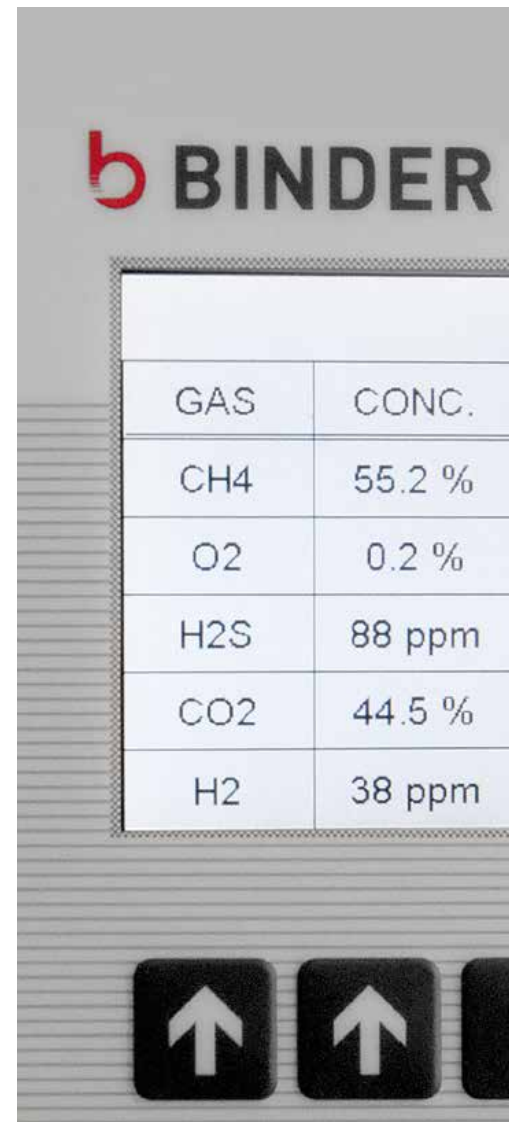


COMBIMASS®

Gas analysis and gas flow measurement systems for portable and stationary operation

For the qualitative and quantitative analysis of biogas, digester gas, landfill gas and syngas




b BINDER

COMBIMASS[®] GA-s hybrid

Metering point	CH ₄ [%]	O ₂ [%]	H ₂ S H [ppm]	H ₂ S L [ppm]
Gas 1	65.0	0.1	333	
Gas 2	61.2	0.3		23

Waiting 0 : 49 : 7
Hour Minute Second

Start Stop Menu



Gas analysis and gas flow measurement

For reliable and cost-effective operation, the gas for modern gas engines in biogas, digester gas and landfill plants needs to meet certain quality standards, the monitoring and recording of which is usually demanded by the engine manufacturer and the plant's insurance. Recording of the current gas production and quality permits improved process control.

Binder offers various solutions for these tasks with **COMBIMASS[®]**: precise biogas flow meter of **COMBIMASS[®] eco** and **eco-bio+** series, completely modular analyzer station **COMBIMASS[®] GA-s hybrid** series with the variants **eco**, **premium** and **syngas**, a portable biogas analyzer **GA-m**, which can be fitted into the **COMBIMASS[®] GA-s docking station** to realize automatic sampling (2-in-1-solution).

In all types of **COMBIMASS[®]** analyzer stations different gas flows and gas compositions of different sampling points are recorded and documented. Flow measurement errors due to changing gas composition, humidity, pressure and temperature are automatically compensated. In addition, rated energy contents of the gas flow and totalized gas flow can be calculated and transmitted.

COMBIMASS[®] eco-bio+ SS FK §35 is a special tamper-proof gas flow meter for agricultural anaerobic digestion plants or CDM-projects with integrated humidity correction for recording the annual raw biogas production in standard cubic metres and therefore is accepted as a monitoring device by authorities.



Portable and stationary measurement systems for gas analysis and flow metering

For decades now, Binder has been supplying leading plant manufacturers with innovative systems for industrial gas flow measurement. In the last few years, the demand for reliable, precise and cost-effective measurement systems for biogas, digester gas and landfill gas as well as gas from solid waste fermentation plants has increased significantly.

Measurements in wet, corrosive and dirty raw gas with fluctuating gas composition place particular demands on the equipment, such as corrosion resistance, accuracy and long term stability. The composition of these gases changes over time due to changes in feedstock composition or process management.

Analysis technology is used to determine the gas composition in the individual fermenter stages, in filter monitoring in front of CHP station and gas injection into gas grids.

In solid waste treatment facilities, bulk biomass with high total solids share (biologically treatable residual materials) is fermented as substrate in dry fermenters and converted into high-quality compost. Since the process is implemented in batch operation, the biogas quantity produced and the gas quality will change considerably across the cycle time.

In the process of wood gasification various kinds of solid biomass residues are used to produce gaseous fuel called syngas.

In sewage treatment plants, the gas analysis is usually used for monitoring the gas quality from purification plants and the H₂S-filter upstream of the cogeneration plants. As compared to the biogas facilities, the quality is, however, subject to much lower fluctuations.

Based on the measured values of the analysis station, a decision on when the filter material should be exchanged can be made with certainty, instead of generally replacing it after specific times.

