

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000089099_00

Certified AMS: ACF5000 LCS for CO, NO, NO₂, NO_x, SO₂, HCl, HF, NH₃, CH₂O, N₂O, CH₄, H₂O, TOC, CO₂ and O₂

Manufacturer: ABB AG
Stierstädter Straße 5
60488 Frankfurt/Main
Germany

Test Institute: TÜV Rheinland Energy & Environment GmbH

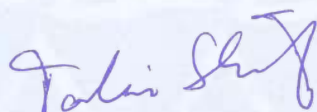
This is to certify
that the AMS has been tested and found to comply with the standards
EN 15267-3 (2007), EN 15267-3 (2023) as well as EN 15267-1 (2023)
and EN 15267-2 (2023).

This certification applies to the conditions set out in this certificate and the accompanying change history document for the device certificate (0000089099) (this certificate contains 20 pages).



This certificate will expire on:
2nd June 2031

TÜV Rheinland Energy & Environment GmbH
Cologne, 3rd June 2026



Dr. Tobias Schäfer
Local Field Manager



M. Sc. Sebastian Decker
deputy Head of QAL1 Certification Body

QAL1-Certification Body
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TÜV Rheinland Energy & Environment GmbH
Am Grauen Stein
51105 Cologne

Certification body accredited to EN ISO/IEC 17065 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate
D-ZE-11120-02-00.

Certificate:
0000089099_00 / 03.06.2026

Test report: EuL/21269395/C dated 28 May 2026 as well as
936/21219814/E dated 10 March 2017
Initial certification: 3rd June 2026
Expiry date: 2nd June 2031
Publication: 3rd June 2026, official database www.qal1.de

Approved application:

The tested AMS is suitable for use at plants according to Directive 2010/75/EU, chapter III (combustion plants / 13th BImSchV:2021), chapter IV (waste incineration plants / 17th BImSchV:2024), Directive 2015/2193/EC (44th BImSchV:2022), 30th BImSchV:2019, plants in compliance with TA Luft and plants according to the 27th BImSchV:2013. The measured ranges have been selected so as to ensure as broad a field of application as possible.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a twelve-month field test at a waste incineration plant.

The AMS is approved for an ambient temperature range of +5 °C to +45 °C.

The notification of the measuring equipment, the suitability test and the performance of the uncertainty calculations were carried out on the basis of the regulations valid at the time of the test. Due to possible changes in the legal framework, each user should ensure, prior to using the measuring equipment, that it is suitable for monitoring the limit values and oxygen concentrations relevant to them.

Every potential user should consult with the manufacturer to ensure that this AMS is suitable for the intended application.

Basis of the certification

This certification is based on:

- Test report EuL/21269395/C dated 28 May 2026 issued by TÜV Rheinland Energy & Environment GmbH, and test report 936/21219814/E dated 10 March 2017 for TOC issued by TÜV Rheinland Energy GmbH
- Audit report EuL/21271143/A dated 14 April 2025 from TÜV Rheinland Energy & Environment GmbH
- Certification decision by the QAL1 certification body TÜV Rheinland Energy & Environment GmbH, accredited in accordance with DIN EN ISO/IEC 17065
- Surveillance of the product and the manufacturing process

AMS designation:

ACF5000 LCS for CO, NO, NO₂, NO_x, SO₂, HCl, HF, NH₃, CH₂O, N₂O, CH₄, H₂O, TOC, CO₂ and O₂

Manufacturer:

ABB AG
Stierstädter Straße 5
60488 Frankfurt/Main
Germany

Field of application:

For plants requiring official approval according to Directive 2010/75/EU, chapter III (combustion plants / 13th BImSchV:2021), chapter IV (waste incineration plants / 17th BImSchV:2024), Directive 2015/293/EC (44th BImSchV:2022), 30th BImSchV:2019, plants in compliance with TA Luft and plants according to the 27th BImSchV:2013

Measuring ranges during performance testing:

Component	Certification range	Supplementary ranges	Unit
CO	0 – 15	0 – 15000	mg/m ³
NO	0 – 50	0 – 5000	mg/m ³
NO ₂	0 – 60	0 – 5000	mg/m ³
NO _x	0 – 60	0 – 5000	mg/m ³
SO ₂	0 – 7.5	0 – 10000	mg/m ³
HCl	0 – 3	0 – 1700	mg/m ³
HF	0 – 1.35	0 – 300	mg/m ³
NH ₃	0 – 3	0 – 300	mg/m ³
CH ₂ O	0 – 12.5	0 – 200	mg/m ³
N ₂ O	0 – 50	0 – 5000	mg/m ³
CH ₄	0 – 5	0 – 2600	mg/m ³
H ₂ O	0 – 40	-	Vol.-%
TOC*	0 – 15	0 – 30/300/500	mg/m ³
CO ₂	0 – 30	-	Vol.-%
O ₂	0 – 25	-	Vol.-%

*Based on certificate 0000053802 issued by the Federal Environment Agency (UBA) on 25 April 2017

Software versions:

Syscon3	V5.5.0
AMC	V3.9.8
FTIR	V3.0.0.146
FTIR-Model Standard	V1.9.9.39

Restrictions:

None

Notes:

1. When testing HF, HCl, NH₃ and CH₂O, humid test gases must be used.
2. For the reference point check (QAL3) of the components measured by the FTIR, the internal automatic validation unit may be used as an alternative to test gases.
3. The measuring system may be operated within a temperature range of 5 to 45 °C.
4. The maintenance interval is 6 months for all FTIR components (CO, NO, NO₂, NO_x, SO₂, HCl, HF, NH₃, CH₂O, N₂O, CH₄, H₂O and CO₂) and TOC and 3 months for oxygen.
5. The measuring system has a digital interface for data transmission in accordance with VDI Guideline 4201, Part 1 (General Requirements), Part 2 (Profibus) and Part 3 (Modbus EIA485 and TCP/IP).
6. The CEM-DAS data acquisition and evaluation unit can be optionally integrated into the system cabinet.
7. Maintenance work must be spread over several days in order to comply with the criteria for downtime at installations under the 13th BImSchV and the 17th BImSchV.
8. During the supplementary inspection relating to test report EuL/21269395/C dated 28 May 2026, a FID was installed for TOC. The certification of TOC is based on the Federal Environment Agency certificate 0000053802 dated 25 April 2017 and the associated test report.

Test institute:

TÜV Rheinland Energy & Environment GmbH, Cologne

Report No.: EuL/21269395/C dated 28 May 2026 issued by TÜV Rheinland Energy & Environment GmbH and test report 936/21219814/E dated 10 March 2017 for TOC issued by TÜV Rheinland Energy GmbH

Certified product

The certificate applies to the AMS that complies with the following description:

The ACF5000 LCS measuring system is a multi-component measuring system comprising a Fourier-transform infrared spectrometer (FTIR spectrometer) for the determination of the components CO, NO, NO₂, N₂O, SO₂, HCl, HF, NH₃, H₂O, CO₂, CH₂O and CH₄; a flame ionisation detector (FID) for determining the component total C; and a zirconium dioxide probe for determining the component O₂. The NO_x component is calculated from the measurement data for NO and NO₂ (NO_x sum channel).

The gas to be measured is sampled from the flue gas duct using a gas sampling probe and fed to the analysis cabinet via a heated sample gas line. The probe contains a particle filter which removes dust from the gas. The control system for the analysis system offers, as standard, the option of automatic zero gas and calibration gas injection at the probe upstream of the filter element. Automatic cleaning of the probe filter is available as an option. The FTIR analyser, the FID and the zirconium dioxide sensor are all fed simultaneously; the sample gas is split and fed to all three analysers.

The gas path from the sampling point to the analyser is continuously heated (180°C) and regulated and monitored by the system electronics to prevent the flue gas falling below the dew point or condensing.

For process measurements, a heated measurement point switchover can be configured as an option.

The sample is fed to the analyser according to the injector principle by means of an air jet injector, which is integrated into the heated conditioning block (ASP block). This, in turn, is directly connected to the heated gas cell.

Test gases can be introduced both automatically and manually; both at the gas sampling probe and directly at the analyser.

All current concentrations of the individual measurement components and status signals are displayed on the system display.

The system controller is tailored to the requirements of both emissions and process measurement and offers interfaces such as an internal CAN bus and fieldbus systems like Modbus and Profibus. An Ethernet interface is available for remote monitoring of the entire analysis system and for data transmission via internal or external TCP/IP networks. Remote control of the analysis system via a UMTS router is possible. Analogue outputs for the measurement components and relay contacts for fault/status signals are standard.

The certified measurement system consists of:

- Heated sampling probe (180 °C) with an ABB GAC125 filter and an ABB Type 40 or ABB Type 42 probe tube, heated to 180 °C
- Heated sample gas line (180 °C) ABB TBL01-S, internal diameter 6 mm, Teflon material, max. 60 m length
- Analytical cabinet with:
 - Interferometer (including internal test facility for validating the spectrometer adjustments (validation unit))
 - FID
 - O₂ sensor
 - Air conditioner
 - Cooling unit
 - CEM DAS emissions analysis computer (optional)

Certificate:
0000089099_00 / 03.06.2026

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 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

The history of the certified ACF5000 LCS measuring system from ABB AG is based on the change history documents associated with the certificate number, as well as on the regular ongoing monitoring of the manufacturer's quality management system.

Initial certification according to EN 15267

Certificate no. 0000089099_00
Expiry of the certificate: 2nd June 2031
Test report: EuL/21269395/C dated 28 May 2026 by TÜV Rheinland Energy & Environment GmbH as well as 936/21219814/E dated 10 March 2017 for TOC by TÜV Rheinland Energy GmbH
Issue of the certificate: 3rd June 2026
Official certificate database: www.qal1.de

Certificate:
0000089099_00 / 03.06.2026

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	CO 0 - 15 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	-0.07 mg/m ³
Sum of positive CS at span point	0.20 mg/m ³
Sum of negative CS at span point	-0.20 mg/m ³
Maximum sum of cross-sensitivities	0.20 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.116 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2	
Lack of fit	u_D 0.022 mg/m ³	0.000	(mg/m ³) ²
Zero drift from field test	u_{lof} 0.011 mg/m ³	0.000	(mg/m ³) ²
Span drift from field test	$u_{d,z}$ 0.095 mg/m ³	0.009	(mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ -0.087 mg/m ³	0.008	(mg/m ³) ²
Influence of supply voltage	u_t 0.015 mg/m ³	0.000	(mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.015 mg/m ³	0.000	(mg/m ³) ²
Influence of sample gas flow	u_i 0.116 mg/m ³	0.013	(mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p 0.058 mg/m ³	0.003	(mg/m ³) ²
	u_{rm} 0.121 mg/m ³	0.015	(mg/m ³) ²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.22 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.43 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 10 mg/m³ 4.3

Requirement of 2010/75/EU

U in % of the ELV 10 mg/m³ 10.0

Requirement of EN 15267-3

U in % of the ELV 10 mg/m³ 7.5

Certificate:
0000089099_00 / 03.06.2026

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	NO 0 - 50 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	1.21 mg/m ³
Sum of negative CS at span point	0.00 mg/m ³
Maximum sum of cross-sensitivities	1.21 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.699 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2	
Lack of fit	u_D 0.182 mg/m ³	0.033 (mg/m ³) ²	
Zero drift from field test	u_{lof} 0.058 mg/m ³	0.003 (mg/m ³) ²	
Span drift from field test	$u_{d,z}$ -0.058 mg/m ³	0.003 (mg/m ³) ²	
Influence of ambient temperature at span	$u_{d,s}$ -0.346 mg/m ³	0.120 (mg/m ³) ²	
Influence of supply voltage	u_t 0.095 mg/m ³	0.009 (mg/m ³) ²	
Cross-sensitivity (interference)	u_v 0.059 mg/m ³	0.003 (mg/m ³) ²	
Influence of sample gas flow	u_i 0.699 mg/m ³	0.489 (mg/m ³) ²	
Uncertainty of reference material at 70% of certification range	u_p 0.277 mg/m ³	0.077 (mg/m ³) ²	
	u_{rm} 0.404 mg/m ³	0.163 (mg/m ³) ²	

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.95 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.86 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 33.33 mg/m³ 5.6

Requirement of 2010/75/EU

U in % of the ELV 33.33 mg/m³ 20.0

Requirement of EN 15267-3

U in % of the ELV 33.33 mg/m³ 15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	NO ₂ 0 - 60 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.50 mg/m ³
Sum of negative CS at span point	-1.80 mg/m ³
Maximum sum of cross-sensitivities	-1.80 mg/m ³
Uncertainty of cross-sensitivity	u_i -1.039 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.107 mg/m ³	0.011 (mg/m ³) ²
Zero drift from field test	u_{lof} 0.173 mg/m ³	0.030 (mg/m ³) ²
Span drift from field test	$u_{d.z}$ -0.069 mg/m ³	0.005 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d.s}$ -0.346 mg/m ³	0.120 (mg/m ³) ²
Influence of supply voltage	u_t 0.070 mg/m ³	0.005 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.151 mg/m ³	0.023 (mg/m ³) ²
Influence of sample gas flow	u_i -1.039 mg/m ³	1.080 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.231 mg/m ³	0.053 (mg/m ³) ²
	u_{rm} 0.485 mg/m ³	0.235 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.25 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.45 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 40 mg/m³	6.1
Requirement of EN 15267-3	U in % of the ELV 40 mg/m³	20.0
	U in % of the ELV 40 mg/m³	15.0

Certificate:
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Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	NOx 0 - 60 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.29 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.80 mg/m ³
Sum of negative CS at span point	-0.80 mg/m ³
Maximum sum of cross-sensitivities	0.80 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.461 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2	
Lack of fit	u_D 0.218 mg/m ³	0.048	(mg/m ³) ²
Zero drift from field test	u_{lof} 0.173 mg/m ³	0.030	(mg/m ³) ²
Span drift from field test	$u_{d,z}$ -0.104 mg/m ³	0.011	(mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ -0.554 mg/m ³	0.307	(mg/m ³) ²
Influence of supply voltage	u_t 0.085 mg/m ³	0.007	(mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.181 mg/m ³	0.033	(mg/m ³) ²
Influence of sample gas flow	u_i 0.461 mg/m ³	0.213	(mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.300 mg/m ³	0.090	(mg/m ³) ²
	u_{rm} 0.485 mg/m ³	0.235	(mg/m ³) ²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.99 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.93 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 40 mg/m³ 4.8

Requirement of 2010/75/EU

U in % of the ELV 40 mg/m³ 20.0

Requirement of EN 15267-3

U in % of the ELV 40 mg/m³ 15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	SO ₂ 0 - 7.5 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.24 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.29 mg/m ³
Sum of negative CS at span point	0.00 mg/m ³
Maximum sum of cross-sensitivities	0.29 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.168 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
	u_D 0.064 mg/m ³	0.004 (mg/m ³) ²
Lack of fit	u_{lof} -0.010 mg/m ³	0.000 (mg/m ³) ²
Zero drift from field test	$u_{d,z}$ 0.126 mg/m ³	0.016 (mg/m ³) ²
Span drift from field test	$u_{d,s}$ 0.126 mg/m ³	0.016 (mg/m ³) ²
Influence of ambient temperature at span	u_t 0.015 mg/m ³	0.000 (mg/m ³) ²
Influence of supply voltage	u_v 0.029 mg/m ³	0.001 (mg/m ³) ²
Cross-sensitivity (interference)	u_i 0.168 mg/m ³	0.028 (mg/m ³) ²
Influence of sample gas flow	u_b -0.043 mg/m ³	0.002 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_{rm} 0.061 mg/m ³	0.004 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.27 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.52 \text{ mg/m}^3$$

Relative total expanded uncertainty

Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 5 mg/m³ 10.4

U in % of the ELV 5 mg/m³ 20.0

U in % of the ELV 5 mg/m³ 15.0

Certificate:
0000089099_00 / 03.06.2026

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	HCl 0 - 3 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.05 mg/m ³
Sum of negative CS at zero point	-0.09 mg/m ³
Sum of positive CS at span point	0.02 mg/m ³
Sum of negative CS at span point	-0.11 mg/m ³
Maximum sum of cross-sensitivities	-0.11 mg/m ³
Uncertainty of cross-sensitivity	u_i -0.064 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.018 mg/m ³	0.000 (mg/m ³) ²
Zero drift from field test	u_{lof} -0.028 mg/m ³	0.001 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ -0.042 mg/m ³	0.002 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ -0.047 mg/m ³	0.002 (mg/m ³) ²
Influence of supply voltage	u_t 0.011 mg/m ³	0.000 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.009 mg/m ³	0.000 (mg/m ³) ²
Influence of sample gas flow	u_i -0.064 mg/m ³	0.004 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.014 mg/m ³	0.000 (mg/m ³) ²
	u_{rm} 0.024 mg/m ³	0.001 (mg/m ³) ²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.10 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.20 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 2 mg/m³ 9.9

Requirement of 2010/75/EU

U in % of the ELV 2 mg/m³ 40.0

Requirement of EN 15267-3

U in % of the ELV 2 mg/m³ 30.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	HF 0 - 1.35 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.02 mg/m ³
Sum of negative CS at zero point	-0.01 mg/m ³
Sum of positive CS at span point	0.04 mg/m ³
Sum of negative CS at span point	-0.04 mg/m ³
Maximum sum of cross-sensitivities	0.04 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.025 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.010 mg/m ³	0.000 (mg/m ³) ²
Zero drift from field test	u_{lof} -0.009 mg/m ³	0.000 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ 0.010 mg/m ³	0.000 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ 0.019 mg/m ³	0.000 (mg/m ³) ²
Influence of supply voltage	u_t 0.008 mg/m ³	0.000 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.008 mg/m ³	0.000 (mg/m ³) ²
Influence of sample gas flow	u_i 0.025 mg/m ³	0.001 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.005 mg/m ³	0.000 (mg/m ³) ²
	u_{rm} 0.011 mg/m ³	0.000 (mg/m ³) ²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.04 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.08 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 0.9 mg/m³ 8.5

Requirement of 2010/75/EU

U in % of the ELV 0.9 mg/m³ 40.0

Requirement of EN 15267-3

U in % of the ELV 0.9 mg/m³ 30.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	NH ₃ 0 - 3 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.05 mg/m ³
Sum of negative CS at zero point	-0.01 mg/m ³
Sum of positive CS at span point	0.10 mg/m ³
Sum of negative CS at span point	-0.02 mg/m ³
Maximum sum of cross-sensitivities	0.10 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.055 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.020 mg/m ³	0.000 (mg/m ³) ²
Zero drift from field test	u_{lof} 0.013 mg/m ³	0.000 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ 0.035 mg/m ³	0.001 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ -0.047 mg/m ³	0.002 (mg/m ³) ²
Influence of supply voltage	u_t 0.012 mg/m ³	0.000 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.012 mg/m ³	0.000 (mg/m ³) ²
Influence of sample gas flow	u_i 0.055 mg/m ³	0.003 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.014 mg/m ³	0.000 (mg/m ³) ²
	u_{rm} 0.024 mg/m ³	0.001 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.09 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.18 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 2 mg/m³	8.8
Requirement of EN 15267-3	U in % of the ELV 2 mg/m³	40.0 **
	U in % of the ELV 2 mg/m³	30.0

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.

