The repeatability of the measurement (for each individual component across its specified range)
- The relationship between concentration and response (for each component across its specified range)
- The absence of interference between components at different concentration levels.



Accuracy or bias error

The term accuracy might be the first to come to mind when you think of an instrument's performance. However it is not mentioned in the list above for the following reasons. A gas chromatograph is nothing more and nothing less than a comparator. A gas with a known composition is analysed and the assumption is that the measured response is linear. Using the system's response to this known gas, we can then also quantify unknown gases. This means that the accuracy of our measurement is directly influenced by

the accuracy of the calibration gas composition. Consequently, it is not possible to quantify the analyzer's accuracy without saying something about the quality of the calibration gas used to calibrate the gas chromatograph. What is possible is saying something about the system's response to various gas compositions and about the linearity or non-linearity of this response. This is where the term bias comes in.

When we calibrate a gas chromatograph, we analyse a known gas and we calculate the response factor for each individual component of the gas mixture. The ratio of the concentration of a component and the system's response to this component is called the response factor. Most gas chromatographs assume the response of the system is linear across the whole concentration range. This results in the following response function indicated by the blue line in Figure 1.

In most cases however the response of the system is not linear across the whole range of concentrations. The actual response will be different to the assumed response. This actual response (exaggerated) is indicated by the red line. The difference in concentration which results from this difference between the assumed response and the actual response is called the bias error.

Following the ISO 10723 performance test, you would be able to provide a well-founded statement about the performance of your particular measuring instrument, rather than about a type of instrument. As mentioned earlier, there are more sources of errors which influence the total energy measurement system, but as regards the analyzer this evaluation is very useful.

The gases used for the test should be prepared by an ISO 17025 accredited laboratory and their uncertainties should comply with ISO 6141. The UK based company Effectech can supply and produce these kinds of gases and can offer an ISO 10723 evaluation for gas chromatographs. Elster-Instromet can offer you the ISO 10723 evaluation for the EnCal 3000 gas chromatographs as part of our services. Besides these international standards, some countries have issued national legislation that defines the requirements for fiscal gas quality measurement. In Germany, for example, instruments for fiscal metering must have a type approval from the national metrological institute Physikalisch-Technische Bundesanstalt (PTB). This approval certifies that the instrument type complies with certain standards. In addition, the performance of each individual instrument must be tested in the field following a procedure that is also defined in this type approval. The gas chromatograph EnCal 3000 has this German PTB approval, and further national approvals are pending or planned.

For more information regarding the ISO 10723 evaluation and national type approvals, please contact the product manager Addy Baksteen.

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Marathon is now called Snickers!

BK-G6 V4 to replace BK-G6 V3.5

In contrast to this simple change of name, the successor to the BK-G6 V3.5 itself incorporates modifications. Conversion to the 4 litre measuring unit (V4) means that a measuring unit with a time-tested stadium shaped diaphragm is now used in the BK-G6, instead of the 3.5 litre measuring unit with the convoluted diaphragm.

The BK-G6 thus fits into the series of existing domestic, commercial and industrial diaphragm gas meters, which also operate with this type of diaphragm. The BK-G6 V4 must not, of course, hide behind its predecessor – this has been proven by all the tests regarding long term performance and measurement stability. The new measuring unit has had no influence whatsoever on the shape of the BK-G6's housing and the existing variants will be retained. The new meter will not be available with mechanical temperature compensation. Should you require this option, you can switch to the BK-G6 V2, the "little brother" with a 2 litre measuring unit.

The BK-G6 V4 is currently in the final testing phase for approval in accordance with EN 1359 and will be delivered as of the end of September 2007 either with EEC approval or with MID approval, as requested. The meter is now also available with a reverse flow valve to prevent gas backflow and tampering. As the result of the changeover the BK-G6 V3.5 will be no longer available as of September.

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