In landfills, analysis technology is used for long-term monitoring of individual fields or monitoring of the landfill gas quality in the collector pipe. If the gas quality decreases, it may be necessary to mix landfill gas with other flammable gases, such as biogas from an adjacent biogas or solid waste treatment plant, to ensure operation of the CHP.

The linking of flow measurement and gas analysis always provides significant advantages in all cases:

- Always providing the most precise flow measurement, even under changing conditions of humidity and gas composition
- Attractive additional functions by linking the data from both systems



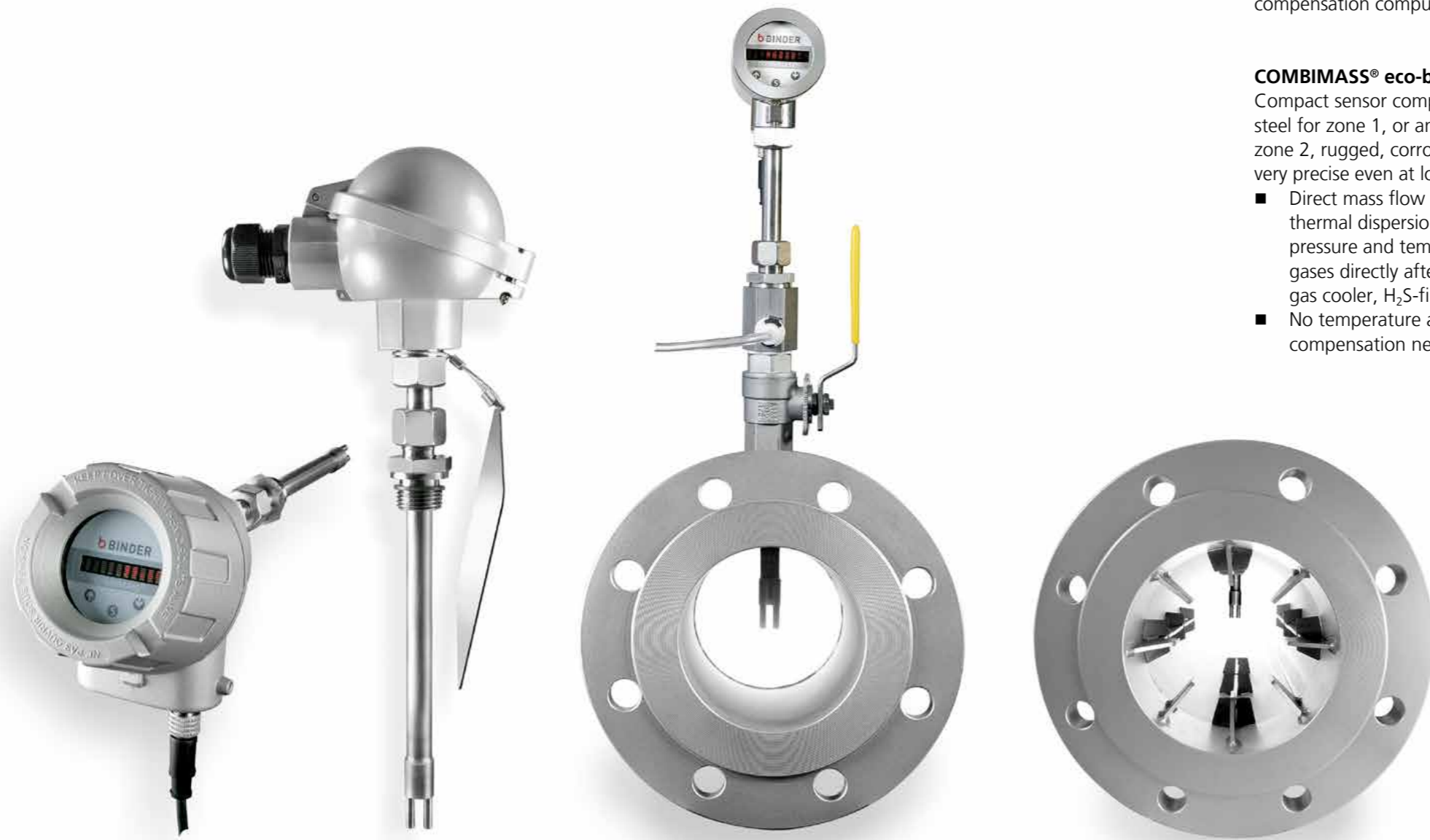
The components of the modular concept are:

