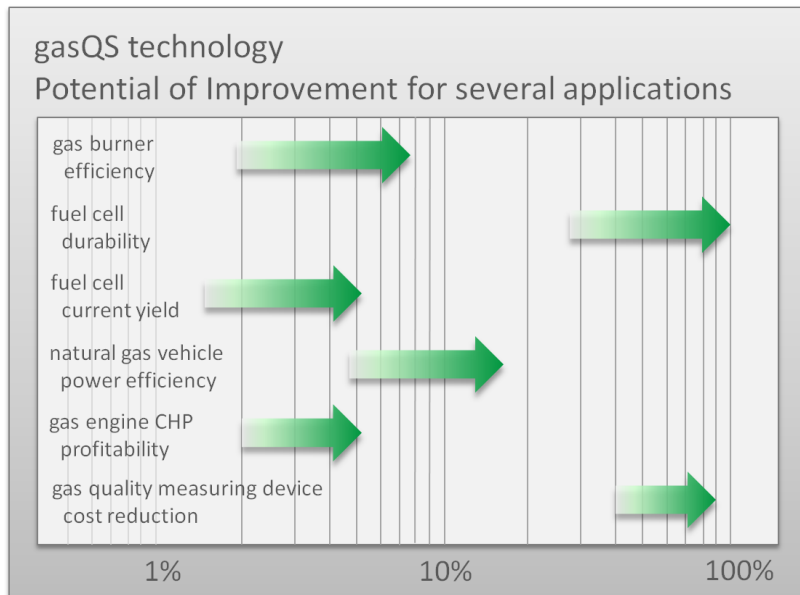


Gas Quality Sensing – gasQS®

With gasQS® MEMS AG has the technology to use natural gas and biogas in an efficient and environmentally friendly manner.

Natural gas is used in many countries around the world as a source of energy for many years already; its significance will ever more grow in importance in the future. However, power output, efficiency and environmental compatibility of the various gas applications are affected by the ever more rapidly changing gas compositions of new gas sources (biogas, LNG, power-to-gas). The effect of these fluctuations can be compensated and processes optimized through determination of the gas quality – today the domain of expensive process and laboratory analytics.

The field of application of gasQS® technology is versatile with considerable potential for improvement depending on the application.



With the gas quality measurement based on gasQS® technology relevant process parameters are continuously measured in-situ. For all applications where knowledge of gas quality is required, MEMS AG develops and optimises low-cost sensor solutions to exploit the full potential of the gas.

Your benefit

Overall quality increase. Increased reliability, efficiency and environmental compatibility.

Real time measurements. Continuous in-situ measurement and real time analysis of gas quality.

Get specific gas parameters. Measurement of relevant combustion parameters such as calorific value, Wobbe Index and methane number.

Reducing costs. Get cost saving by reducing acquisition and maintenance costs of gas quality measuring devices.

Trademark

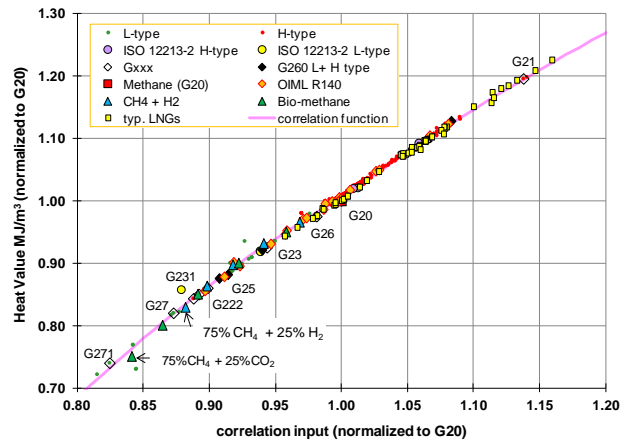
The innovative gasQS® technology is intellectual property of MEMS AG. Since 2014 gasQS® is a registered trademark.



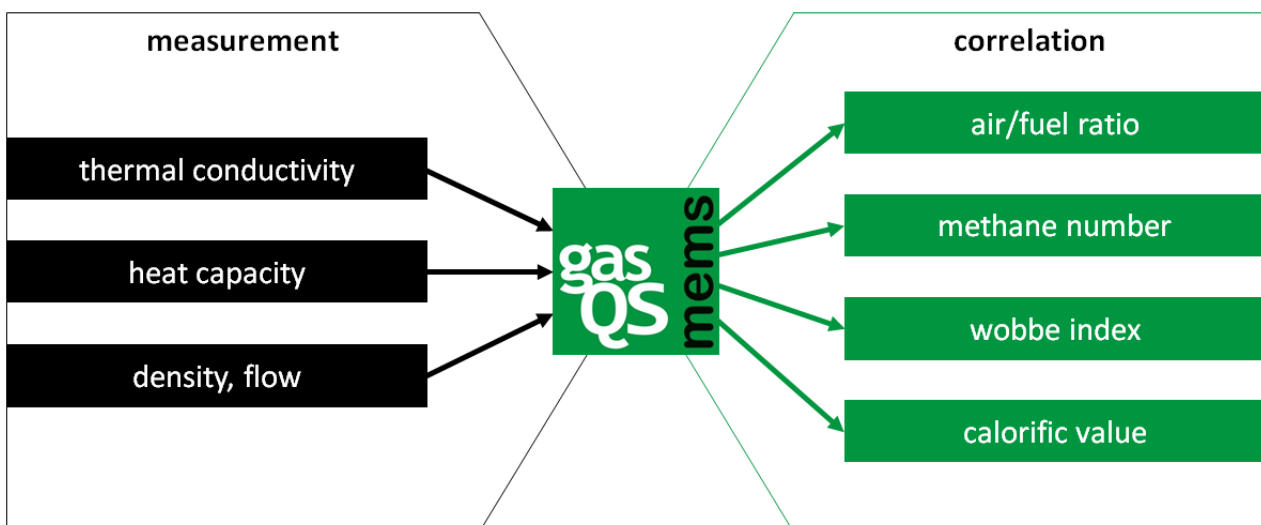
gasQS[®] Technology

MEMS AG uses microthermal calorimeters for their gas quality sensors. Process gas chromatographs, the standard analytical tool to determine gas composition, are too bulky, slow, fragile and too expensive for «mass» dissemination in application fields like traffic (NGVs), industrial burners or combined heat and power plants (CHP). Chip based, fully integrated microelectromechanical (MEMS) sensors comply with these requirements.

The microthermal sensors allow to measure thermal conductivity as well as heat capacity and, from an associated flow measurement using a sonic nozzle setup, density. These physical sum parameters are used as input to correlate gas quality factors such as air/gas ratio, methane number, Wobbe Index or heat value. No knowledge is required about the composition of the gas and, in comparison to conventional process chromatographs, sensors measure quickly, are compact and robust.



For both, sonic nozzle as well as microthermal sensor chip, a physical model has been established based on the same physical parameters of a gas mixture that are also used as input to correlate the gas quality of interest. The model allows for anticipating the correlation result even without measuring a given gas mixture; an important advantage compared to existing correlative measurement equipment and best suited to thoroughly analyze each customer's application specific needs.



gasQS® products

OEM products available at MEMS AG measure relevant process parameters to exploit the full potential of your gas.



| Gas Parameter | gasQS® flonic | gasQS® goffredic | gasQS® static |
|----------------------|------------------|------------------|------------------|
| Calorific value | OK | OK | OK ²⁾ |
| Methane number | OK | OK | ~ |
| Air/gas ratio | OK | OK | ~ |
| Wobbe Index | OK | OK | ~ |
| Density | OK ¹⁾ | OK ¹⁾ | ~ |
| Thermal conductivity | OK ¹⁾ | OK ¹⁾ | OK |
| Binary gas mixtures | OK ¹⁾ | OK ¹⁾ | OK |

1) Low cost gasQS® static version to be preferred

2) For defined gas groups (e.g. H-gas only)

The **gasQS® static** is the ideal choice whenever binary gas mixtures need to be analyzed or to measure selected physical gas properties. It offers an excellent price/performance ratio at a very compact size.

With the **gasQS® flonic** the user gets a very versatile instrument to measure many important gas properties still at reasonably low costs. High accuracy together with fast response time makes this innovative combination of a low cost sensor chip with a simple nozzle to a comprehensive sensor system for real-time monitoring of gas quality of natural and bio-gas.

The **gasQS® goffredic** is a mobile laboratory measurement unit based on the functionality of the gasQS® flonic. It is available as high pressure (HP) and low pressure (LP) variant.

None of the products need to be recalibrated in the field; installation efforts are small (no carrier gases needed) and only low maintenance is required.

gasQS® flonic

The new OEM sensor system combines unmatched compactness with high robustness for applications in harsh environments.

Equipped with the same functionality as the advanced, modular system, it has been optimized for low production costs to enable its widespread use in high numbers, where knowledge of gas quality, although of prime interest, was not available due to the lack of affordable sensors systems on the market.

In addition, data logging capabilities and ease of installation makes the OEM version ideal also for temporary monitoring of gas quality at almost any location.

