Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000034863_04

Certified AMS:	Gas chromatograph GC 5000 BTX Version PID for benzene
Manufacturer:	AMA Instruments GmbH Lise-Meitner-Strasse 8 89081 Ulm Germany
Test Institute:	TÜV Rheinland Energy & Environment 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) as well as EN 15267-1 (2009) and EN 15267-2 (2023).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 10 pages).
The present certificate replaces certificate 0000034863_03 dated 5 November 2019.

TÜVRheinland® CERTIFIED
Suitability Tested
Complying with 2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000034863

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

German Environment Agency
Dessau, 3 July 2024

This certificate will expire on:
21 July 2029

TÜV Rheinland Energy & Environment GmbH
Cologne, 2 July 2024

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Test institute accredited to EN ISO/IEC 17025 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 143-01K PID/18D dated 26 April 2019 and test report 143-04R/10 dated 23 November 2010
Initial certification:	16 March 2012
Expiry date:	21 July 2029
Certificate:	Renewal (of previous certificate 0000034863_03 of 5 November 2019 valid until 21 July 2024)
Publication:	BAnz AT 22.07.2019 B8, chapter III No. 3.2

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 applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the measured values 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 143-01K PID/18D dated 26 April 2019 and test report 143-04R/10 dated 23 November 2010 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 No. 3.2, Announcement by UBA dated 28 June 2019:

AMS designation:
Gas chromatograph GC 5000 BTX Version PID for benzene

Manufacturer:
AMA Instruments GmbH, Ulm

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

Measuring ranges during the performance test:
Benzene: 0 – 50 µg/m³

Software versions:

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 institute:
Landesanstalt für Umwelt Baden-Württemberg (LUBW), Karlsruhe
Report No.: AMA 143-01 PID/18D dated 21 February 2019
(part of LUBW test report: 143-04R/10 dated 23 November 2010)

Publication in the German Federal Gazette: BAnz AT 28.07.2022 B4, Chap. III notification 38, Announcement by UBA dated 28 June 2022:

38 Notification as regards Federal Environment Agency (UBA) notices of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter III number 3.2)

The current software versions of the measuring device gas chromatograph GC 5000 BTX version PID for benzene of AMA Instruments GmbH are:

Common.Control	v. 1.1
SS.Control	v. 2.1
AMA_PEAK.log	v. 1.3

Various hardware changes have been made to the measuring equipment. These concern the following points:

- new connector modules at the back of the device
- new electronic pressure controller
- optimization of valve drive 6-port valve
- new actuator for furnace damper
- minor housing adaptations

Statement issued by TÜV Rheinland Energy GmbH dated 26 April 2022

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 temperaturerange:	0 to 40 °C

Voltage and gas supply

Voltage:	220 – 250 VAC, 50 Hz
Power:	max. 800 W
Carrier gas:	N_2 5.0 (12 ml/min)
Gas connection:	Swagelok, 1/8 inch
Detector:	PID – Photo-Ionisations-Detector

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 & Environment 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 & Environment 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 & Environment 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: **qal1.de**.

History of documents
Certification of Gas chromatograph GC 5000 BTX Version PID is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic approval
Test report: 143-04R-10 dated 23 November 2010
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter III number 1.1
UBA announcement dated 10 January 2011

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29 September 2011
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V notification 14
UBA announcement dated 23 February 2012
(Soft- and hardware changes)

Initial certification according to EN 15267
Certificate No. 0000034863_00: 16 March 2012
Expiry date of the certificate: 1 March 2017
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 30 January 2012
Test report: 143-04R/10 dated 23 November 2010
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V notification 22
UBA announcement dated 23 February 2012
(comply with requirements of EN 14662-3 2005)

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 23 March 2015
Publication: BAnz AT 26.08.2015 B4, chapter V notification 53
UBA announcement dated 22 July 2015
(Soft- and hardware changes)

Certificate based on a notification
Certificate No. 0000034863_01: 25 April 2016
Expiry date of the certificate: 1 March 2017
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 21 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 3
UBA announcement dated 18 February 2016
(new hardware parts)

Renewal of certificates
Certificate No. 0000034863_02: 28 February 2017
Expiry date of the certificate: 1 March 2022

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 6 January 2017
Publication: BAnz AT 31.07.2017 B12, chapter II notification 35
UBA announcement dated 13 July 2017
(Software changes)

Supplementary testing according to EN 15267
Certificate No. 0000034863_03: 5 November 2019
Expiry date of the certificate: 21 July 2024
Test report: AMA 143-01K PID/18D dated 26 April 2019
Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (LUBW),
Publication: BAnz AT 22.07.2019 B8, chapter III number 3.2
UBA announcement dated 28 June 2019
(approval according to EN 14662-3)

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 26 April 2022
Publication: BAnz AT 28.07.2022 B4, chapter III notification 38
UBA announcement dated 28 June 2022
(Soft- and hardware changes)

Renewal of certificates
Certificate No. 0000034863_04: 3 July 2024
Expiry date of the certificate: 21 July 2029

