POLLUTION
ANALYTICAL EQUIPMENT

Pico GC VOC
PROCESS ANALYSER

# VOC Measuring System in Biogas


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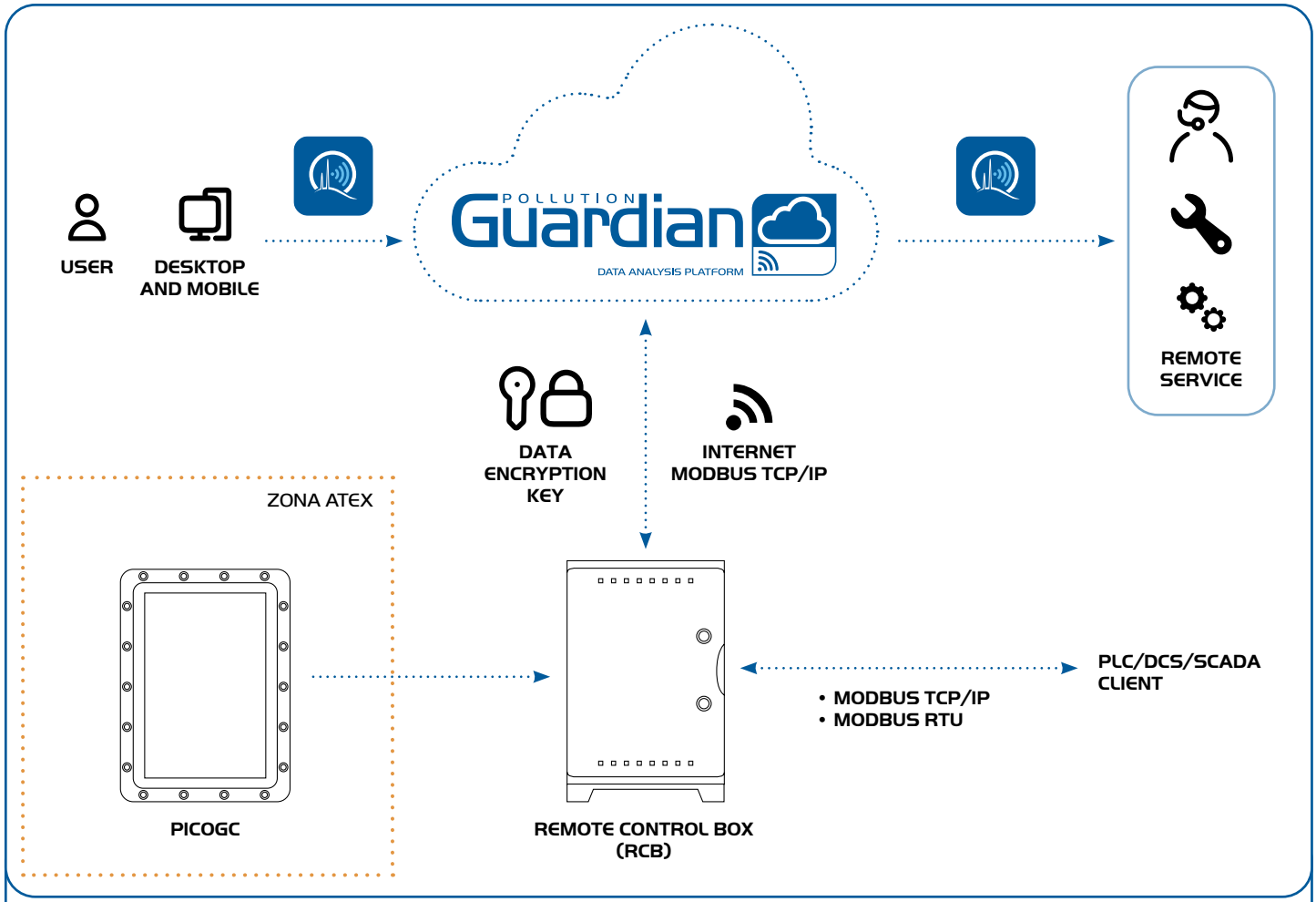
Reliable and ATEX




## POLLUTION GUARDIAN, THE CLOUD SOLUTION FOR REMOTE REAL-TIME DATA ACCESS

PicoGC is fully integrable with the "Pollution Guardian" Cloud service for **monitoring and managing acquired data**. The Pollution Guardian software automatically stores and archives analytical data, enables real-time data visualization and provides access to historical data (with the ability to create tables, charts, and other statistical analyses).

Pollution Guardian also allows users to set customizable alarms on collected data and send notifications via SMS, email, or push notifications on smartphones through the dedicated app. Remote access for PicoGC diagnostics is no longer an issue, as Pollution Guardian makes this operation simple and efficient.

# VOC ANALYSIS SYSTEM FOR OPTIMAL MANAGEMENT OF BIOGAS UPGRADING PLANTS

**PicoGC** is an automatic gas chromatograph for continuous and online determination of VOCs (Volatile Organic Compounds), i.e. the masking and/or interfering compounds affecting biomethane odorants, in accordance with UNI TS 11537:2024, with a method compliant with UNI EN ISO 2614:2023.
Thanks to PicoGC, it is possible **to protect the upgrading system in biogas plants, optimize the quality of the biomethane produced, and ensure compliance with the odorability** requirements necessary for grid injection.

## GAS CHROMATOGRAPHY SERVING BIOGAS PLANTS

**VOCs** (Volatile Organic Compounds) are compounds always present in biogas produced by the anaerobic fermentation of organic material. Their concentration varies depending on the feedstock matrix and seasonality, but, in raw biogas, it can reach up to 5,000 ppm.

In biogas and biomethane production plants, VOCs represent a critical **component of the treated gas stream**. If not properly removed, they can cause significant operational issues, including complete shutdown of the upgrading system due to clogging. Moreover, VOCs **interfere with the biomethane odorization process**, a particularly critical aspect when the gas is intended for injection into the distribution grid.
For these reasons, **VOC removal** is a fundamental step in the upgrading process. The most widely used and effective solution is the application of activated carbon filters, which can reduce VOC concentrations to values below 5 ppm. However, the efficiency of these systems is not constant over time and depends on the saturation level of the carbon, which must be replaced periodically (breakthrough).
Continuous VOC monitoring is therefore essential to verify the effectiveness of the removal system, prevent failures, and optimize operating costs.

**PicoGC** is the practical, reliable, and cost-effective micro gas chromatographic solution for **VOC monitoring**. The device can be configured to analyze the outlet streams from the activated carbon filters.

The system provides a fast and accurate response to a concrete process issue: it optimizes upgrading efficiency, reduces the risk of plant shutdown, and allows full utilization of the activated carbon charge. At the same time, it ensures compliance with safety requirements related to the odorability of biomethane intended for grid injection.

## STRUCTURE

The complete solution for VOC monitoring in biogas/biomethane consists of two main components:

- **PicoGC**: a micro gas chromatograph designed to be installed close to the sampling points, thanks to its ATEX Zone 1 certified enclosure. Compact and reliable, it ensures accurate continuous and remote monitoring of VOCs.
- **RCB - Remote Control Box**: a system for data storage, processing, and communication of the data collected in the field by the PicoGC, transmitting them to the customer's control systems and/or to the proprietary cloud platform, Pollution Guardian.

The system is **compliant with UNI EN ISO 2614:2023** and meets the requirements of UNI TS 11537:2024, performing analyses in a manner equivalent to the portable gas chromatographic systems currently in use.


# SAFETY AND EFFICIENCY WITH PICOGC

## KEY FEATURES

- High analytical accuracy
- Reduced operating costs
- Increased plant profitability
- Easy installation and management
- Low carrier gas consumption
- Robust design
- ATEX Certification: II 2G Ex db IIB+H2 T6 Gb

## APPLICATIONS

Online and automated monitoring of VOC concentration in biogas-to-biomethane upgrading plants:

- Post-activated carbon filter analysis
- Analysis at REMI stations for biomethane injection into distribution networks (DSO)

## SAFETY AND EFFICIENCY WITH PICOGC

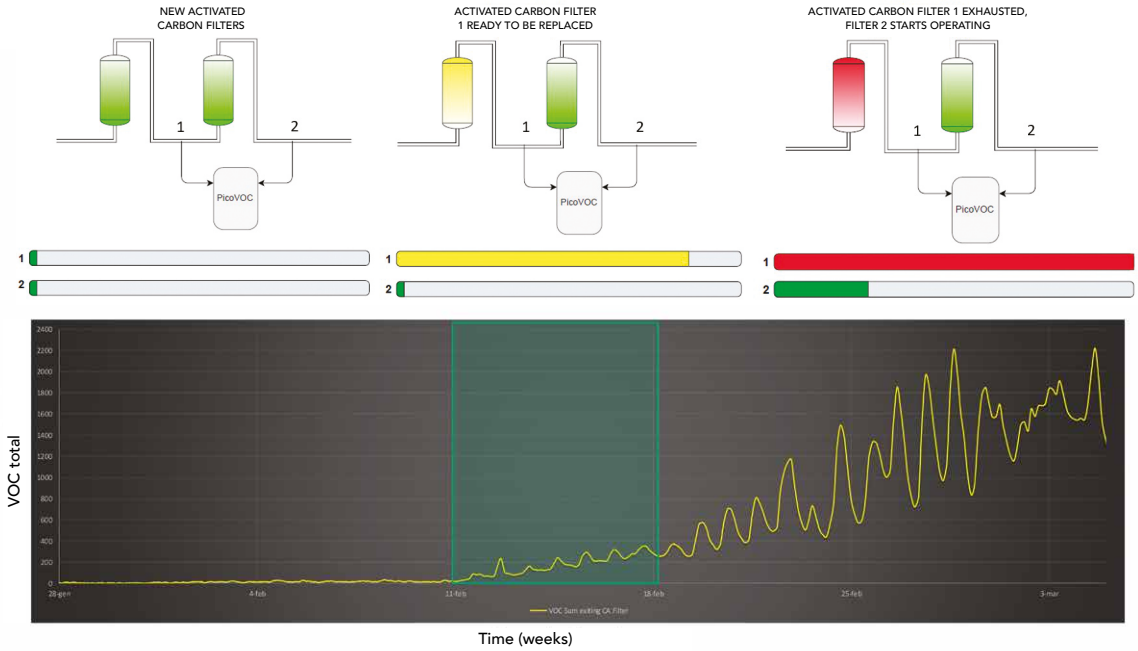
The monitored VOCs include:

- Terpenes (Limonene, Cymene, Pinene, Carene)
- Ketones (Acetone, MEK, etc.)
- Other VOCs available upon request.

These compounds are used as tracers to **measure the efficiency of the abatement system and to promptly alert the operator upon breakthrough detection**, preventing these substances from compromising the upgrading system or the odorability of biomethane. This approach allows the activated carbon filter in the removal system to be replaced only when it has actually reached saturation.

Below is the typical trend of VOC concentration within the removal system. The graph shows how, **once the activated carbon becomes saturated, VOC concentrations increase rapidly**.
It is essential that the analytical system promptly triggers an alarm when concentrations of the target compounds rise, enabling the necessary countermeasures to safeguard the plant, which would otherwise be exposed to high operational risk.

This solution **reduces operating costs and contributes to economic sustainability, especially for small and medium-sized plants**.




PicoGC VOC continuously monitors key VOCs at two sampling points downstream of the activated carbon filters (1 and 2), which are measured alternately. By comparing VOC concentrations in real time, the system detects activated carbon filter saturation (breakthrough) and clearly identifies which filter requires replacement, thereby protecting the upgrading system. Measurement data are transmitted in real time to the control room via Modbus TCP/IP.

# TECHNICAL SPECIFICATIONS

| | | |
|---|---|---|
| Application | Automatic gas chromatograph for VOC monitoring | |
| Functions | Chromatogram acquisition, alarm management, continuous monitoring.<br>Analog and digital I/O status, data protection, PLC communication and supervision, remote server and wireless connectivity | |
| Inputs/Outputs – RCB | 1 x RS485 (Modbus ASCII/RTU) (optional)<br>1 x Ethernet TCP/IP (Modbus / Web APIs)<br>WiFi, 4G | |
| Inputs/Outputs – GC | 1 x Power supply + Data RJ45 (Ethernet) | |
| Supported Protocols | Modbus TCP/IP; Web APIs; Modbus RTU (optional) | |
| ATEX GC Enclosure | IP66, 450 × 350 × 251 mm, < 27 kg | |
| Certifications | CE ATEX II 2G Ex db IIB+H2 T6 Gb - IECEx Ex db IIB+H2 T6 Gb | |
| RCB Enclosure | IP66, 325 × 428.2 × 178 mm, 4 kg | |
| Carrier Gas Connection | 1 x Carrier gas inlet: 1/8" OD Swagelok type | |
| Process Gas Connections | 2 x Sample gas inlet: 1/8" OD Swagelok type | |
| Carrier Gas | Helium (He) or Hydrogen ($H_2$)<br>- He cylinder 14 L @ 200 barg: up to 10 years (4 analyses/hour)<br>- $H_2$ cylinder 14 L @ 200 barg: up to 9 years (4 analyses/hour)<br>- Minimum purity: Grade 5.5 (≥ 99.9995%)<br>- Pressure: 3.5 ± 0.5 barg | |
| Sample Gas Conditions | Recommended pressure: 20 - 100 mbarg; Pmax: 1.5 barg<br>Consumption: 13 mL/min @ 20 mbar (excluding fast loop bypass, if required)<br>Free of particulates and liquids ($H_2O$ < 2000 ppm; particulates Ø < 2 µm) | |
| Analyzed Compounds | Range | Limit of Detection (S/N = 3) |
| Acetone | 0 – 100 ppm | LOD 1 ppm |
| 2-Butanone – MEK | 0 – 100 ppm | LOD 1 ppm |
| Benzene | 0 – 100 ppm | LOD 1 ppm |
| Toluene | 0 – 100 ppm | LOD 1 ppm |
| Ethylbenzene | 0 – 100 ppm | LOD 1 ppm |
| Xylenes (o-, p-, m-) | 0 – 100 ppm | LOD 1 ppm |
| Pinene (alpha & beta) | 0 – 100 ppm | LOD 1 ppm |
| o,p-Cymene | 0 – 100 ppm | LOD 1 ppm |
| Limonene | 0 – 100 ppm | LOD 1 ppm |
| 3-Carene | 0 – 100 ppm | LOD 1 ppm |
| Data Logging | Storage of concentration with configurable lower/upper alarms | |
| Chromatogram storage | > 3 years of continuous measurements with configurable lower/upper alarms | |
| Language | English | |
| Operating Temperature | -35°C to +60°C (Outdoor installation) | |
| Power Supply | 24 V supplied by external RCB (included); - Automatic restart after power interruption | |
| Nominal Power Consumption | 35 W @ 0°C; Maximum instantaneous power draw: 90 W | |
| Analysis Time | < 300 seconds | |

Quality & Process

# THE ANSWER TO YOUR ON-SITE DETECTION CHALLENGES

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