- **COMBIMASS® eco-bio+ SS** for biogas: Thermal dispersion gas flow meter, ATEX certified, with integrated humidity correction (option) for direct determination of standard flow according to DIN 1343, manipulation-safe version (option), hot tapping unit (option), display (option)
- **COMBIMASS® eco-bio+ AL** for biogas: Thermal dispersion gas flow meter, for operation in EX-zone 2, hot tapping unit (option), display (option)
- **COMBIMASS® eco** for gas from sludge digester and landfills: Thermal dispersion gas flow meter, with integrated humidity correction (option) for direct determination of standard flow according to DIN 1343, for operation in ATEX-zones 1 and 2, hot tapping unit (option), display (option)
- **COMBIMASS® syngas**: Thermal gas flow meter coupled with a heat conductivity sensor, flanged unit with integrated H₂-compensation, for use in EX-zone 2, display (option)
- **COMBIMASS® OEIN hot tapping unit**: For easy assembly/disassembly of the flow meter eco series for easy maintenance
- **COMBIMASS® flow conditioner**: To improve accuracy of flow measurement when the piping is unfavourable
- **COMBIMASS® GA-m**: Portable analyzer instrument with battery and data logger, for up to 6 gas components, ATEX certified
- **COMBIMASS® GA-s docking station**: Docking station for the portable analyzer GA-m for fully automatic stationary operation
- **COMBIMASS® GA-s hybrid eco**: Simple, cost-efficient, reliable and modular analyzer station for 1–3 gases
- **COMBIMASS® GA-s hybrid premium**: Flexible, modular analyzer station with many additional functions and options, with integrated maintenance diagnostic
- **COMBIMASS® GA-s hybrid syngas**: Modular analyzer station with specially tailored gas modules, simple operation and maintenance



COMBIMASS® biogas flow meter

The field transmitters of the **COMBIMASS® eco** series are suitable for gas flow measurement and cover a wide range of different applications. The instruments can be employed for process temperatures up to 130 °C and are available in various explosion proof versions. The sensor head is made of a single piece of stainless steel and thus resistant to corrosion. The measured values are transmitted via an insulated 4–20 mA analogue output and a freely parametrisable impulse output. Optionally Modbus RTU or a display with operating panel is available to show the current flow rate or totalized flow.



Each flow meter is tested prior to shipment and calibrated at our **CAMASS® Calibration Lab** under actual operating conditions (piping layout, gas composition, pipe diameter, flow direction...). The sensor uses the thermal dispersion principle and directly measures the gas mass or volumetric flow at standard pressure and standard temperature (according to DIN 1343: 0 °C, 1,01325 bar, 0 % rel. humidity) in dry gases. It consists of a heated

electrode and a reference electrode. The gas flowing past cools the heated sensor and thus constitutes a measure for the number of molecules flown passing (mass flow). Biogas and gas from purification plants are usually wet gases. The moisture share is also recorded. The standard volume according to DIN 1343 thus cannot be determined directly. At saturation point, the water content in the gas is calculated based on the gas temperature

and signal compensated for directly in the sensor. Therefore, suitable selection of the probe location permits determination of the dry volumetric flow at standard conditions.

Quantitative measurements based on thermal mass flow are superior to all other methods since they are accurate even at low gas velocities and pressure. An additional benefit is that the necessary compensation can occur in the probe without an additional hardware or compensation computer.

COMBIMASS® eco-bio+ for biogas

Compact sensor completely made of stainless steel for zone 1, or an aluminum housing for zone 2, rugged, corrosion-proof and durable, very precise even at low gas flow and pressure

- Direct mass flow measurement based on thermal dispersion principle at standard pressure and temperature even in wet gases directly after the digester, behind the gas cooler, H₂S-filter or in front of the CHP
- No temperature and pressure compensation necessary

COMBIMASS® eco for digester/landfill gas
Compact sensor completely made of stainless steel for zone 0, 1 or 2, rugged, corrosion-proof and durable, very precise even at low gas flow and low gas pressure

- Direct mass flow measurement based on thermal dispersion principle at standard pressure and temperature even in wet gases
- No temperature and pressure compensation necessary
- Calibration range adjusted to the application
- With integrated humidity correction for direct determination of dry gas flow in standard cubic meter according to DIN1343 (option)
- With a hot tapping unit and ball valve with integrated gas sample connection (option)

COMBIMASS® syngas from gasification plants

Compact thermal dispersion sensor with an aluminium enclosure for EX-zone 2 in combination with a heat conductivity sensor, mounted in a stainless steel pipe section with flanges on both ends of size DN 50–DN 200

- Rugged, corrosion-resistant, wear free guarantee long-term high accuracy
- Direct measurement of mass flow at standard pressure and temperature (DIN 1343)
- Heat conductivity sensor for determination of H₂-concentration
- Compensation of fluctuating gas composition directly in the sensor electronics

COMBIMASS® flow conditioner

The patented **COMBIMASS® flow conditioners** are used for difficult pipeline configurations, after bends, cross-section changes, fittings or pulsating compressors. They smooth the flow profile, almost without pressure loss, ensuring reproducible conditions at the measuring location even if inlet pipe section is short.

Guaranteed precision for COMBIMASS®

When using technically highly developed systems for measuring and controlling gases, calibration becomes the most decisive factor for success. To ensure maximum measurement accuracy, every **COMBIMASS®** measuring device or system is calibrated precisely in the **CAMASS® Calibration Lab** by simulating the actual installation conditions. For difficult applications, even the corresponding pipeline configuration (up to nominal diameter DN 500) can be replicated exactly if necessary. In this way, every effect of flow on the measurement caused by the pipeline and the configuration can be recorded and compensated.

- With integrated humidity correction for direct determination of dry gas flow in standard cubic meters according to DIN1343 (option)
- Tamper-proof version **COMBIMASS® eco-bio+ SS FK §35** (option) for use in CDM and similar projects
- With a hot tapping unit and ball valve with integrated gas sample connection (option)

COMBIMASS® gas analysis

Various technologies are used in the COMBIMASS® gas analysis devices and systems. In addition to the typical non-dispersive infrared sensors, electrochemical and heat conductivity sensors are used to determine the gas composition. All values are measured and compensated for pressure and temperature, so that a high repeatability is achieved.

Manual or automatized calibration ensure very good long-term stability of the measured values. All devices and stations are modular and can be expanded if required. Every system is inspected and calibrated in our CAMASS® Calibration Lab before delivery.

All analysis devices are designed for ease of service. Wearing parts can be replaced by the operator, spare analyzer or gas modules may be provided for the time of maintenance. The following technical solutions for gas analysis are available in the COMBIMASS® GA series:



COMBIMASS® GA-s hybrid premium

Completely modular gas analyzer station, with integrated maintenance diagnostic, flexible design, adjusted to the measuring task:



- Version for one to ten gas streams, with a PLC and 4.3" graphic display, multiple-language menu guidance and operation via touchscreen
- Visualization of the current measured values as well as graphical illustration of the history on a 7" graphic display
- Integrated data storage (option)

- Plastic or stainless steel enclosure for indoor or outdoor installation
- Cyclic or continuous analysis of gas streams
- Manual calibration or auto-calibration function
- Individually equipped with sensor modules installed on top-hat rails
- Automatic compensation of flow signals based on actual gas composition
- Alarm trigger when limits are exceeded or undercut
- Overload protection of H₂S gas sensors
- Data transfer to the central control systems via standard interfaces (analogue signal 4–20 mA, Ethernet, Modbus TCP, Modbus RTU, Profibus DP, Profinet) or via remote connection, e.g. to central data servers
- Remote access for maintenance diagnosis via secured internet or GSM-/GPRS-connection possible
- All wearing parts (pumps, valves, etc.) are mounted on plates for top-hat rail assembly for easy replacement by the operator
- Maintenance diagnostic function permits the monitoring of the wear of the gas cells and maintenance when needed

COMBIMASS® GA-s hybrid eco

Simple, modular designed analyzer station with standardized gas modules, without local graphic display

- For one to three gases (CH₄, O₂, H₂S)
- For one or two gas streams
- Plastic or stainless steel enclosure
- Data transfer analog/digital or Modbus RTU

COMBIMASS® GA-m

Measurement of up to six gas components using optical infrared analysis and long-life electro-chemical cells, with a powerful sample pump and data logging according to sampling sites

- Battery pack, exchangeable in the field
- Field calibration of gas cells at site possible
- ATEX certified for operation in explosive environments

COMBIMASS® GA-s docking station as a "2-in-1"-solution

Gas analyzer station with a PLC and 4.3" graphic display, multilingual menus, operation via touch screen, prepared for cyclic analysis of two gas streams, based on standardized components for gas sampling and pre-treatment, data logging and processing, visualization and data transmission

- Visualization of actual data
- Manual calibration function
- Analog inputs for COMBIMASS® gas flow meter, with automatic compensation of the flow signal based on actual gas concentration
- Automatic alarm triggering in case of under- or overshoot of limits
- Data transmission to the local PLC via standard communication gateways (analog signal 4–20 mA, Ethernet, Modbus TCP, Modbus RTU, Profibus DP or Profinet) or via Remote-dial-in (external access)

COMBIMASS® GA-s hybrid syngas

Completely modular gas analyzer station, special version of hybrid premium series, with PLC and 4.3" graphic display as well as gas dilution system

- Sampling of one to five gas streams
- Gas modules for top-hat rail assembly and adjusted for syngas gas cells and operation ranges
- Automatic alarm triggering in case of under- or overshoot of limits
- Data transmission to the local PLC via standard communication gateways
- Various remote-dial-in versions (external access)





Guaranteed precision

of the COMBIMASS® gas flow meters for biogas and syngas

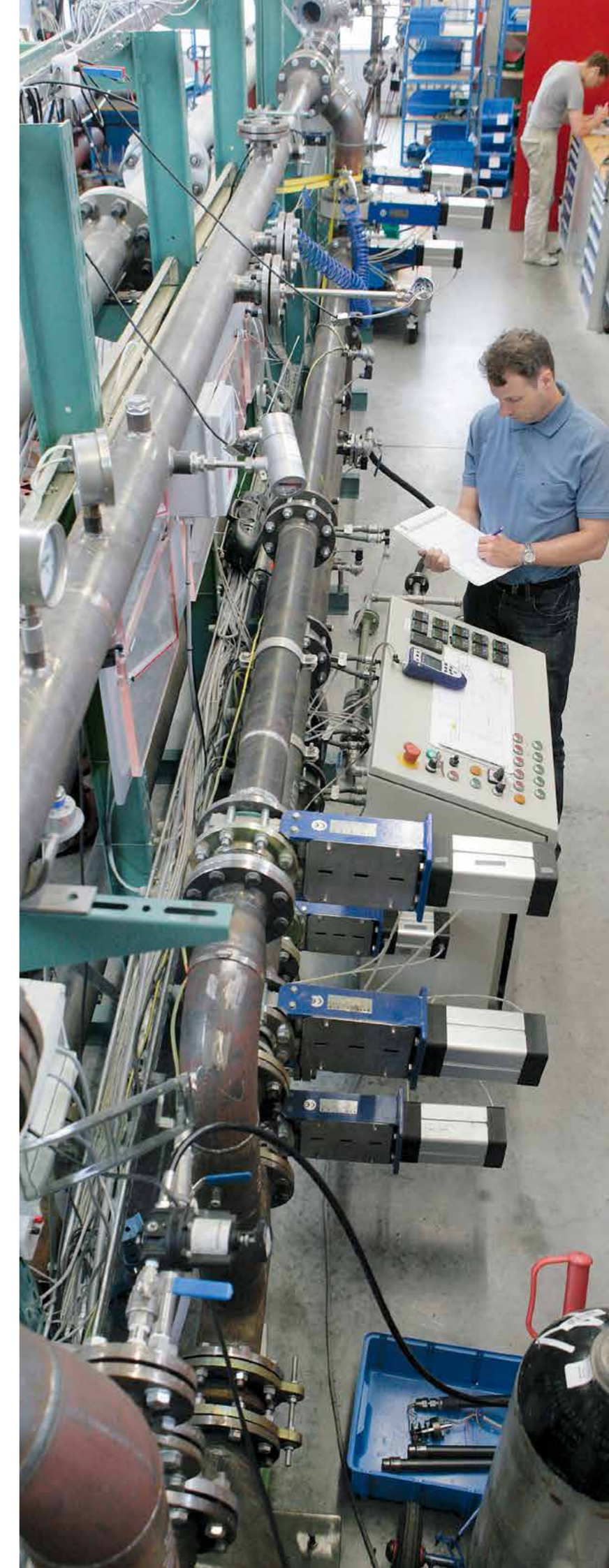
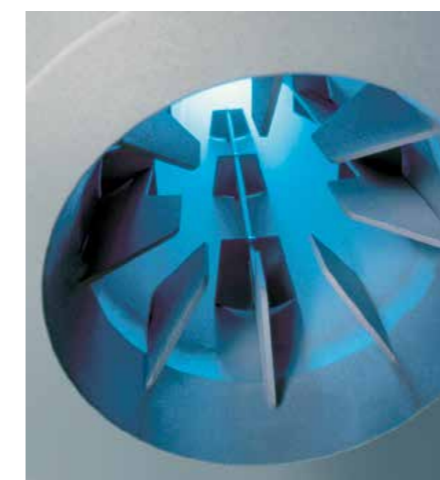
In order to guarantee the precision of the measurement systems, the gas composition, pressure, temperature and loading conditions which will later occur in the customer's plant are precisely simulated.

For difficult applications, even the corresponding pipeline configuration (up to nominal diameter DN 500) can be exactly replicated if necessary. Furthermore the gas flow meter can be calibrated and supplied in a customized spool piece if requirements on accuracy are especially high. In this way, every effect of the pipeline on the measurement and the configuration can be recorded and compensated.

COMBIMASS® flow conditioner

The patented COMBIMASS® flow conditioner made of stainless steel is used for difficult pipeline configurations, after bends, cross-section changes, fittings or pulsating compressors. It smoothes the flow profile, almost without pressure loss, damp flow pulsations, ensuring reproducible conditions at the probe location.

COMBIMASS® flow conditioners reduce the inlet and outflow straight pipe length for measurements to 3–7 times of the pipe diameter. They are rugged and dirt resistant.



CAMASS® calibration technology for gas flow

Calibration is an important success factor when using technologically advanced systems for measuring and analyzing gases. In order to ensure the best possible measurement and control precision, each COMBIMASS® system is precisely calibrated in the CAMASS® Calibration Lab, simulating real operating conditions.

In contrast to liquid media, the properties of flowing gases depend much more on operating conditions, gas composition and the actual flow conditions in the pipeline. If such parameters are not taken into account, considerable limitations must be expected regarding the accuracy of measurements.



Application: Biogas from agricultural anaerobic digestion or solid waste treatment plants

Modern biogas and solid waste treatment plants can not be operated in a cost-effective and environmentally friendly way without appropriate measurement and analysis technology. Analysis technology is used for determination of the gas composition in the individual fermenter stages, in filter monitoring, in gas treatment and in front of the CHP. Other applications are process monitoring in bio-methane upgrade plants, determination of the energy content of the biogas when gas is fed into local micro grids and sold to several customers.

Measurements right downstream of the digester serve to determine the gas yield. The biogas downstream of the digester is particularly moist, usually even saturated. Therefore, it is suitable to install a **COMBIMASS® eco-bio+** with integrated humidity correction downstream of every fermenter to determine the dry biogas mass flow referring to the standard condition. If, in contrast, the gas composition changes more strongly, such as in solid waste fermentation plants, a correction of the gas volume signal from every fermenter based on the current gas composition can make sense.

Biological solid waste treatment plants are often found at landfill sites. There, mostly solid residual materials from households, such as green cuttings and other bio-degradable residues are treated according to the procedure of solids fermentation in single- or two-stage plants. In addition to gas use in CHPs, compost results as an end product, which can be used to achieve further revenues.

