SIEMENS

Process Analytics

Building the future with the proven

Your trusted partner for analytical solutions in processing

Answers for industry.

Contents

Why choose gas chromatography?

“Measure, analyze, optimize!” This fundamental principle of the process industry sums it up: sustainable improvements in processes and efficient production are only possible using accurate measurement procedures and results which are reliable at all times.

All sectors of the process industry are facing similar challenges: increasingly diverse requirements, mounting cost pressure and ever more complex processes. But even though the requirements often seem similar, when it comes down to the details, no process, measuring task, or infrastructure is ever quite the same as any other. This is why precise and reliable analytical methods play such an important role in the success of your business. As a trusted partner of the process industry for many years, we are able to offer our customers state-of-the-art solutions that set standards in their discipline.

Our process analyzers have been in use for more than 50 years, during which time they have steadily built up a reputation for quality, reliability, measuring accuracy and versatility. Gas chromatography has a long tradition with us. And especially for this reason, we are able to offer solutions that are precisely tailored to your requirements. Whether it’s fast chemical reactions and short analysis times, high safety requirements, maximum redundancy or remote operation you are looking for, our team of competent employees is sure to understand your measuring task and provides you with an optimum solution.

The right process gas chromatograph for every measuring task

There are numerous, varied areas of application in process analysis and each user expects their analyzer to meet different requirements. Our MicroSAM, SITRANS CV and MAXUM edition II process gas chromatographs will provide you with just the right solution for each and every application.

MAXUM edition II and its incredible versatility

The versatile MAXUM edition II combines various analytical modules of different types in one system. This broad basis means that you can use the MAXUM edition II for all your different measuring tasks. This significantly reduces your costs for capital investment, training and spare parts.

- The most versatile chromatograph in the world, thanks to a variety of detector types such as FID, WLD, FPD, ECD, HID, PID, which can also be combined into multi detector configurations.
- A flexible oven concept with energy-saving airless ovens and airbath ovens (also available in temperature-programmable version). They are all available as dual ovens. This configuration makes it possible to implement one complex application or two simple applications with just one device, where you would otherwise require two separate chromatographs. The new modular oven is the new standard for concise and quick maintenance and high measuring uptime.
- Parallel chromatography divides a complex application into several simpler sub-applications, which are then analyzed simultaneously. This reduces cycle times and facilitates maintenance.
- The patented, valve-less live column switching technology has been a tried-and-tested feature of our chromatographs for many years. It contains no moving parts and is chemically inert, making it maintenance-free.
- Electronic pressure controllers provide accurate pressure control without the need for throttles or needle valves, which is ideal for our live column switching.
- State-of-the-art TCP/IP communication and Ethernet standard hardware mean compatibility with a wide range of different networks. This simplifies communication between chromatograph, computers and operating personnel.
- On-site operation with the Color Touch Screen HMI is simplicity itself. Intuitive user interfaces reduce training expenditure and speed up operation of the device.
- Remote monitoring of each parameter couldn't be easier thanks to flexible PC operation with Windows-based software and Ethernet communication, as well as high-performance Analyzer System Management Software.

Small size, big performance – MicroSAM

Whether you want to refurbish an existing system or are planning a greenfield project, space-saving is always an important issue in the process industry, and a clear case for MicroSAM. If the micro process GC is installed together with traditional process gas chromatographs (PGCs), significantly smaller analyzer shelters are required at significantly reduced costs. When combined with a user-friendly remote operation concept, the MicroSAM allows for field-mounted operation directly at the sampling point. This is particularly advantageous in those installations where analyzer shelters cannot be used for reasons of space or cost. But the MicroSAM is not only an attractive solution in these situations. It is also recommended for installation at remote locations with limited infrastructure and restricted maintenance potential.

The MicroSAM offers considerable economic advantages when compared to traditional PGCs, both in the initial investment and life-cycle costs:

- Simple analyzer maintenance, even without expert knowledge
- Fast and simple replacement of the analysis module instead of replacing or repairing individual analytic components
- Lower operational costs due to reduced carrier gas and power consumption; no instrument air necessary
- Protection from sun and rain is provided by a canopy or a simple enclosure, rather than using an analyzer shelter
- Shorter sample infeed, return, and waste lines
- Lower sample extraction volume
- Reduced engineering and installation time and costs
- Use of MAXUM edition II software reduces training requirements
- Communication interfaces and network connection as for the MAXUM edition II

MAXUM or MicroSAM: Which device is best suited to my application?

