



## MONITORING OF VOLATILE ORGANIC COMPOUNDS Online gas chromatograph – GC 5000 VOC

### Optimized for monitoring of low boiling ozone precursors

The GC 5000 VOC has been developed for the continuous monitoring of emission and immission levels of organic pollutants in ambient air in the range of C<sub>1</sub>-C<sub>6</sub>. The instrument is characterized by its compact design and its outstanding detection sensitivity in the ppt range.

In particular the analyzer can be applied for continuous monitoring of ozone precursors in the range of C<sub>1</sub>-C<sub>6</sub> according to the EU guideline 2002/3/EC from February 12<sup>th</sup> 2002, the VDI guideline 2100 and the guidelines of the Technical Assistance Document EPA/600-R-98/161 of the American environmental protection agency EPA from September 30<sup>th</sup> 1998.

A system for continuous monitoring of the complete range of ozone precursors from C<sub>2</sub>-C<sub>12</sub> can be configured by combining the GC 5000 VOC and the GC 5000 BTX.

### Advanced technology for emissions and immissions control

The GC 5000 VOC features a dual-stage enrichment module for pre-concentration of organic compounds. In the first stage, the low volatile organic compounds will be collected using special adsorption materials. Subsequently the organic compounds will be released by means of thermal desorption technique. Prior to final sample introduction, the components to be analyzed will be focused on the second stage.

This dual-stage sample introduction technique allows using larger quantities of suitable adsorption materials in order to retain even extremely volatile organic compounds, such as ethene or ethine. Subsequent focusing of the sample anyway provides for distinct and well separated peaks in the chromatogram.

Fully automated air sampling is performed using a low-maintenance membrane pump downstream of the enrichment module. While sampling the air volume will be measured precisely using a thermal mass flow sensor, which avoids any impact of pressure and temperature fluctuations as its output signal refers directly to the standard conditions.

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Pre-concentration of the sample is always done at temperatures above the freezing point. This avoids freezing of the enrichment module while sampling even in case of high humidity.

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In particular while monitoring low boiling organic compounds, variations in humidity may cause major interferences in the chromatogram due to peak shifting. In order to avoid this, the GC 5000 VOC features a pre-column switching assembly. Humidity as well as high boiling compounds will be retained in the pre-column and back-flushed subsequently, providing reliable peak identification. Furthermore this feature protects the analytical column resulting in extended durability.

A display and control panel will optionally be available and allows for intuitive touch screen operation providing direct access to all maintenance and diagnostic functions. All parameters and analytical methods can be edited in a convenient manner. The actual operating status of the analyzer as well as chromatograms and results will be displayed on the colour screen.

#### **Reliable operation in monitoring stations**

The online gas chromatograph GC 5000 VOC has especially been developed to be installed in monitoring stations or mobile labs for continuous monitoring of emission and immission levels. The analyzer and the software are designed for stable and reliable operation without any human intervention.

The powerful analyzer software allows controlling and observing the instrument remotely via Ethernet or modem communications. Furthermore data and status messages can be transmitted via serial communications using common standard protocols.

All system parameters will be observed continuously. Any deviation from normal operation will be recorded and stored into a log file. In case of serious malfunctions or instrument failures immediately an error message will be transmitted. Therefore the gas chromatograph meets the highest demands for safe and unattended operation.

To ascertain proper analyzer operation, each controller as well as the operating system and the software will continuously be observed. In case of a system crash the computer will automatically reboot and the gas chromatograph starts in a self-acting manner the next analysis cycle.

#### **Range of applications**

- Ambient air monitoring, immissions and emissions control
- Aliphatic hydrocarbons from C<sub>2</sub> (ethane, ethene, ethine, propane, propene, 1,3-butadiene,...)
- Chlorinated hydrocarbons from C<sub>1</sub> (chlormethane, chlorethane, dichlormethane, vinyl chloride,...)

## TECHNICAL DATA

### General

Enclosure	19" plug-in case
Height	6 height units
Depth	600 mm
Weight	appr. 33 kg
Mounting	designed for cabinet/rack mounting, telescopic slide mounting recommended
Ambient temperature	0°C to 40°C
Humidity	5% to 95% relative humidity, non-condensing
EMC	CE-marking, conformity with EMC-guideline 89/336/EEC

### Instrument supply

Power supply	220-250 VAC, 110-120 VAC (optional)
Line frequency	50-60 Hz
Power consumption	max. 800 Watt
Carrier gas	N <sub>2</sub> , GC Grade, min. 3 bar
Supply gases	Combustion air, GC Grade, min. 3 bar H <sub>2</sub> , GC Grade, min. 3 bar
Supply connections	1/8" bulkhead union
Pressure control	Integrated pressure regulators, electronic readout of carrier gas pressure, manometers for indication of supply gas pressures (for FID only)

### Sampling

Sampling	Low-maintenance membrane pump for automated air sampling
Volume measurement	MFC with thermal flow sensor for precise measurement and control of sample volume irrespective of fluctuations in atmospheric pressure and temperature
Sampling time	0-99 min (adjustable)
Flow rate	2-50 sccm/min (adjustable)
Sample volume	Typical 200-800 sccm (adjustable)

### Enrichment

Enrichment module	Dual-stage enrichment module with integrated thermal desorption, focusing and sample introduction unit for pre-concentration of organic components from C <sub>1</sub> to C <sub>6</sub>
Enrichment temperature	Typical 10°C (adjustable)
Desorption temperature	Max. 350°C (adjustable)
Heating-up rate (Desorption)	Max. 40°C/s
Focusing temperature	Typical 30°C (adjustable)
Sample introduction temperature	Max. 350°C (adjustable)

### Valve oven

Oven liner	Stainless steel
Internal dimensions	H 210 mm x W 80 mm x D 55 mm
Heated valve block	Temperature controlled, adjustable from 30-150°C
Valves	6-Port VALCO valves, electrically actuated, for sample line switching in sample pre-concentration mode, sample focusing mode and sample introduction mode (3 valves in total)

#### Column oven

Oven liner	Stainless steel
Internal dimensions	H 210 mm x W 210 mm x D 55 mm
Pre-column	Polar fused silica capillary column, length 15-30 m, depending on cycle time required
Analytical column	Fused silica capillary column, length 25-50 m, depending on cycle time required
Heating	Forced air
Temperature range	40 °C to 210 °C
Temperature control	Closed loop PID, setpoint resolution 1 °C
Temperature program	3 linear heating ramps, 4 isothermal holds
Heating rate	1 °C/min to 25 °C/min, setpoint resolution 1°C/min
Oven cooling	Fast cooling down time due to forced air cooling

#### Detector

FID	<b>FID – Flame Ionization Detector</b> <ul style="list-style-type: none"><li>▪ Stable signal output due to temperature controlled detector block</li><li>▪ Make-up gas connection provides enhanced detection sensitivity</li><li>▪ Linearity of the FID &gt; 10<sup>7</sup></li><li>▪ Amplifier output 0-5 VDC</li><li>▪ Requires H<sub>2</sub> and combustion air supply</li></ul>
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#### Communication

Communication ports	2 x Ethernet, RS232 / RS485, 4 x USB, PS2, VGA
Protocols	GESYTEC II, other protocols on request

#### Options

- Display and control panel with intuitive touch-screen operation
- Various I/O modules with analog output and digital I/O
- Calibration gas selector (sample, Cal1, Cal2)
- Combustion air supply for FID (dry-running compressor with exchangeable charcoal filter)