During filling and emptying processes, in particular the oxygen and hydrogen sulfide concentrations in the opened boxes must be measured and monitored.



Redundant measuring cells with automatic plausibility check are often used if safety-technical aspects or worker protection must be considered. Alarms are integrated as a standard.

Availability and accuracy of the measured values are very important. The gas modules are therefore typically automatically recalibrated at fixed intervals always to keep the accuracy high. Operators can use a second set of gas modules to be operational again within just a few minutes if a replacement is required. Monitoring of the concentration of sulfur and methane when using the gas is of special importance, since these essentially influence the function, maintenance cycles and efficiency of the CHP. While our **COMBIMASS® eco-bio+** thermal mass flow meter works reliably, precisely and almost without maintenance even under the most difficult conditions, a higher level of technical effort is needed for gas analysis equipment regarding long-term accuracy. This also affects the purchase price and maintenance costs.

Unlimited freedom of design with GA-s hybrid

The **COMBIMASS® GA-s hybrid** analyzer station is completely modular and can be customized with various gas modules, pumps, valves, gas coolers and further components mounted on top-hat rails.

Visualization of the data and wear of gas cells, calibration of the gas cells on site or an auto calibration of the gas modules, an integrated overload protection of the gas cells, alarming of the operator when limits are exceeded or undercut and a simple exchange of all spare and wearing parts by a service company or the operator ensure a high operating safety, always precise measurement values and low maintenance costs.

COMBIMASS® GA-s hybrid eco:

For H₂S-filter monitoring, monitoring of O₂-concentration downstream to the filter, for monitoring of the CH₄-concentration upstream of the CHP or as combination of the three gas components – this cost-efficient version offers standardized basic concepts based on a simple control.

COMBIMASS® GA-s hybrid premium:

Analyzer station with flexible measurement programs, PLC and graphic display, also for complex measurement tasks with multiple gas circuits, remote access and data transfer via GSM/GPRS possible.



Typical applications

Fermentation of organic waste (dry fermentation)

- A dozen sampling points for gas quantity and quality? No problem. Thanks to the unlimited scalability of the **COMBIMASS®** modular concept
- The highest measurement accuracy even for extremely variable gas composition thanks to automatic compensation of flow signal
- Parallel gas circuits and redundant gas modules increase operational safety and availability of data
- Best measurement accuracy, even for the lowest flows, without noticeable pressure loss

H₂S filter monitoring

Process monitoring of hydrogen sulfide removal from raw biogas, control of the air flow blown into the filter based on inlet H₂S-concentration, versions with two H₂S gas modules of different operation ranges are used to measure low concentrations inside or downstream of the filter, gas modules with integrated overload-protection and continuous analysis of O₂ downstream of the filter, solve all measuring tasks at its best.

Gas-2-grid (biomethane)

Process monitoring at removal of hydrogen sulfide, carbon dioxide and remaining moisture from the raw biogas, continuous gas analysis, precise measurement of very low sulfur concentrations and precise measurement of low methane concentrations in the exhaust flow – thanks to high-quality measuring cells, adjusted measuring ranges and auto calibration of the gas modules with different test gases – allow a long-term stable operation. Spare modules on site ensure replacement within a few minutes.

Energy computation for gas sales

The measurement system consists of a **GA-s hybrid premium** analyzer station with a continuous methane analysis and a gas flow meter (with special calibration at high accuracy, installed in a standardized pipe section to avoid pipe-related influences on the gas volume signal) of the **COMBIMASS®** series. A redundant pump, uninterruptable power supply, plausibility checks of the measured values and data transfer to a central data server to avoid manipulations permit a calculated accuracy of the energy content better than 3%.

