



**AMA Instruments GmbH**

Science Park II  
Lise-Meitner-Str. 8  
89081 Ulm, Germany  
Tel +49 731 850774-0  
Fax +49 731 850774-10

info@ama-instruments.com  
www.ama-instruments.com

## Air quality and industrial site monitoring

Online gas chromatograph – GC 5000 series

### **Optimized for monitoring of organic pollutants in ambient air**

The GC 5000 series of gas chromatographs have been developed for the continuous monitoring of organic compounds. The instruments are characterized by their rugged and compact design and their outstanding detection sensitivity in the low ppb to ppt range. The instruments allow for cabinet/rack mounting in AQMS, containers and mobile vans for monitoring of air pollutants in unattended operation mode.

Various configurations of the GC 5000 series are available to cover a wide range of applications, such as monitoring of BTEX acc. European Directive 2008/50/EC, monitoring of ozone precursors acc. to the PAMS target list of VOC's published by the U.S. EPA, monitoring of sulfur organic compounds, solvents, chlorinated hydrocarbons and other organic pollutants and air toxics.

The GC 5000 series of analyzers is type approved and QAL1 certified by German TÜV acc. EN 14662-3 and EN 15267 for monitoring of benzene in ambient air. This proves the high quality standard of the instruments and its suitability for air quality and industrial site monitoring applications.

### **Advanced sample enrichment technology**

The GC 5000 series features either single stage or dual-stage sample pre-concentration of organic compounds. Fully automated air sampling is performed using an integrated, low-maintenance membrane pump. Both – sampling flow rate and sampling volume – will be measured and controlled precisely using a digital mass flow controller and is not affected by any fluctuations in ambient pressure and temperature.

The single-stage sample enrichment module allows for quantitative pre-concentration of volatile organic compounds in the range from C4 to C12. Subsequent sample introduction is performed by means of thermal desorption technique. Digital PID temperature control, active peltier-cooling and heating of the adsorbent tube using high, but precisely controlled short circuit currents, allow for well controlled temperatures during sampling and sample introduction.

Optionally the GC 5000 series features unique dual-stage sample enrichment technology for pre-concentration of very low boiling organic compounds, such as ethane, ethylene and acetylene. Breakthrough of these extremely volatile compounds will be avoided even at sampling temperatures well above 0°C due to a high capacity pre-concentration tube. This allows to retaining low boiling organic compounds quantitatively and avoids freezing of the flow path while atmospheric humidity will be high. Prior to sample introduction, the organic compounds will be focused on a second stage providing for distinct and well separated peaks in the chromatogram.

### **Field proven detector technology**

AMA Instruments GmbH has more than 20 years of experience in developing and manufacturing of GC detectors. Two types of detectors are available for the GC 5000 series, a Flame Ionization Detector (FID) and a Photo Ionization Detector (PID). Both detectors have especially been designed for air quality monitoring applications in the field and are characterized by their ruggedness, superior long-term stability, excellent reproducibility and unmatched detection sensitivity.

Many PID's having mainly been developed for laboratory type of gas chromatographs and using DC operated high voltage UV lamps are known for their significant drift over longer periods of time. Therefore these common PID's are not ideally suited for field operation. In contrast to this, the PID available for the GC 5000 series is using a RF excited UV lamp providing excellent long-term stability. Also detection sensitivity of this type of detector is superior and allows for monitoring of benzene at concentration levels of 10 ppt (MDL) or even lower.

### **System control software with powerful PEAK.log™ Chromatography Data System**

The system control software for the GC 5000 series allows to controlling complete monitoring systems combining just one or even more GC systems with a dilution calibrator and additional gas generators. All data, settings, chromatograms and results will be stored in a SQL database and can easily be retrieved. The powerful **PEAK.log™** Chromatography Data System is fully integrated into the system control software and offers unique features, such as peak shift compensation.

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## TECHNICAL DATA

### General

Dimensions, weight	19" x 6 HU x 600 mm, appr. 35 kg – depending on instrument configuration
Mounting	designed for cabinet/rack mounting, telescopic slide mounting recommended
Ambient conditions	0°C to 40°C, 5% to 95% relative humidity, non-condensing
EMC	CE-marking, conformity with EMC-guideline 2004/108/EG
Display	Glass front panel with integrated 12,1" TFT display, resolution 1280 x 800 pixel
Instrument control	integrated industrial PC board, MS Windows based system control software
Data storage	integrated solid state disk (SSD), SQL database
EMC	CE-marking, conformity with EMC-guidelines 2004/108/EG

### Instrument supply

Power supply	220 - 250 VAC, 100-120 VAC (optional)
Line frequency	50 - 60 Hz
Power consumption	max. 800 W
Carrier gas	N <sub>2</sub> (GC grade, min. 5.0) or H <sub>2</sub> (for FID only, GC grade, min 6.0), 3 bar
Supply gases	Combustion air, GC Grade, min. 3 bar (for FID only) H <sub>2</sub> , GC Grade, min. 3 bar (for FID only)
Supply connections	1/8" bulkhead union
Pressure control	Integrated pressure regulators, electronic readout of carrier gas pressure, manometer for indication of combustion air pressure (for FID only)
Flow control	MFC for precise flow control of hydrogen supply (for FID only)

### Sampling

Sampling	Integrated, low-maintenance membrane pump for automated air sampling
Flow rate control	MFC for precise measurement and control of sampling flow rate and sampling volume irrespective of fluctuations in atmospheric pressure and temperature
Sampling time	0-99 min (adjustable)
Flow rate	10-50 sccm/min (adjustable)
Sample volume	Typical 200-800 sccm (adjustable)

### Sample pre-concentration

Single-stage	Single-stage sample enrichment module <ul style="list-style-type: none"> <li>• suitable for organic components <math>\geq C_4</math></li> <li>• allows for sample pre-concentration and subsequent sample introduction by means of thermal desorption technique</li> </ul>
Dual-stage	Dual-stage sample enrichment module <ul style="list-style-type: none"> <li>• suitable for organic components from C<sub>1</sub> to C<sub>6</sub></li> <li>• allows for sample pre-concentration, sample focusing and sample introduction by means of thermal desorption technique</li> </ul>
Typical parameters	<ul style="list-style-type: none"> <li>• active peltier cooling and heating for precise temperature control of enrichment &amp; focusing tubes</li> <li>• typical enrichment/focusing temperature 10°C ... 30°C (adjustable)</li> <li>• max. desorption/injection temperature 350°C (adjustable)</li> <li>• typical heating-up rate 40°C/s</li> </ul>

### Valve oven

Oven liner	Stainless steel
Internal dimensions	H 210 mm x W 80 mm x D 55 mm
Heated valve block	Closed loop PID temperature control, adjustable from 30-150°C
Sample valve	up to three 6-Port or 10-Port rotary type VALCO valves, electrically actuated

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#### Column oven

Oven liner	Stainless steel
Internal dimensions	H 210 mm x W 210 mm x D 55 mm
Columns	<ul style="list-style-type: none"><li>analytical column, fused silica capillary, max. length 60 m</li><li>stripping column (optional), fused silica capillary</li></ul>
Heating	Forced air
Temperature	range 40°C to 210°C
Temperature control	Closed loop PID temperature control, 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

#### Type of detectors

FID	FID – Flame Ionization Detector <ul style="list-style-type: none"><li>temperature controlled detector body</li><li>linear detector response &amp; superior long-term stability</li><li>requires H<sub>2</sub> and combustion air supply</li></ul>
PID	PID – Photo Ionization Detector <ul style="list-style-type: none"><li>temperature controlled detector body</li><li>electrodeless, RF excited UV lamp for excellent long-term stability and extended lifetime</li></ul>

#### Communication

Communication ports	2 x Ethernet, RS-232 / RS-485, 4 x USB, VGA
Protocols	GESYTEC I (Bayern-Hessen), GESYTEC II, Modbus RTU

#### Standard Configurations

GC 5000 BTX	Single-stage sample enrichment, FID or PID, analytical column AMAsep 1, monitoring of BTEX, styrene and ozone precursors (C <sub>6</sub> -C <sub>12</sub> )
GC 5000 B-BTX	Single-stage sample enrichment, FID or PID, analytical column AMAsep SilicaPLOT, monitoring of 1,3-butadiene & BTEX
GC 5000 VOC	Dual-stage sample enrichment, FID, analytical column AMAsep AluminaPLOT, stripping column AMAsep WAX, monitoring of ozone precursors (C <sub>2</sub> -C <sub>5</sub> )
GC 5000 Organic Sulfur	High-capacity single-stage sample enrichment, Sulfinert® coating of tubing, fittings and valves, PID, analytical column AMAsep SilicaPLOT, monitoring of sulfur organic compounds, such as methyl sulfide, dimethyldisulfide, mercaptanes, ... & benzene and toluene

**Note: Other configurations of the GC 5000 series for specific applications on request.**

#### Options and accessories

- Glass front panel with 12,1" capacitive TFT touch screen, resolution 1280 x 800 pixel
- Calibration gas selector (Sample, Cal1, Cal2)
- DIM 200 – Dilution Calibrator for fully automated multi-level calibrations and/or fully automated instrument validation (zero/span check)
- HG 300 – HP Hydrogen Generator for supply of combustion gas
- HG 500 – UHP Hydrogen Generator for supply of combustion gas and carrier gas
- ZAG 300 – HP Zero Air Generator for supply of hydrocarbon free zero air

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