

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000034862_03

Certified AMS: Gaschromatograph GC 5000 BTX Version FID for Benzene

Manufacturer: AMA Instruments GmbH
Lise-Meitner-Strasse 8
89081 Ulm
Germany

Test Institute: TÜV Rheinland Energy GmbH

**This is to certify that the AMS has been tested
and found to comply with the standards**

**VDI 4202-1 (2018), EN 14662-3 (2016),
EN 15267-1 (2009) and EN 15267-2 (2009).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 8 pages).
The present certificate replaces certificate 0000034862_02 dated 28 February 2017.



Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular Surveillance

www.tuv.com
ID 0000034862

Publication in the German Federal Gazette
(BAnz.) of 22 July 2019

This certificate will expire on:
21 July 2024

German Federal Environment Agency
Dessau, 05 November 2019

TÜV Rheinland Energy GmbH
Cologne, 04 November 2019



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Test institute accredited to EN ISO/IEC 17025:2005 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

| | |
|-------------------------------|--|
| Test report: | Addendum: AMA 143-01 FID/18D dated 21 February 2019 and test report 143-02R1/09 dated 8 June 2009 |
| Initial certification: | 16 March 2012 |
| Expiry date: | 21 July 2024 |
| Publication: | BAnz AT 22.07.2019 B8, chapter III number 3.1 |

Approved application

The tested AMS is suitable for continuous ambient air monitoring of Benzene (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three months field test at a traffic related location.

The AMS is approved for an ambient temperature range of +5 °C to +35 °C.

The notification of suitability of the AMS, performance testing, and the uncertainty calculation have been effected on the basis of the regulations valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure in consultation with the manufacturer that this AMS is suitable for monitoring the limit value relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended purpose.

Basis of the certification

This certification is based on:

- Addendum: AMA 143-01 FID/18D dated 21 February 2019 and test report 143-02R1/09 dated 8 June 2009 of Landesanstalt für Umwelt Baden-Württemberg (LUBW), Karlsruhe
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz AT 22.07.2019 B8, chapter III number 3.1,
Announcement by UBA dated 28 June 2019:

AMS designation:

Gaschromatograph GC 5000 BTX Version FID for Benzene

Manufacturer:

AMA Instruments GmbH

Approval:

For continuous ambient air monitoring of benzene concentration
(stationary operation)

Measuring ranges during the performance test:

Benzene 0–50 µg/m³

Software version:

AMA_System.Control v.1.25 (software for GC control)
AMA_Peak.log v.1.1 (software for chromatogram evaluation)

Restrictions:

1. The AMS does not have a living zero.
2. The measuring system can only be properly operated up to a vacuum of 86 kPa.

Notes:

None

Test report:

Landesanstalt für Umwelt Baden-Württemberg (LUBW), Karlsruhe
Addendum to the test report no.: AMA 143-01 FID/18D dated 21 February 2019
(part of LUBW test report: 143-02.R1/09 dated 8 June 2009)

Certified product

This certificate applies to automated measurement systems conforming to the following description:

The online gas chromatograph GC 5000 BTX has been developed for the continuous measurement of benzene, toluene, m-p-xylene, o-xylene and ozone precursors (C6 to C12) in ambient air.

The tested AMS is installed in a 19 inch housing with the following technical specifications:

Housing 19 inch

Height: 6 rack units (U)
Depth: 600 mm
Weight: approximately 33 kg
Ambient temperature range: 0 to 40 °C

Voltage and gas supply

Voltage: 220 – 250 VAC, 50 Hz
Power: max. 800 W
Carrier gas: N₂ 5.0 (12 ml/min)
Burning air: Synthetic air or catalytic purified compressed air
Burning gas: H₂ 5.0 (37 ml/min)
Gas connection: Swagelok, 1/8 inch
Detector: FID

Sampling system

Pump: Maintenance free diaphragm pump
Volume measurement: MFC – mass flow controller with thermal sensor
Sampling duration: 15 min
Sample flow rate: 20 ml/min (normal conditions, dry)
Sampling volume: 300 ml (normal conditions, dry)

Accumulation

Adsorber: Carbotrap
Accumulation temperature: 30 °C
Desorption temperature: 230 °C

Valve Oven

Temperature: 80 °C
Sample switch: 6-port-valve

Column Oven

Separating column: Quartz capillary column
AMAsep 1 - 0.32 mm ID/ 30 m / 1.5 µm film
Temperature program: 50 °C 3 min, 8 °C/min, 130 °C 5 min oven cooling
Cooling: Forced cooling by opening the column oven and air recirculation

Communication interfaces

Interfaces: 2 Ethernet, RS 232, RS 485, 4 USB, PS2, VGA
max. 16 analogue outputs (4 - 20 mA, 0 - 20 mA, 0 - 5 V, 0 - 10 V),
digital inputs/outputs, field bus connection
Protocols: Gesytec-II, Modbus, Profibus, others on request

General notes

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energy GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate. This certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: gal1.de.