Monitoring projects

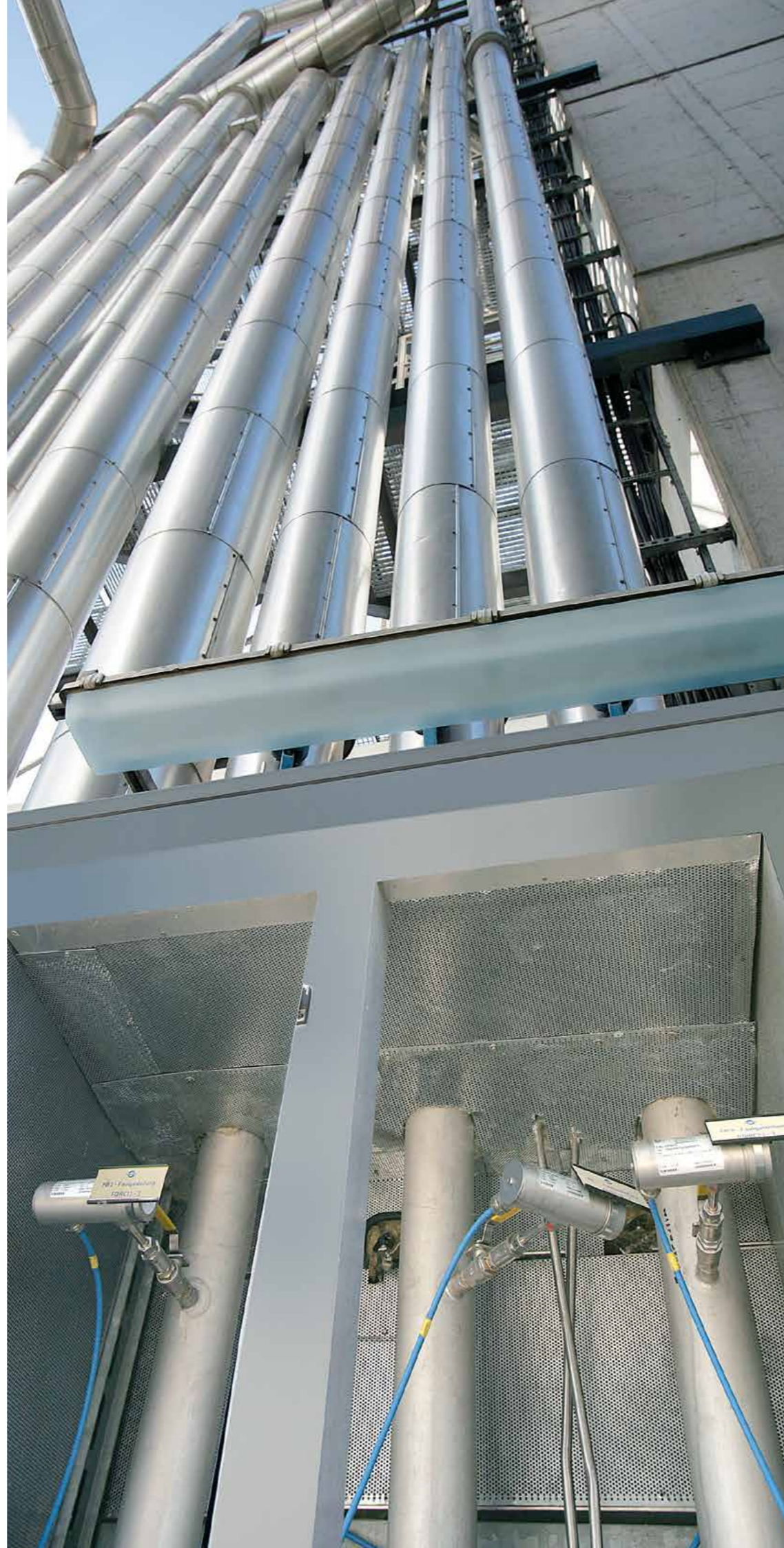
Special tamper-proof versions are available which can be used for monitoring projects e.g. CDM or similar. A special data logger can be used to store the data on a SD-card or to transfer actual data at frequent intervals to a central data server.

Application: Sewage treatment plant

In contrast to biogas systems, the livelihood of a sewage treatment plant does not directly depend on the cost effectiveness of gas generation. Different priorities are set here. Since methane is much more climate-hazardous than carbon dioxide, the fermentation process in the digester must be controlled under exclusion of air. In the past, the biogas was often burnt off in a flare, but today it is essential to utilize this valuable energy source and so significantly reduce the operating costs of the plant.

By implementing sewage sludge fermentation and using the gas for energy production, the plant not only benefits from energy, but the load on the secondary treatment process is reduced by about one third which reduces aeration energy demand by the same amount. Sludge digestion is applied and digester gas therefore is increasingly used in medium-sized and smaller sewage treatment plants when energy optimization is an objective.

For reliable and cost-effective operation, modern gas engines for digester gas require a minimum gas quality. Environmental regulations require modern and powerful gas measuring technology with appropriate data recording. In addition to maximum operational reliability and ability to communicate, cost effectiveness is also indispensable. Stationary measurement systems with stainless steel piping are preferred here. Along with the quantity, they record and document typically the concentration of methane, hydrogen sulfide and oxygen in the digester gas.



Special features for sewage treatment plants

Sewage treatment plants are often operated by regional wastewater treatment utilities. In addition to large plants that require the installation of stationary systems, there are numerous small sewage treatment plants. Here powerful, portable measurement systems can be more cost-effective.

The **COMBIMASS®** concept offers both – stationary and portable measurement systems for better cost effectiveness in your sewage treatment plant.

- Modular designed systems with maintenance diagnostics enable monitoring of the gas cells and early detection of required service
- Competitive full maintenance at a fixed price with optional spare analyzer or spare gas modules while the maintenance or repair is being carried out
- Due to the modular design, the operator can replace all spares and wearing parts on his own without any limitation in warranty
- Very little training needed for the personnel
- A uniform, ergonomic and clear operating philosophy makes expensive training unnecessary
- Maximum user-friendliness via a sophisticated control concept
- External access for data transmission or diagnosis of maintenance
- Future-proof: requirements for extended compulsory documentation and data recording are to be expected. Today our systems are already fully equipped to deal with this. The data format is compatible with Excel, but can also optionally be exported in an essentially manipulation-proof binary format.
- Emergency operation: the **COMBIMASS®** concept provides optional battery back-up operation (UPS). If the power supply fails, important alarm functions are ensured.