Do you have an application where space in the analyzer shelter is a critical factor?	The most up-to-date silicon-based micromechanics are integrated into the MicroSAM. This allows the size of the device to be reduced to that of a football while increasing its performance at the same time.
Do you need a solution which can be integrated into your complete system without a great deal of investment cost?	The compact and rugged design of the MicroSAM means it can be integrated into the process environment simply and cost-effectively.
Are you looking for a device which can take time-critical measurements as part of complex applications?	The parallel chromatography of the MAXUM edition II enables the distribution of complex applications to several simple units, which shortens analysis times and improves the device serviceability.
Do you find that device maintenance takes a long time and is very complicated?	The average maintenance time for the MicroSAM and MAXUM edition II modular oven is half an hour. And the service can be carried out by staff with practically no training. This increases the availability of your plant.
Do you need a gas chromatograph for samples with complex compositions, trace detection or for liquid samples?	The MAXUM edition II enables applications like temperature-programmed analyses, trace analyses with special detectors or the analysis of liquid, complete and undecomposed vaporizable samples.

The specialist for natural gas analysis: SITRANS CV

The SITRANS CV gas chromatograph is based on the innovative analytic MicroSAM technology and has been developed especially for natural gas analysis. It offers all the advantages of the MicroSAM such as low investment and operating costs.

User software was especially developed for the SITRANS CV to fulfill all the requirements for custody transfer operation of natural gas chromatographs. Special features of this device are: fast, accurate and reliable calculation of higher and lower calorific values, the standard density, Wobbe Index and compressibility factor according to international standards. The system delivers information about natural gas concentrations and quality parameters every 100 seconds with a repeatability variance of < 0.01%.

The SITRANS CV offers significant advantages in terms of analysis and operating costs in comparison to other natural gas chromatographs.

- Linearity over the entire measuring range enables single-point calibration – confirmed by the German National Test Authority (Physikalisch-Technische Bundesanstalt, PTB)
- No impact of ambient temperature and pressure
- Maintenance-free valves based on MEMS chip technology, this means no moving parts and consequently the highest reliability
- Continuous self-testing and automatic optimization of parameterization increase availability
- Self-explanatory and easy-to-use CVControl software
- Flexible installation and assembly – practically anywhere (pipelines, offshore or in general under extreme environmental conditions)
  - Compact design and light weight – only 15 kg
  - Explosion protection EEx d and weatherproof protection according to IP65 / NEMA 4X

Summary of technical data

Product	MAXUM edition II
Analytical system	
Detector types	Thermal conductivity (TCD / 8 cells or 2 cells), Flame ionization (FID); Flame photometry (FPD), Helium ionization (HID), Photo ionization (PID), Electron capture (ECD)
Number of detectors	Max. 3 detector modules
Ovens	Airless oven (single or dual), airbath oven (single or dual) The temperature of dual ovens can be adjusted independently of one another; both oven types are operated isothermally (for exceptions please see oven options)
Temperature ranges	5 – 225 °C (airbath oven), RT +5 – 260 °C (airless oven)
Oven options	Vortex cooling for applications below ambient temperature, temperature-programmable airbath oven
Sample / column valves	Diaphragm valves, diaphragm piston valves, rotary slide valves, liquid dosage valves and “valve-less” live switching
Columns	Packed, micro-packed or capillary separation columns
Gas supply	Up to 8 electronic and up to 6 mechanical pressure controllers
Sample receipt conditions	
Permissible states	Gaseous, liquid
Sample flow	50 – 200 ml / min (gaseous sample); 5 – 20 ml / min (liquid sample)
Min. sample pressure	35 kPa
Max. sample pressure	2070 kPa
Max. sample temperature	120 °C Standard (higher temp. optional)
Communication	
Serial interface	RS232, RS485
Ethernet	Standard 10 / 100 Base T Ethernet, TCP / IP
Protocols	Modbus RTU via serial interface and via Ethernet / OPC (ODBC) via Ethernet
I / Os	Standard: 2 AO, 4 DI, 8 DO pneumatic, 4 DO electrical
Design, enclosure	
Weight	77 kg
Degree of protection	IP54 / category 2
Ambient temperature	–18 to 50 °C
Relative humidity	99 % non-condensing
Certification	
ATEX	ATEX II G EEx pedmib IIB + H2 T1 –T4
CSA	CSA Class I, Div 1; Group B, C, D with Air or Nitrogen purge

MAXUM edition II Modular Oven	MicroSAM / SITRANS CV
Thermal conductivity	Thermal conductivity (micro TCD)
Up to 4x4 cells (16 cells in total)	Max. 8 TCD cells
Airless oven (single or dual) The temperature of dual ovens can be adjusted independently of one another and operated	Isothermal airless oven
60 – 80 °C	60 – 165 °C
None	None
Diaphragm valves M50	"valve-less" live switching
Packed, micro-packed separation columns	capillary separation columns
Up to 6 electronic and up to 4 mechanical pressure controllers	4 electronic pressure controllers
Gaseous	Gaseous, defined energy gas composition (for SITRANS CV)
50 – 200 ml / min	20 – 100 ml / min
35 kPa	10 kPa
500 kPa	50 kPa
80 °C – saturation temperature < 55 °C at sample pressure	120 °C
1 x RS232C or RS485 + 1 x RS485	RS232, RS485
2 x Standard 10 / 100 Base T Ethernet RJ45	Standard 10 Base T Ethernet, TCP / IP
Modbus RTU via serial interface and via Ethernet / OPC (ODBC) via Ethernet	Modbus RTU via serial interface / OPC (ODBC) via Ethernet 1 x RS485 / RS232 Modbus RTU / ASCII (for SITRANS CV)
Standard 2 DO (1 x reserved for system fault) 2 DI	4DI, 4DO MicroSAM (freely configurable), SITRANS CV (DI, 1 = sample flow, 2 = hourly synchronization, 3 = revision (results do not affect average values), 4 = calibration (DO, 3 x samples, 1 x calibration)
up to 60 kg according to features	15 kg
IP54	IP65 / NEMA 4X
–18 °C to 50 °C	–20 °C to 50 °C –20 °C to 55 °C (for SITRANS CV)
99 % non-condensing	90 % non-condensing
ATEX II G Ex pyedmib IIB+H2 T4	ATEX II 2 G Ex d IIC T4, IEC Ex: II 2 G Ex d IIC T4 Gb
CSA Class I Div 1; Groups B, C, D with Air or Nitrogen purge	CSA Class I, Div 1; Group B, C, D Class I, Zone 1; Group IIB + H2 T4 Class I, Div 1; Groups B, C, D T4, Factory Sealed

Successful process analytics require more than just a gas chromatograph

The considerable benefits of gas chromatography can be fully exploited when the outstanding technologies of MAXUM edition II, MicroSAM and SITRANS CV are combined with other factors.

Application

"Application" is the term used for customer-specific system adaptation to the measuring task. It is here that the strengths of the MAXUM edition II, MicroSAM and SITRANS CV show their full effect. Our applications specialists are involved in the process right from the start, bringing years of experience with hundreds of applications with our gas chromatographs. They configure the device, according to detailed customer specifications, including the oven, detectors, valves and separation columns. The appropriate solution is then developed in close collaboration with the customer and introduced during the factory acceptance test.

Sample conditioning

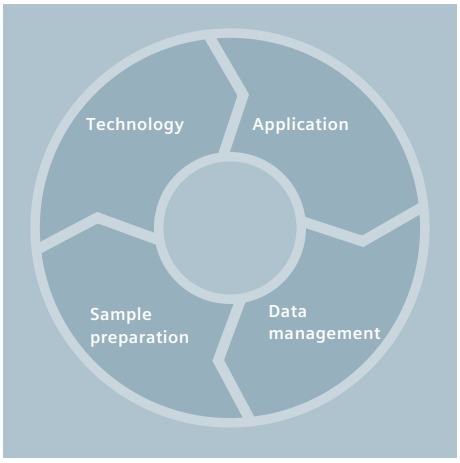
The quality and reliability of the measured values of a gas chromatograph are in direct correlation to the quality of the samples fed into the device. Sample conditioning is an integral part of a reliable analytical solution and furthermore is responsible for 50–80 % of maintenance costs and analyzer-related downtimes. We recommend sample conditioning geared to the gas chromatograph in order to ensure the highest level of reliability and simplified maintenance.

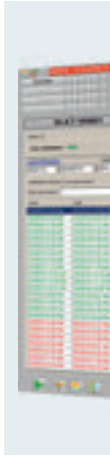
The future will see a trend toward increased automation of sample conditioning. If the sample conditioning process can supply additional measured data such as flow rate, temperature, and pressure, this could help to diagnose faults at an early stage and, as a result, reduce maintenance expenditure.

Data management

Reliable communication between analyzers and the control system is vitally important for process control. While SITRANS CV is fitted with the operator software CVControl necessary for custody transfer, the independent analyzers MAXUM edition II and MicroSAM use the same software and infrastructure for communication. With the help of this infrastructure, measured values can be transmitted, further calculated or corrected if necessary and parameters can be set and modified.

In addition, calibration and validation processes can be triggered and tracked and status signals (also external ones) scanned and processed. Alternatively, our Analyzer System Manager (ASM) can take over these functions.





Software

The Gas Chromatograph Portal workstation software runs on a PC workstation, and provides real-time status for all MAXUM and MicroSAM gas chromatographs in a local area network. In the event of an alarm, interrogating the analyzers is as simple as clicking on the icon for the analyzer in question. This automatically calls up screens that are intuitive to use and display all the analyzer's key performance parameters.

Every gas chromatograph in the network is monitored continuously with the Gas Chromatograph Portal software, mapping current analysis and operating conditions. The results of an analysis, chromatograms or alarm protocols are all but a mouse click away. Furthermore, automatic data logging and reporting functions are fully supported in the Gas Chromatograph Portal.

The operating software CVControl for SITRANS CV makes a user manual practically superfluous. It is self-explanatory and enables comfortable operation of the device. The storage of data within the device, the use of log books, and the various user levels, including password protection, facilitate the installation and operation of SITRANS CV in fiscal metering applications according to different local meterological requirements and standards.

Data communication in line with industry standards

Our gas chromatographs are fully compatible with modern Ethernet networks and offer, when teamed with the corresponding software, access to all measuring results, diagnostics, and key performance indicators (KPIs). They natively support the Modbus TCP / IP-Data-Protocol. This simplifies data transfer for the direct and secure connection to a plant control system. A system expansion into a single joint network is possible without problems and without the practical limitation of the number of gas chromatographs. In this way, a system can quite simply grow in step with analytical requirements, over the course of time. Furthermore, it is possible to configure the system to be fully redundant, in terms of networking and connectivity, for those applications which demand a high level of data security.

Analyzer System Manager

With the Analyzer System Manager (ASM) we offer a PC-based operating and monitoring system for the monitoring, checking and administration of analyzers in subsystems or the entire plant. The intuitive user interfaces provide easy access from the PC to measurement trends, equipment statuses and statistical evaluations or make it possible to start up test routines for the validation of measuring results. A comprehensive reporting module documents the evaluation.

Benefits

- Just one system monitors, tests and administers the most disparate analyzers
- Visualization and operation from simple single-user or distributed multi-user systems with redundant servers
- Evaluation of measuring reliability by checking analyzers with a variety of validation routines, for example, based on the industry standard ASTM D 3764
- Increased analyzer online time
- Statistical evaluation of operating conditions and performance characteristics (KPIs) such as availability, error rate and frequency of maintenance
- Reduction of maintenance costs through device-specific planning, implementation and control of maintenance tasks
- Documentation of the performance – from individual analyzers to the entire system

Field of application

The ASM is ideally suited for all systems and plants where analyzer performance documentation and high reliability of the measured values are required. Distributed analyzers can be monitored from a central workstation through the communication network. The ASM is especially suitable for implementation in the oil and gas, the petrochemical and the chemical industries for the optimization of the analyzer landscape in existing or new plants.

The Analyzer System Manager (ASM) optimizes performance through its intuitive user interface.

Many different industries, varying requirements, one partner for all of your process gas chromatography needs

Our process gas chromatographs are extremely versatile. Customized configurations facilitate use in a wide range of measuring tasks, such as required in chemical and petrochemical processes.

The MicroSAM, MAXUM edition II and SITRANS CV are frequently used to take measurements in the following fields

- **Petrochemicals**
  Ethylene, polyethylene, propylene, polypropylene, benzene-toluene-xylenes, phenols, butadiene, and numerous derivatives; for composition and purity; modern fuel extraction methods, such as gas-to-liquid (GTL) and biomass-to-liquid (BTL)
- **Refining**
  Analysis of light and heavy hydrocarbons; composition and purity; process monitoring of alkylation and reforming; sulfur content of gasoline and diesel, PINA and measurements with simulated distillation
- **Natural gas (preparation)**
  Methane, ethane, and other light hydrocarbons, calorific value, BTU and specific gravity, NGL, LNG, and liquid-gas processes or samples, Wobbe Index and specific gravity
- **Chemistry**
  Fine chemicals, products made by means of polysilicon manufacturing, chlorine gas, and chlorinated hydrocarbons
- **Environmental monitoring**
  Monitoring of ambient air, waste gas, wastewater, and cooling water
- **Industrial gases**
  Nitrogen, hydrogen, gas purity, and air purification, air separation

This list contains just a few examples of applications where the MAXUM edition II, MicroSAM or SITRANS CV are used. The wide range of applications offered by these devices means that many more applications can be implemented which are completely new to process gas chromatography.

Application examples for MAXUM, MicroSAM and SITRANS CV

Polyethylene plants

We have been demonstrating our skills in creating successful analysis systems for polyethylene plants over a number of decades; from planning and engineering to production, installation and maintenance. Process gas chromatographs are indispensable components in ethylene plants. They derive key data from the process and make it available to the operator or the control system. Our devices play an essential part in increasing plant efficiency, verifying that specific regulations are being observed, protecting personnel, plant and the environment, and in lowering emissions in an efficient manner.

LNG plants

LNG is natural gas in liquid form. It therefore has a high energy density, which makes storage and transportation over long distances from the gas field to the consumer economically viable. LNG is produced from natural gas in large liquefaction plants. Process analytics plays an important role in terms of ensuring reliable, efficient plant operation and high product quality.

Process gas chromatographs are the dominant process analyzers found in an LNG plant. They are used not only to determine process data in order to optimize plant operation, but also to ascertain calorific values for billing purposes. With MAXUM edition II, MicroSAM and SITRANS CV we are able to offer solutions for every measuring task arising within the framework of the process and in connection with settlement of accounts, all from a single source.

Comprehensive and reliable: Service and support for process analytics

Our range of services at a glance

- Plant planning and scheduling
- Professional design and engineering of analysis systems (FEED for PA)
- Specialists offer advice in selecting your analytical systems and process devices
- Plant documentation
- Installation, testing, and commissioning
- Remote servicing
- Comprehensive after-sales service

Training

To optimize system availability, we offer you a comprehensive process analytics training program for your planning, operating and maintenance personnel. Training can take place at Siemens Training Centers (Karlsruhe, Houston, Shanghai) or at your site and can be carried out on a system- or application-specific basis. Your benefit: After participation in training, your personnel will be able to carry out servicing work and even certain repair work.

As your trusted partner, we support you with a complete spectrum of reliable service and support. Our services range from planning and professional specialist support to connecting your device to the control system and beyond to comprehensive customer service. You can count on our competent specialists no matter what.

Service contracts

Reduced downtimes and the ability to improve planning of your maintenance costs are just two of the many benefits that come from having a Siemens service agreement in place. We offer packages that cover preventive maintenance, fault elimination and on-call services. We can also put together customized service packages if required.

Worldwide service

Your plants need to run reliably around the clock. Efficient process analytics are essential for achieving this requirement. For this, you need to be able to rely on your providers delivering quick and professional service. Whether you need advice, a fast delivery, or new devices to be installed, we offer a global network of experts who are available in all corners of the globe. By combining process analytics with the latest communication technologies, we are also able to provide effective remote servicing for our gas chromatographs.

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- Make accurate and reliable measuring your recipe for success

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