Expanded uncertainty laboratory, system 1

Parameter	Minimum requirement	value	Given benzene-conc. c_t	sensitivity coefficient	X_{min}	X_{max}	u	u^2
Repeatability standard deviation[1]	≤ 0,25 µg/m³	0,02 µg/m³	5,9 µg/m³				0,01 µg/m³	0,00004 (µg/m³)²
Largest deviation of linearity[2]	≤ 5,0 %	3,34 %	2,6 µg/m³				0,10 µg/m³	0,009 (µg/m³)²
Change of the sample gas pressure[2]	≤ 0,1 (µg/m³)/kPa	0,02 (µg/m³)/kPa	37,2 µg/m³	0,02 (µg/m³)/kPa	85 kPa	110 kPa	0,05 µg/m³	0,002 (µg/m³)²
Change of the surrounding temperature[1]	≤ 0,08 (µg/m³)/K	0,001 (µg/m³)/kPa	39,1 µg/m³	0,001 (µg/m³)/kPa	278 K	308 K	0,002 µg/m³	0,000003 (µg/m³)²
Change of the electrical voltage[1]	≤ 0,08 (µg/m³)/V	0,012 (µg/m³)/V	39,1 µg/m³	0,012 (µg/m³)/V	210 V	245 V	0,030 µg/m³	0,0009 (µg/m³)²
Interfering component H_2O (19 *10³ ppm)[2]	≤ 0,015 (µg/m³)/10³ ppm)	-0,004 (µg/m³)/10³ ppm	4,9 µg/m³	-0,004 (µg/m³)/10³ ppm	0,6 Vol-%	2,1 Vol-%	-0,05 µg/m³	0,003 (µg/m³)²
Carry over (memory-effect)[1]	≤ 1,0 µg/m³	0,00 µg/m³	43,8 µg/m³				0,00 µg/m³	0,00 (µg/m³)²
Reproducibility standard deviation under field conditions[1]	≤ 0,25 µg/m³	0,19 µg/m³					0,19 µg/m³	0,04 (µg/m³)²
Long term drift at span-value[1]	≤ 10,0 %	-5,9 %	41,8 µg/m³				-0,17 µg/m³	0,029 (µg/m³)²
Short term drift at span-value[1]	≤ 2,0 µg/m³	0,15 µg/m³	39,1 µg/m³					
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/m³	0,004 (µg/m³)²

*no separate calibration port

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

Benzene annual limit value	5,0	µg/m³
Combined standard uncertainty laboratory	0,14	ppb
Relative expanded uncertainty laboratory	5,5	%
Comb. standard uncertainty laboratory + field	0,29	ppb
Rel. expanded uncertainty laboratory + field	11,6	%

[1]: Tests conducted in 2010 with the tested device AMA GC 5006

[2]: Tests conducted in 2018 with the tested device AMA GC 5551

The test data are taken from the test report: AMA 143-01K PID/18D of 26 April 2019 of the Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg.

Expanded uncertainty, system 2

Parameter	Minimum requirement	value		Given benzene-conc. C_t		sensitivity coefficient	X_{min}		X_{max}		u		u^2	
Repeatability standard deviation[1]	≤ 0,25 µg/m³	0,06	µg/m³	5,9	µg/m³						0,02	µg/m³	0,0003	(µg/m³)²
Largest deviation of linearity[2]	≤ 5,0 %	4,97	%	2,6	µg/m³						0,14	µg/m³	0,02	(µg/m³)²
Change of the sample gas pressure[2]	≤ 0,1 (µg/m³)/kPa	0,02	(µg/m³)/kPa	37,2	µg/m³	0,02 (µg/m³)/kPa	85	kPa	110	kPa	0,03	µg/m³	0,001	(µg/m³)²
Change of the surrounding temperature[1]	≤ 0,08 (µg/m³)/K	0,002	(µg/m³)/kPa	39,1	µg/m³	0,002 (µg/m³)/kPa	278	K	308	K	0,004	µg/m³	0,00001	(µg/m³)²
Change of the electrical voltage[1]	≤ 0,08 (µg/m³)/V	0,004	(µg/m³)/V	39,1	µg/m³	0,004 (µg/m³)/V	210	V	245	V	0,009	µg/m³	0,0001	(µg/m³)²
Interfering component H_2O (19 *10³ ppm)[2]	≤ 0,015 (µg/m³)/10³ ppm)	0,001	(µg/m³)/10³ ppm	4,9	µg/m³	0,001 (µg/m³)/10³ ppm	0,6	Vol-%	2,1	Vol-%	0,02	µg/m³	0,0003	(µg/m³)²
Carry over (memory-effect)[1]	≤ 1,0 µg/m³	0,04	µg/m³	43,8	µg/m³						0,003	µg/m³	0,00001	(µg/m³)²
Reproducibility standard deviation under field conditions[1]	≤ 0,25 µg/m³	0,19	µg/m³								0,19	µg/m³	0,04	(µg/m³)²
Long term drift at span-value[1]	≤ 10,0 %	4,8	%	41,8	µg/m³						0,14	µg/m³	0,02	(µg/m³)²
Short term drift at span-value[1]	≤ 2,0 µg/m³	0,15	µg/m³	39,1	µg/m³									
Difference sample/calibration port*	≤ 1,0 %	N/A	%											
Maintenance interval[1]	≤ 14 days	4	weeks											
Availability[1]	≥ 90 %	99,20	%											
test gas[1]	N/A	2,5	%								0,06	µg/m³	0,004	(µg/m³)²

*no separate calibration port

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

Benzene annual limit value	5,0	µg/m³
Combined standard uncertainty laboratory	0,16	ppb
Relative expanded uncertainty laboratory	6,5	%
Comb. standard uncertainty laboratory + field	0,29	ppb
Rel. expanded uncertainty laboratory + field	11,4	%

[1]: Tests conducted in 2010 with the tested device AMA GC 5007

[2]: Tests conducted in 2018 with the tested device AMA GC 5552

The test data are taken from the test report: AMA 143-01K PID/18D of 26 April 2019 of the Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg.