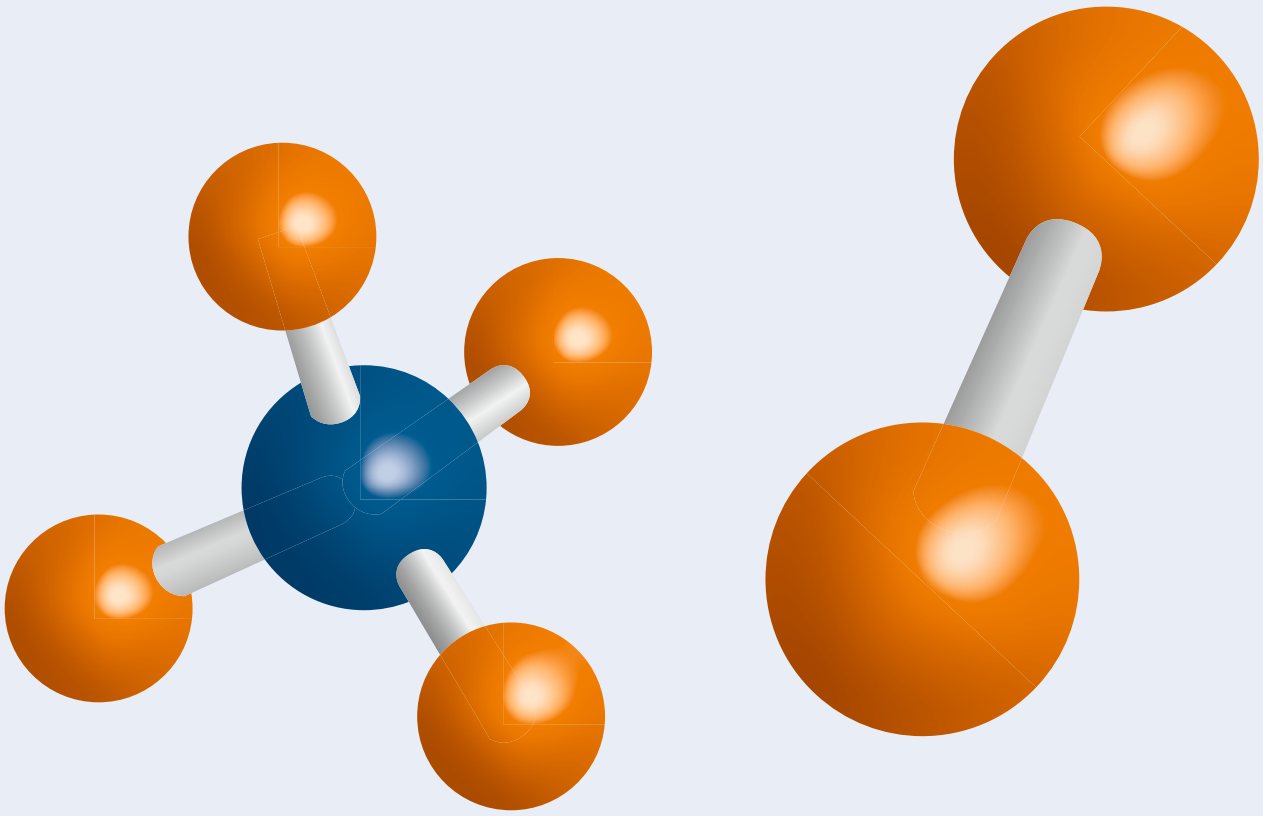
meterQ



Perfectly Measure and Analyse Gas Quality

Prime Partner
in Hydrogen
and Gas Analytics

Perfectly Measure and Analyse Gas Quality

The perfect measurement of gas can avoid unnecessary costs, secure high yields, and sustainably protect our climate. Our aspiration is to achieve exactly that. We want to be the best at it by offering innovative, unique solutions.

Meter-Q Solutions GmbH is an engineering office, system solver and planner for your tasks with the focus on:

- **gas (quality) analysis**
- **volumetric measurement and volume correction**
- **service and commissioning**

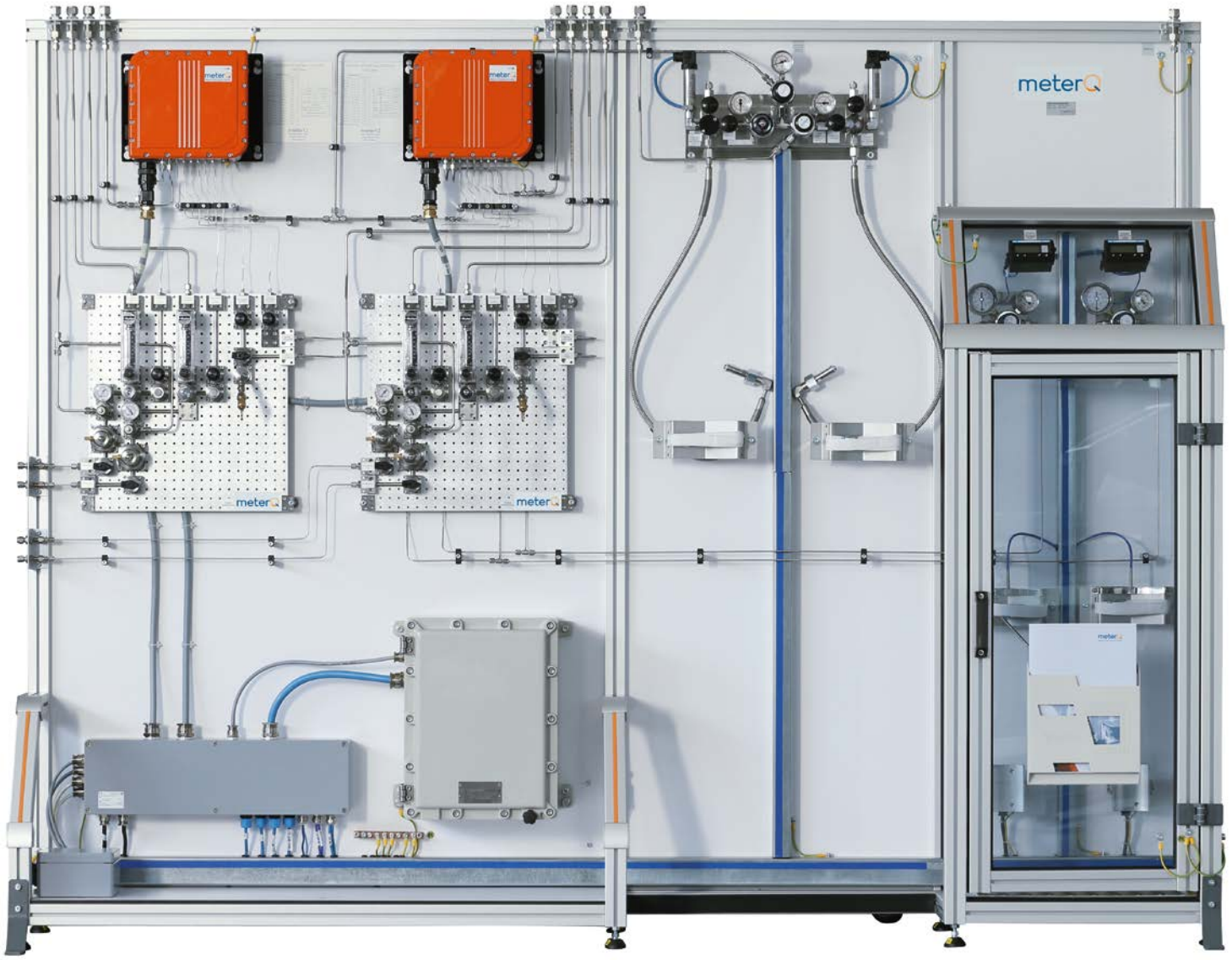
Sustainability through Hydrogen Technology and Emission Reduction

We write CLIMATE PROTECTION in capital letters! Our analysers are 100% hydrogen capable. At the same time, we offer solutions for emission reduction up to the complete elimination of a bypass without negative impact on the response time.

Our GCs consistently use modern micro and nano technology. The result is a platform that is 4x faster and 20x more sensitive than established technology while still being smaller, lighter, and easier to maintain.

Analytical Equipment

Classic Gas Analysis Using New Technology: **MGC**^{flex}



Our standard PGC for custody transfer measurement of natural gas/hydrogen mixtures is well equipped for every conceivable task in this field up to Ex-Zone 1: custody transfer measurement, blending and conditioning plants, biogas, LNG and hydrogen injection, storage facilities.

In addition to billing measurement, the **MGC**^{flex} is also suitable for mixing tasks, for process control and can even take over limit value monitoring for components such as oxygen due to its short measuring cycles of only 45s and its high sensitivity. Low maintenance and operating costs complete the picture.

Apart from carrier gas, there are no consumables that need to be replaced regularly, such as special filters. Carrier gas consumption can even be reduced if a particularly fast measurement is not required.

Mobility without Compromise: **MGC**^{mobile}

MGC^{flex} and **MGC**^{mobile} complement each other perfectly. In terms of measurement technology, both systems are identical. They share a PTB approval in which the **MGC**^{mobile} is explicitly listed and described as **MGC**$^{flex\text{-}m}$. The **MGC**^{mobile} has been developed for measurement tasks in which mobility is important. This can be a control measurement at any location, for example in a gas composition reconstruction system. The **MGC**^{mobile} can also be used to check another PGC or to replace it at short notice in case of failure.

The use of the **MGC**^{flex} for hydrogen as a custody transfer measurement is in preparation. For custody transfer measurements, the **MGC**^{mobile} is already available for the determination of the calorific value of hydrogen and its impurities.

MGC^{mobile} is a measurement case that fits in almost any car, can be easily transported by one person, and put into operation in less than two hours. In addition to the measuring case, the system includes a small electronics and supply case and a tripod with the blowers. **MGC**^{mobile} is of course also designed for use in ATEX Zone 1. The case can be operated with an internal 2 L carrier gas and an internal 2 L calibration gas cylinder or alternatively with externally connected gases.

If the **MGC**^{mobile} is to run self-sufficiently for extended periods of time, it can be integrated into a small and lightweight trailer that provides space for standard sized gas cylinders, the operating and communication electronics, and even an independent power source. The system is modular, so the case can be removed at any time and used on its own as described above.

The **MGC**^{mobile} has been patented by the European Patent Office.
The patent number is: **19000587.6 – 1001**

Analytical Equipment

Focus on Reaction Time and Emission Reduction: **MGC**^{direct}

The robust and compact measuring system of the MGC series allows with the **MGC**^{direct} an even more innovative variant than the ones described above: As a transmitter, the **MGC**^{direct} is mounted in a small weatherproof box above the tapping point, directly on the pipeline. With about one meter between the analyzer and the gas line, the conditions for a fast response measurement are optimal with the **MGC**^{direct}.

A special sampling system is used that feeds gas to the pressure reduction unit and loops unused remainder directly back into the pipeline using a specially designed sample probe. The gas exchange is very fast, and the loop makes it possible to achieve this without a bypass.

With the fast measurement, the short distance, and the special sampling system, the **MGC**^{direct} can achieve by far the fastest possible response time. It is therefore ideally suited for all tasks where fast detection of changes in gas quality is essential. Comparing the **MGC**^{direct} with an average classically installed PGC, the saved bypass leads to a reduction of emissions by about 95 %!

There are additional advantages compared to a classic installation. A special analysis building or container is no longer necessary. Only the operating gases (carrier gas and calibration gas) need to be installed near the **MGC**^{direct}. For indoor installations, a conventional gas supply unit is sufficient. For outdoor installations, a heated cabinet is required and a heated calibration gas line.

The need for the usually much longer heated sample gas line is eliminated, however. Only a single Ethernet cable is needed to connect the cabinet to the electrical room. The **MGC**^{direct} is therefore usually the cheaper and always the more sustainable alternative to any classic PGC installation.

The development of the **MGC**^{direct} type PGC transmitter led to a European patent application.

Continuous Calorific Value Measurement: **MGQ^{flex}**

When one measurement per minute is not enough and a continuous reading is needed, the right solution is the correlative **MGQ^{flex}**. Once you have a true analog and continuous reading like this, it can be directly used to control a gas conditioning/ blending system. It can be used for the conditioning of biogas, the mixing of two different gas qualities or any similar task.

The operating principle of the **MGQ^{flex}** is based on the well-known correlation between Calorific Value (Wobbe Index) on the one hand and thermal conductivity and heat capacity on the other. For this purpose, the **MGQ^{flex}** measures the thermal conductivity of the flowing gas sample at different temperatures. To eliminate any possible drift, the instrument calibrates itself automatically at regular intervals using a permanently connected methane cylinder.

MGQ^{flex} is significantly less expensive than a PGC, both in terms of purchase and operation. If only the Calorific Value or the Wobbe Index is of interest, and if you can do without a custody transfer approval and a maximum error smaller than 0.1 %, the **MGQ^{flex}** is the best choice. With the observable increase in fluctuation of the natural gas qualities in the German network, every industrial customer and every operator of gas engines or turbines can benefit from an **MGQ^{flex}**.

The **MGQ^{flex}** has utility model protection no. **20 2017 005 215, IPC G01N 33/22.**

Analytical Equipment

Advantages from Both Worlds: **MGC**^{duo}

Because the **MGC**^{duo} is particularly compact and fast, it can easily be packaged with an **MGC**^{flex} to take advantage of both systems.

The **MGC**^{duo} produces continuous analog readings with an uncertainty of < 1 % that can be used for control and a full analysis every 45s that can even be used for custody transfer. If desired, the MGQ reading can be regularly corrected with the MGC reading.

This system is particularly safe because gas is always measured in parallel using two different measuring principles. Any instrument error becomes immediately apparent and if one of the two systems fails, the respective other will continue to produce usable measurement results.

Areas of Application

Custody Transfer Gas Quality Measurement of Natural Gas and Bio Natural Gas

MGC^{flex} and MGC^{mobile}		
Component	**Formula**	**Measuring range [%]***
Methane	CH_4	≥ 55.00
Ethane	C_2H_6	≤ 15.00
Propane	C_3H_8	≤ 2.90
iso-Butane	C_4H_{10}	≤ 1.50
n-Butane	C_4H_{10}	≤ 1.50
neo-Pentane	C_5H_{12}	≤ 0.10
iso-Pentane	C_5H_{12}	≤ 0.30
n-Pentane	C_5H_{12}	≤ 0.30
Hexane and higher HC´s	C_{6+}	≤ 0.30
Carbon Dioxide	CO_2	≤ 12.00
Nitrogen	N_2	≤ 25.00
Oxygen	O_2	≤ 5.00
Hydrogen	H_2	≤ 10.00 (20.00)**
Helium	He	≤ 0,36

Calculations: *Calorific Value, Standard Density, Wobbe-Index*

**Note: Measuring ranges preliminary*

***Note: Under PTB approval*

Measurement of 100 % Hydrogen and its Impurities

According to PTB TRG 19 and the 5th Gas Family of DVGW Technical Guide G 260 (Sept. 2021)		
Component	**Formula**	**Measuring range [%]***
Hydrogen	H_2	97 - 100
Oxygen	O_2	≤ 1000 ppm
Nitrogen	N_2	≤ 1000 ppm
Methane	CH_4	≤ 1000 ppm
Ethane	C_2H_6	≤ 1000 ppm
Propane	C_3H_8	≤ 1000 ppm
iso-Butane	C_4H_{10}	≤ 1000 ppm
n-Butane	C_4H_{10}	≤ 1000 ppm
Carbon Dioxide	CO_2	≤ 1000 ppm
Carbon Monoxide	CO	≤ 1000 ppm

Calculations: *Calorific Value, Standard Density, Wobbe-Index*

**Note: Measuring ranges preliminary*

Areas of Application

The German natural gas transport network measures 511,000 kilometers. It receives the natural gas at eight border crossing points and distributes it to consumers at the high, medium and low-pressure levels.

In order to establish hydrogen transport networks as quickly as possible, it is obvious to convert the existing natural gas pipelines to use 100% hydrogen. To do this, the existing natural gas must be replaced by hydrogen.

To monitor this process, it is necessary to determine the hydrogen content from 0 to 100 %. The **meterQ** MGC measuring system is ideally suited for this purpose.

Determination of Hydrogen Content from 0 to 100 %

MGC^{flex} and MGC^{mobile}		
Component	**Formula**	**Measuring range [%]***
Methane	CH_4	≤ 100.00
Ethane	C_2H_6	≤ 15.00
Propane	C_3H_8	≤ 9.00
iso-Butane	C_4H1_0	≤ 4.00
n-Butane	C_4H_{10}	≤ 4.00
neo-Pentane	C_5H_{12}	≤ 0.10
iso-Pentane	C_5H_{12}	≤ 0.30
n-Pentane	C_5H_{12}	≤ 0.30
Hexane and higher HC´s	C_{6+}	≤ 0.30
Carbon Dioxide	CO_2	≤ 10.00
Nitrogen	N^2	≤ 20.00
Oxygen	O_2	≤ 5.00
Hydrogen	H_2	≤ 100.00

Calculations: *Calorific Value, Standard Density, Wobbe-Index*

**Note: Measuring ranges preliminary*

Determination of the Natural Gas Accompanying Substances According to G260 and G267

MGC^{flex} and MGC^{mobile}		
Component	**Formula**	**Measuring range [%]***
Hydrogen sulphide	H_2S	≤ 10 ppm
Carbonyl sulphide	COS	≤ 10 ppm
Oxygen	O_2	≤ 10 ppm

Matrix: *Natural Gas*

**Note: Measuring ranges preliminary*

Determination of Odorant (THT) According to G260 in Natural Gas

MGC^{flex} and MGC^{mobile}		
Component	**Formula**	**Measuring range [%]***
Tetrahydrothiophene	THT	≤ 10 ppm

