



WHITEPAPER

No solution for a unique **gas measurement challenge?**

Adaptable technology and easily exchangeable modules multiply the potential applications of process gas analyzers

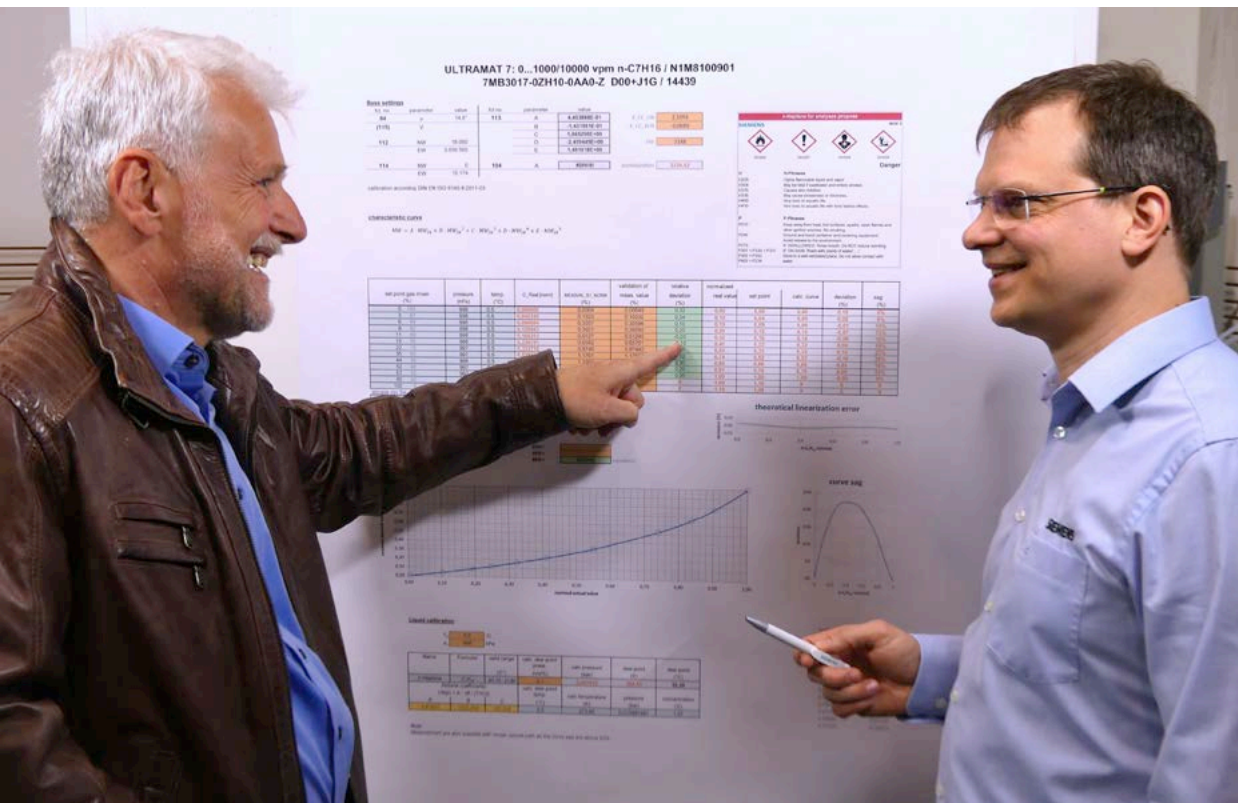
Many continuous gas analyzers are optimized for common but very specific monitoring tasks, for example measuring exhaust gas emissions from combustion. In industrial processing, however, there is demand for a multitude of different gas monitoring capabilities, each requested only rarely, and sometimes for unique combinations of these capabilities. Adding further to the complexity, there is often a need to switch between measurement tasks at regular or irregular intervals, for example when moving from one process to the next. No off-the-shelf solutions are available on the market for such needs.

SIEMENS

The numerous but very special gas analytical challenges in processing

Many processes in the chemical, petrochemical and other industries have a sweet spot at which the combination of high product yield, low running costs and ensured safety is ideal. Reaching this point and maintaining it throughout the process often requires continuous gas analyzers to monitor the concentration of one or more gases. However, depending on the nature of the process and the involved gases, considerable obstacles may have to be overcome. Corrosive gases such as chlorine can damage a regular gas analyzer, and toxic gases like carbon monoxide (CO) pose risks in case of a leakage. The analyzer's gas path can't be heated or its measurement range is unsuitable for an application.

If the gas to be monitored occurs alongside another gas, this may cause cross-sensitivities during detection, as CO₂ does when measuring CO. Moisture in the gas matrix can also cause cross-sensitivities. But solutions can usually be found for such challenges. What this takes is adaptable instrumentation and a supplier with the expertise, experience and resources to devise gas analytical solutions that help industrial customers create value.



Developing together a tailored solution for specific challenges.

The platform Siemens has used for customized applications in industrial processing is the SIPROCESS GA700 continuous gas analyzer. This platform can house two different modules and thus serve applications where a combination of gas measurements is needed, for example in electrolyzer plants. These produce hydrogen from water and separate the hydrogen from the simultaneously produced oxygen. The GA700 can use one module to measure O_2 in H_2 and the other for H_2 in O_2 , with both modules cost-effectively housed in the same analyzer.

Another feature of the SIPROCESS GA700 increases flexibility still further: the modules can be exchanged easily and quickly, allowing the analyzer to be used for a variety of processes with different gas analytical requirements. Convenient switching is made possible by the "Plug&Measure" feature, which makes reconfigurations unnecessary. The configuration data are kept on both the module and the base unit, allowing the data to be mirrored back and forth whenever needed.



Quick and easy exchange of the modules thanks to the „Plug&Measure“ feature.

Tailored variants to serve a multitude of applications

Beyond allowing different, exchangeable modules to be used, the SIPROCESS GA700 offers flexibility in a further respect: Siemens can adapt the analyzer's components to serve applications beyond the established ones. This is achieved in a variety of ways. Parts made of resistant materials can be integrated where aggressive gases would cause damage. Optical filters can be built in to cope with cross-sensitivities between gases. And settings can be changed within the analyzer software, for example the time constant or other parameters, to alter the measurement curve or otherwise adapt the analyzer to new applications. Such changes within the software are usually easier to perform than hardware adaptations.

Examples of parts made of special materials include measurement chambers and tubing made of Hastelloy C22 or stainless steel, and gaskets made of perfluorelastomers (FFKM, Kalrez®). As a customer service, Siemens engineers can examine the usefulness of further materials for an application. What they need to know, of course, is the composition of the customer's gas matrix. This matrix can then be simulated in a dedicated Siemens laboratory with the help of, for example, mixing pumps. The created gas mixture can serve for testing purposes or to properly adjust the analyzer. For working with toxic or aggressive gases, Siemens maintains well equipped and adequately staffed facilities in Germany and France that are approved for all gases.

Solutions have been developed there for vinyl chloride, ethylene oxide, nitrogen monoxide (>3%), hydrogen chloride, and other flammable, explosive or dangerous gases.



Our approved gas laboratories allow for treatment of all gases, even toxic gases.

Industrial customers needing a customized solution initially complete an online form to communicate relevant data, specifications and application requirements. Then, in cooperation with the customer and usually over several feedback loops, a tailor-made solution is devised, its feasibility discussed, tests conducted where necessary and the perfect-fit gas analyzer produced and delivered within an agreed timeframe.

The exchangeable gas analyzer modules currently available

In principle, the SIPROCESS GA700 continuous gas analyzer can be equipped with any two of the ULTRAMAT 7, OXYMAT 7 and CALOMAT 7 modules, either in a wall-mounted housing or in a 19-inch rack with three height units, depending on individual requirements. The software is available in several different languages for a worldwide market.

ULTRAMAT 7 is designed for complex gas mixtures, measuring gases with absorption bands in the infrared wavelength range (e.g., CO, CO₂, SO₂, NO, CH₄, C₂H₄, N₂O, NH₃), optionally with an integrated interfering gas correction feature. Maintenance costs are low because cleaning the analysis cuvettes is easy and can be performed on site. The OXYMAT 7 module is a paramagnetic oxygen measuring unit that can handle low measuring ranges (0 to 0.5% O₂). Its vibration compensation and possibility to physically suppress the zero point (99.5 to 100% O₂) ensure highly reliable and precise measurements. Applications include quality assurance, purity monitoring and

safety-related oxygen measurements. The CALOMAT 7 module measures thermal conductivity to carry out quantitative determinations of, for example, H₂, He, Ar, CO₂ or CH₄ in binary or quasi-binary gas mixtures. With its high measuring range dynamics, it is the ideal solution for a variety of applications, including safety monitoring, inert gas and hydrogen-argon gas monitoring. In addition, CALOMAT 7 is ideally suited for the growing worldwide hydrogen production industry.

In addition to the flexible modules, there is a SIPROCESS GA700 variant with special housing: an Ex d cased field operating device and an Ex d field module, linked by a cable connection. The pressure-capsulated housing of the field module contains an OXYMAT module for an extended temperature range of up to 50 °C and IP65 class protection, allowing operation in hazardous locations. Being able to separately mount the field operating device and the field module makes this solution highly versatile.

Outlook:

The modular gas analyzer concept for niche applications in processing

With fewer and fewer companies employing dedicated gas analyzer specialists, the devices they rely on must be all the more robust, easy to use, and require as little staff training and intervention as possible. On the other hand, many chemical and petrochemical facilities run a wide spectrum of different processes, often not all year round, but consecutively. So, flexibility is a further frequent requirement for gas analyzers in industrial processing. The modular SIPROCESS GA700, which has pattern approval certification for many markets around the world, not only allows easy switching between measurement tasks but is also adaptable to specific monitoring needs.

Experienced Siemens specialists can customize this gas analyzer in many ways to serve even niche applications, calling upon comprehensive resources including purpose-equipped testing laboratories and a worldwide service network. Three exchangeable modules are currently available, and more will be added to the SIPROCESS GA700 portfolio. Additional gas analyzer modules, e.g., for air separation plants and waste incineration emission monitoring, will follow in the coming years.

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