A value of 40.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	CH ₂ O 0 - 12.5 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.06 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.11 mg/m ³
Sum of negative CS at span point	-0.22 mg/m ³
Maximum sum of cross-sensitivities	-0.22 mg/m ³
Uncertainty of cross-sensitivity	u_i -0.127 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.023 mg/m ³	0.001 (mg/m ³) ²
Zero drift from field test	u_{lof} 0.029 mg/m ³	0.001 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ 0.029 mg/m ³	0.001 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ -0.159 mg/m ³	0.025 (mg/m ³) ²
Influence of supply voltage	u_t 0.030 mg/m ³	0.001 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.006 mg/m ³	0.000 (mg/m ³) ²
Influence of sample gas flow	u_i -0.127 mg/m ³	0.016 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p 0.029 mg/m ³	0.001 (mg/m ³) ²
	u_{rm} 0.101 mg/m ³	0.010 (mg/m ³) ²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.24 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.46 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 8.33 mg/m³	5.5
Requirement of EN 15267-3	U in % of the ELV 8.33 mg/m³	30.0 **
	U in % of the ELV 8.33 mg/m³	22.5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 30.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Measured component	N ₂ O
Certification range	0 - 50 mg/m ³

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.70 mg/m ³
Sum of negative CS at span point	-0.40 mg/m ³
Maximum sum of cross-sensitivities	0.70 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.404 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Lack of fit	u_D 0.039 mg/m ³		0.002 (mg/m ³) ²
Zero drift from field test	u_{lof} 0.058 mg/m ³		0.003 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ -0.115 mg/m ³		0.013 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ 0.260 mg/m ³		0.068 (mg/m ³) ²
Influence of supply voltage	u_t 0.108 mg/m ³		0.012 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.091 mg/m ³		0.008 (mg/m ³) ²
Influence of sample gas flow	u_i 0.404 mg/m ³		0.163 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.173 mg/m ³		0.030 (mg/m ³) ²
	u_{rm} 0.404 mg/m ³		0.163 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.68 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.33 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 33.33 mg/m³	4.0
Requirement of EN 15267-3	U in % of the ELV 33.33 mg/m³	20.0 **
	U in % of the ELV 33.33 mg/m³	15.0

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 20.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	CH ₄ 0 - 5 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	-0.11 mg/m ³
Sum of positive CS at span point	0.15 mg/m ³
Sum of negative CS at span point	-0.08 mg/m ³
Maximum sum of cross-sensitivities	0.15 mg/m ³
Uncertainty of cross-sensitivity	u_i 0.087 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0.012 mg/m ³	0.000 (mg/m ³) ²
Zero drift from field test	u_{lof} -0.008 mg/m ³	0.000 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ -0.069 mg/m ³	0.005 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ 0.046 mg/m ³	0.002 (mg/m ³) ²
Influence of supply voltage	u_t 0.003 mg/m ³	0.000 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0.023 mg/m ³	0.001 (mg/m ³) ²
Influence of sample gas flow	u_i 0.087 mg/m ³	0.008 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_p -0.020 mg/m ³	0.000 (mg/m ³) ²
	u_{rm} 0.040 mg/m ³	0.002 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.13 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.26 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 3.33 mg/m³	7.7
Requirement of EN 15267-3	U in % of the ELV 3.33 mg/m³	30.0 **
	U in % of the ELV 3.33 mg/m³	22.5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 30.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

	H ₂ O
Certification range	0 - 40 Vol.-%

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of positive CS at span point	0.00	Vol.-%
Sum of negative CS at span point	0.00	Vol.-%
Maximum sum of cross-sensitivities	0.00	Vol.-%
Uncertainty of cross-sensitivity	u_i	0.000 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				u^2
Lack of fit	u_D	0.086	Vol.-%	0.007 (Vol.-%) ²
Zero drift from field test	u_{lof}	0.115	Vol.-%	0.013 (Vol.-%) ²
Span drift from field test	$u_{d,z}$	0.069	Vol.-%	0.005 (Vol.-%) ²
Influence of ambient temperature at span	$u_{d,s}$	0.462	Vol.-%	0.213 (Vol.-%) ²
Influence of supply voltage	u_t	0.071	Vol.-%	0.005 (Vol.-%) ²
Cross-sensitivity (interference)	u_v	0.023	Vol.-%	0.001 (Vol.-%) ²
Influence of sample gas flow	u_i	0.000	Vol.-%	0.000 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_p	-0.214	Vol.-%	0.046 (Vol.-%) ²
	u_{rm}	0.323	Vol.-%	0.105 (Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.63	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.23	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 40 Vol.-%	3.1
Requirement of EN 15267-3	U in % of the range 40 Vol.-%	10.0 **
		7.5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 /3.467483.3
Measuring principle	FTIR

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Measured component	CO ₂
Certification range	0 - 30 Vol.-%

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of positive CS at span point	0.20	Vol.-%
Sum of negative CS at span point	0.00	Vol.-%
Maximum sum of cross-sensitivities	0.20	Vol.-%
Uncertainty of cross-sensitivity	u_i	0.116 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Lack of fit	u_D	0.029 Vol.-%	0.001 (Vol.-%) ²
Zero drift from field test	u_{lof}	0.057 Vol.-%	0.003 (Vol.-%) ²
Span drift from field test	$u_{d,z}$	0.017 Vol.-%	0.000 (Vol.-%) ²
Influence of ambient temperature at span	$u_{d,s}$	-0.087 Vol.-%	0.008 (Vol.-%) ²
Influence of supply voltage	u_t	0.050 Vol.-%	0.003 (Vol.-%) ²
Cross-sensitivity (interference)	u_v	0.038 Vol.-%	0.001 (Vol.-%) ²
Influence of sample gas flow	u_i	0.116 Vol.-%	0.013 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_p	-0.173 Vol.-%	0.030 (Vol.-%) ²
	u_{rm}	0.242 Vol.-%	0.059 (Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.34 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.67 Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 30 Vol.-%	2.2
Requirement of EN 15267-3	U in % of the range 30 Vol.-%	10.0 **
	U in % of the range 30 Vol.-%	7.5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	ABB AG
AMS designation	ACF5000 LCS
Serial number of units under test	3.424917.1 / 3.467483.3
Measuring principle	Zirkoniumdioxid

Test report

Test laboratory	EuL/21269395/C TÜV Rheinland
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Measured component

Certification range	O ₂ 0 - 25 Vol.-%
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at span point	0.00 Vol.-%
Sum of negative CS at span point	0.00 Vol.-%
Maximum sum of cross-sensitivities	0.00 Vol.-%
Uncertainty of cross-sensitivity	u _i 0.000 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Lack of fit	u _D 0.046 Vol.-%		0.002 (Vol.-%) ²
Zero drift from field test	u _{lof} 0.058 Vol.-%		0.003 (Vol.-%) ²
Span drift from field test	u _{d,z} 0.075 Vol.-%		0.006 (Vol.-%) ²
Influence of ambient temperature at span	u _{d,s} 0.115 Vol.-%		0.013 (Vol.-%) ²
Influence of supply voltage	u _t 0.047 Vol.-%		0.002 (Vol.-%) ²
Cross-sensitivity (interference)	u _v 0.047 Vol.-%		0.002 (Vol.-%) ²
Influence of sample gas flow	u _i 0.000 Vol.-%		0.000 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _p -0.052 Vol.-%		0.003 (Vol.-%) ²
	u _{rm} 0.202 Vol.-%		0.041 (Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.27 Vol.-%
Total expanded uncertainty	U = u _c * k = u _c * 1.96	0.53 Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 25 Vol.-%	2.1
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	10.0 **
	U in % of the range 25 Vol.-%	7.5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.