Matrix: *Natural Gas*

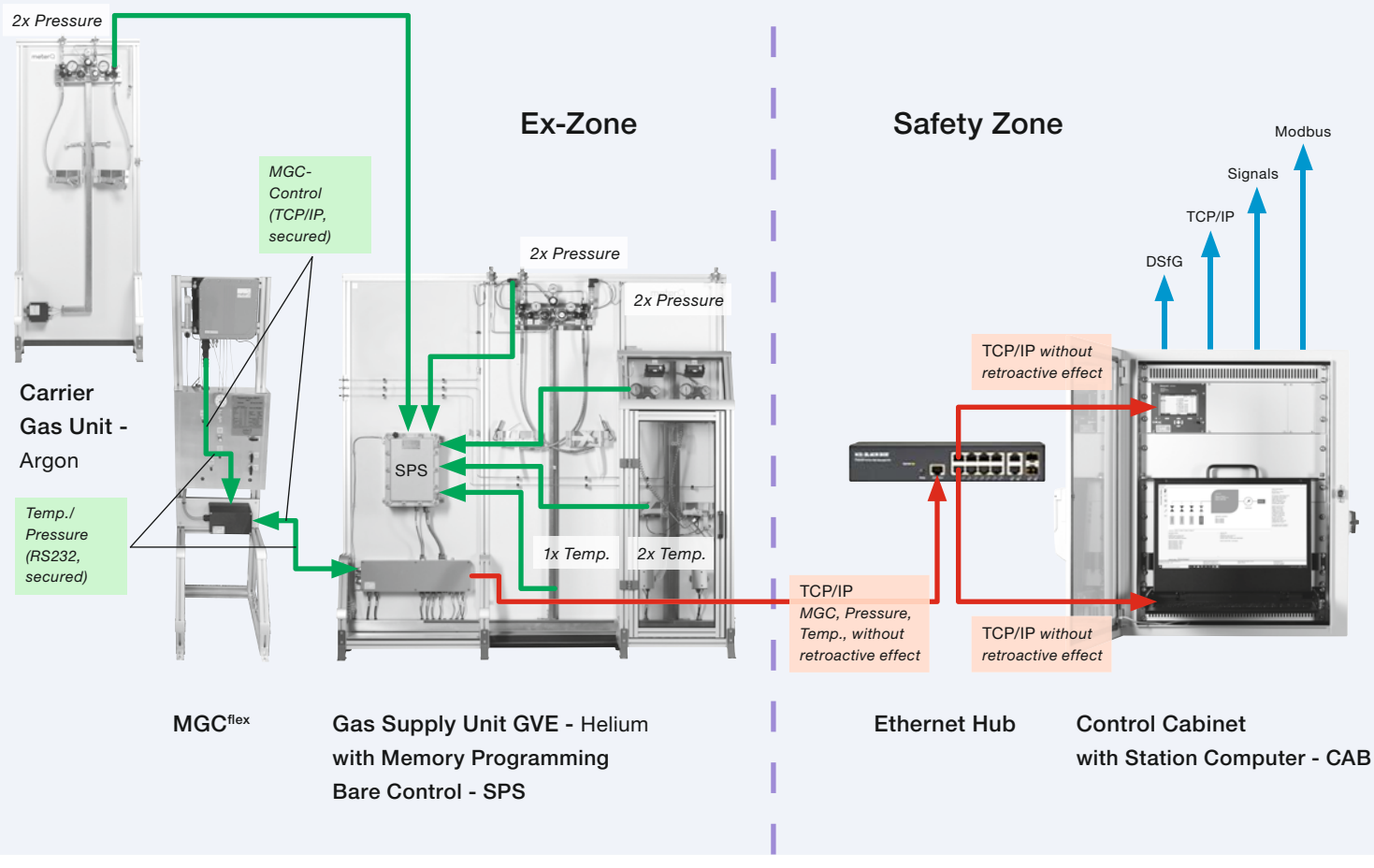
**Note: Measuring ranges preliminary*

System Architecture

How **Meter-Q Solutions GmbH** Implements Digitalization

meterQ consistently implements digitalization through state-of-the-art system architecture and design in the field of analytical measuring systems. All data and signals that are determined or collected in the Ex-Zone are collected in a programmable logic controller (PLC).

This ensures that the largest share of the installation work is done in the factory, and the system check is also done in the factory. Installation problems are already uncovered and rectified before delivery; in contrast to on-site assembly, these errors are generated on site and have to be searched for, found and rectified under difficult conditions.



Another major advantage in consistent digitalization is that all data communication is realized via an ethernet cable. This also leads to a great reduction in on-site installation work. Digitalization means that fewer electrical components are used, making the system much more robust and less susceptible to faults.

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