For the highest demands

The COMBIMASS® analysis concept is impressive in its flexibility and scalability

In practical operation of a sewage treatment plant, the following design versions – in combination with the COMBIMASS® eco flow meter for digester gas – turn out to be of great benefit:

- **COMBIMASS® GA-s hybrid eco:**
Modular, simple and cost-efficient gas analysis station with fixed measurement program, e.g. for methane, oxygen and/or hydrogen sulfide only
- **COMBIMASS® GA-s hybrid premium:**
Modular gas analysis station with flexible gas modules and flexible measurement program, e.g. for outdoor installation or for co-fermentation plants
- **COMBIMASS® GA-s docking station with a portable GA-m:**
Autonomous portable gas analyzer with ATEX certification, rechargeable battery, sampling gas pump and data logger, which is converted into a stationary measurement system by plugging into the docking station

Tried and tested a thousand times

COMBIMASS® eco flow meter for digester gas have proven themselves for many years in sewage treatment plants around the world and have become a standard. The new generation digester gas flow meter offers an integrated humidity correction for direct determination of dry gas flow at standard conditions.



Application: Landfill

Today, hardly any new landfill sites are being created in Europe, waste separation and waste avoidance are clearly a trend. All the same, high-quality gas measurement technology is needed here, too. During the stable, anaerobic methane phase, the landfill gas is used for energy production in CHPs. Modern gas engines require a minimum gas quality for reliable and efficient operation, the monitoring and recording of which are usually required by the engine manufacturer. The monitoring of motor efficiency gives early warning of damage and helps to minimize it. Taking actual gas consumption and gas generation into account permits optimized performance control.

Combined systems for gas flow measurement and portable/stationary landfill gas analysis

The analyzer stations of the **COMBIMASS® GA-s** series record, evaluate and document gas consumption and gas composition. If the methane content drops over the course of the years of operation, the gas flow signal is automatically corrected. The landfill gas is piped in multiple wells, collected in compressor stations and guided to the generator. Each of the compressor stations needs a stationary measurement system for gas composition and gas quantity, but there is an important additional function: The connected wells are frequently scanned for gas flow and gas quality and the data must be saved. Due to the enormous distances involved, it is not economical or safe to connect the individual wells permanently for fully automatic monitoring. The only meaningful solution is to monitor the wells using portable technology.

The **COMBIMASS® GA-m** is removed from the docking station, whereby the permanently connected flow meter **COMBIMASS® eco** continues to record the gas measurements and compensates with the latest gas composition. For every individual well, the landfill gas volume and the gas composition are then recorded with a portable gas flow meter and saved in the **COMBIMASS® GA-m** with measuring point recognition, date and time by the push of a button. After the round tour, the data are read by a USB-interface and the analysis device is returned to the docking station. This way, several hundred measuring points can be monitored and documented with little effort and greatest operating safety. Even in older landfill sites, where the landfill gas is no longer used actively during the decaying methane phase and is only burnt off in a flare, environmental protection regulations require a further monitoring.



Application: Syngas

Use of the energy potential of biological wastes

Further use of solid organic waste materials led in recent years to a revival of gasification plants. Gas flow meter and analyzer are used for process monitoring. But only the combination of both data points enables the calculation of energy contents in the syngas flow.

A typical configuration for one gasifier contains one flow meter of **COMBIMASS® eco** series, where its flow signal is continuously compensated based on actual gas composition and measured flow in the main collector in front of the CHP units. The analyzer station is used cyclically to measure CH_4 , CO , CO_2 and H_2 in the syngas. The H_2 -concentration significantly influences the calorific value, therefore precise analysis is especially important. A gas dilution system with carrier gas is provided.

The design of the analyzer station **COMBIMASS® GA-s hybrid syngas** is completely modular. All pumps and valves are mounted on plates assembled on top-hat rails for easy maintenance. The gas cells are incorporated into gas modules and even assembled on top-hat rails. Because the accuracy of heat conductivity sensors at high H_2 -concentrations is not very high, a precise electrochemical sensor after dilution with the carrier gas is used in the hybrid syngas station.

The gas modules can be recalibrated in the analyzer station. So long-time accuracy of the data can be achieved. As an option, in addition to a manual recalibration function, an auto-calibration function can be also used, if one or several span gas bottles are permanently connected to the analyzer cabinet. The operator can define its acceptable tolerances of actual readings compared to the span gas composition. If recalibration fails because of increased wear and requirements on accuracy, gas modules can be refurbished at the manufacturer. The time between two service cycles is adjusted automatically by the maintenance diagnostic system based on frequency of use and requirements on accuracy.



COMBIMASS®

A convincing concept

The COMBIMASS® concept is optimal if the following features are important to you:

- Precise gas flow measurement without pressure loss even at low gas speed and flows
- Precise gas flow measurement even with variable gas composition
- Precise gas flow measurement, nearly no maintenance needed, portable and stationary use, at a reasonable price
- High-performance stationary analyzer system with the highest level of precision, scalable, with flow measurement and humidity compensation, easy maintenance, with independent data recording and various types of data transmission
- Long-term stable analysis using recalibration functions, full maintenance or maintenance on request based on real wear, incl. spare analyzer or gas modules for 100 % availability at reasonable prices

For all system operators with high demands who don't have money to waste!





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