History of documents

Certification of Gaschromatograph GC 5000 BTX Version FID is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic approval

Test report No.: 143-02.R1/09 of 08 June 2009
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz. 25 August 2009, No. 125, page 2929, chapter II no. 3.1
Announcement by UBA from 03 August 2009

Notification

Statement of TÜV Rheinland Energie und Umwelt GmbH, Cologne of 29 September 2011
Publication: BAnz. 2 March 2012, No. 36, page 920, chapter V notification 13
Announcement by UBA from 23 February 2012
(new software version, new power supply)

Initial certification according to EN 15267

Certificate No. 0000034862_00: 16 March 2012
Expiry date of the certificate: 01 March 2017
Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
dated 30 January 2012
Test report: 143-02.R1/09 of 08 June 2009
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz. 2 March 2012, No. 36, page 920, chapter V notification 21
Announcement by UBA from 23 February 2012
(comply with the requirements of EN 14662-3 2005)

Notifications

Statement of TÜV Rheinland Energie und Umwelt GmbH, Cologne of 23 March 2015
Publication: BAnz AT 26.08.2015 B4, chapter V notification 52
Announcement by UBA from 22 July 2015
(new software and hardware)

Certificate based on a notification

Certificate No. 0000034862_01: 25 April 2016
Expiry date of the certificate: 01 March 2017
Statement of TÜV Rheinland Energie und Umwelt GmbH of 21 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 2
Announcement by UBA from 18 February 2016
(new hardware parts)

Renewal of the certificate

Certificate No. 0000034862_02: 28 February 2017
Expiry date of the certificate: 01 March 2022

Notifications

Statement of TÜV Rheinland Energy of 06 January 2017
Publication: BAnz AT 31.07.2017 B12, chapter II notification 36
Announcement by UBA from 13 July 2017
(new software)

Supplementary testing according to EN 15267

Certificate No. 0000034862_03: 05 November 2019
Expiry date of the certificate: 21 July 2024
Test report AMA 143-01 FID/18D dated 21 February 2019
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz AT 22.07.2019 B8, chapter III number 3.1
Announcement by UBA dated 28 June 2019
(approval according to EN 14662-3)

Expanded uncertainty, System 1

| Parameter | Minimum requirement | value | Given benzene-conc. C _i | sensitivity coefficient | X _{min} | X _{max} | u | u ² |
|--|--|--|------------------------------------|--|------------------|------------------|--------------------------|---|
| Repeatability standard deviation ¹ | ≤ 0,25 µg/m ³ | 0,08 µg/m ³ | 5,9 µg/m ³ | | | | 0,02 µg/m ³ | 0,0005 (µg/m ³) ² |
| Largest deviation of linearity ² | ≤ 5,0 % | -3,23 % | 5,4 µg/m ³ | | | | -0,09 µg/m ³ | 0,009 (µg/m ³) ² |
| Change of the sample gas pressure ² | ≤ 0,1 (µg/m ³)/kPa | 0,02 (µg/m ³)/kPa | 37,2 µg/m ³ | 0,02 (µg/m ³)/kPa | 86 kPa | 110 kPa | 0,04 µg/m ³ | 0,002 (µg/m ³) ² |
| Change of the surrounding temperature ¹ | ≤ 0,08 (µg/m ³)/K | 0,04 (µg/m ³)/kPa | 38,1 µg/m ³ | 0,04 (µg/m ³)/kPa | 278 K | 308 K | 0,08 µg/m ³ | 0,01 (µg/m ³) ² |
| Change of the electrical voltage ¹ | ≤ 0,08 (µg/m ³)/V | 0,013 (µg/m ³)/V | 41,7 µg/m ³ | 0,01 (µg/m ³)/V | 210 V | 245 V | 0,031 µg/m ³ | 0,0009 (µg/m ³) ² |
| Interfering component H ₂ O (19 · 10 ³ ppm) ² | ≤ 0,015 (µg/m ³)/10 ³ ppm | -0,0002 (µg/m ³)/10 ³ ppm | 4,9 µg/m ³ | -0,0002 (µg/m ³)/10 ³ ppm | 0,6 Vol.-% | 2,1 Vol.-% | -0,002 µg/m ³ | 0,00001 (µg/m ³) ² |
| Carry over (memory-effect) ¹ | ≤ 1,0 µg/m ³ | 0,53 µg/m ³ | 41,7 µg/m ³ | | | | 0,04 µg/m ³ | 0,001 (µg/m ³) ² |
| Reproducibility standard deviation under field conditions ¹ | ≤ 0,25 µg/m ³ | 0,14 µg/m ³ | | | | | 0,14 µg/m ³ | 0,02 (µg/m ³) ² |
| Long term drift at span-value ¹ | ≤ 10,0 % | -1,4 % | 41,8 µg/m ³ | | | | -0,04 µg/m ³ | 0,002 (µg/m ³) ² |
| Short term drift at span-value ¹ | ≤ 2,0 µg/m ³ | 0,06 µg/m ³ | 42,0 µg/m ³ | | | | | |
| Difference sample/calibration port* | ≤ 1,0 % | N/A % | | | | | | |
| Maintenance interval ¹ | ≤ 14 days | 4 weeks | | | | | | |
| Availability ¹ | ≥ 90 % | 100,00 % | | | | | | |
| test gas ¹ | N/A | 2,5 % | | | | | 0,06 µg/m ³ | 0,00 (µg/m ³) ² |
| Benzene annual limit value | 5,0 µg/m ³ | | | | | | | |
| Combined standard uncertainty/laboratory | 0,15 ppb | | | | | | | |
| Relative expanded uncertainty laboratory | 6,2 % | | | | | | | |
| Comb. standard uncertainty/laboratory + field | 0,21 ppb | | | | | | | |
| Rel. expanded uncertainty laboratory + field | 8,4 % | | | | | | | |

*no separate calibration port

X_{min} Minimum value of the influence quantities
X_{max} Maximum value of the influence quantities

¹: Tests conducted in 2008/2009 with the tested device AMA GC 5004

²: Tests conducted in 2018 with the tested device AMA GC 5549

The test data are taken from the test report: AMA 143-01 FID/18D of 21 February 2019 of the Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg.

Expanded uncertainty, System 2

| Parameter | Minimum requirement | value | Given benzene-conc. C _q | sensitivity coefficient | X _{min} | X _{max} | u | u ² |
|---|--|--|------------------------------------|---|------------------|------------------|--------------------------|--|
| Repeatability standard deviation ¹ | ≤ 0,25 µg/m ³ | 0,06 µg/m ³ | 5,9 µg/m ³ | | | | 0,02 µg/m ³ | 0,0003 (µg/m ³) ² |
| Largest deviation of linearity ² | ≤ 5,0 % | -3,38 % | 2,5 µg/m ³ | | | | -0,10 µg/m ³ | 0,010 (µg/m ³) ² |
| Change of the sample gas pressure ² | ≤ 0,1 (µg/m ³)/kPa | 0,02 (µg/m ³)/kPa | 37,2 µg/m ³ | 0,02 (µg/m ³)/kPa | 86 kPa | 110 kPa | 0,03 µg/m ³ | 0,001 (µg/m ³) ² |
| Change of the surrounding temperature ¹ | ≤ 0,08 (µg/m ³)/K | 0,01 (µg/m ³)/kPa | 38,1 µg/m ³ | 0,01 (µg/m ³)/kPa | 278 K | 308 K | 0,03 µg/m ³ | 0,0007 (µg/m ³) ² |
| Change of the electrical voltage ¹ | ≤ 0,08 (µg/m ³)/V | 0,0001 (µg/m ³)/V | 41,7 µg/m ³ | 0,0001 (µg/m ³)/V | 210 V | 245 V | 0,0004 µg/m ³ | 0,0000 (µg/m ³) ² |
| Interfering component H ₂ O (19 *10 ³ ppm) ² | ≤ 0,015 (µg/m ³)/(10 ³ ppm) | 0,006 (µg/m ³)/10 ³ ppm | 4,9 µg/m ³ | 0,01 (µg/m ³)/10 ³ ppm | 0,6 Vol.-% | 2,1 Vol.-% | 0,09 µg/m ³ | 0,0075 (µg/m ³) ² |
| Carry over (memory-effect) ¹ | ≤ 1,0 µg/m ³ | 0,09 µg/m ³ | 41,7 µg/m ³ | | | | 0,01 µg/m ³ | 0,000 (µg/m ³) ² |
| Reproducibility standard deviation under field conditions ¹ | ≤ 0,25 µg/m ³ | 0,14 µg/m ³ | | | | | 0,14 µg/m ³ | 0,02 (µg/m ³) ² |
| Long term drift at span-value ¹ | ≤ 10,0 % | -1,5 % | 41,8 µg/m ³ | | | | -0,04 µg/m ³ | 0,002 (µg/m ³) ² |
| Short term drift at span-value ¹ | ≤ 2,0 µg/m ³ | 0,27 µg/m ³ | 42,0 µg/m ³ | | | | | |
| Difference sample/calibration port* | ≤ 1,0 % | N/A % | | | | | | |
| Maintenance interval ¹ | ≤ 14 days | 4 weeks | | | | | | |
| Availability ¹ | ≥ 90 % | 100,00 % | | | | | | |
| test gas ¹ | N/A | 2,5 % | | | | | | |
| Benzene annual limit value | 5,0 µg/m ³ | | | | | | | |
| Combined standard uncertainty/laboratory | 0,15 ppb | | | | | | | |
| Relative expanded uncertainty laboratory | 6,1 % | | | | | | | |
| Comb. standard uncertainty laboratory + field | 0,21 ppb | | | | | | | |
| Rel. expanded uncertainty laboratory + field | 8,3 % | | | | | | | |

*no separate calibration port

X_{min} Minimum value of the influence quantities
X_{max} Maximum value of the influence quantities

¹: Tests conducted in 2008/2009 with the tested device AMA GC 5005

²: Tests conducted in 2018 with the tested device AMA GC 5550

The test data are taken from the test report: AMA 143-01 FID/18D of 21 February 2019 of the Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg.