

CERTIFICATE

of Product Conformity (QAL1)

Certificate No: 0000074626_01

Certified AMS: AGAM Q1 for Temperature measurement in combustion gases

Manufacturer: Bonnenberg & Drescher GmbH
Industriepark Emil Mayrisch
52457 Aldenhoven
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 15267-1 (2009), EN 15267-2 (2023), EN 15267-3 (2007)
as well as EN 14181 (2014).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 8 pages).
The present certificate replaces certificate 0000074626_00 dated 2 June 2021.



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000074626

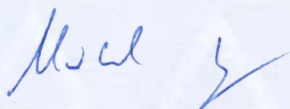
Publication in the German Federal Gazette
(BAnz) of 3 May 2021

German Environment Agency

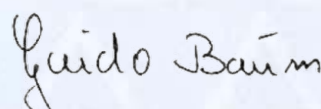
Dessau, 3 May 2026

This certificate will expire on:
2 May 2031

TÜV Rheinland
Energy & Environment GmbH
Cologne, 2 May 2026



Dr. Marcel Langner
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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:	936/21247645/A dated 17 August 2020
Initial certification:	3 May 2021
Expiry date:	2 May 2031
Certificate:	Renewal (of previous certificate 0000074626_00 of 2 June 2021 valid until 2 May 2026)
Publication:	BAnz AT 03.05.2021 B9, chapter II No. 4.1

Approved application

The tested AMS is suitable for use at plants according to Directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV:2020), chapter IV (waste incineration plants / 17th BImSchV:2013), Directive 2015/2193/EC (44th BImSchV:2019), TA Luft:2002, 30th BImSchV:2019 and 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 four-month field test at a waste incineration plant.

The AMS is approved for an ambient temperature range of -20 °C to 50 °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 emission limit values relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Note

The legal regulations mentioned correspond to the current state of legislation during certification. Each user should, if necessary, in consultation with the competent authority, ensure that this AMS meets the legal requirements for the intended use. In addition, it cannot be ruled out that legal regulations governing the use of a measuring device for emission monitoring may change during the lifetime of the certificate.

Basis of the certification

This certification is based on:

- Test report 936/21247645/A dated 17 August 2020 of TÜV Rheinland Energy GmbH
- 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 03.05.2021 B9, chapter II No. 4.1,
Announcement by UBA dated 31 March 2021:

AMS designation:

AGAM Q1 for Temperature measurement in combustion gases

Manufacturer:

Bonnenberg & Drescher GmbH, Aldenhoven

Field of application:

For measurements at plants requiring official approval and plants according
to 27th BImSchV

Measuring ranges during the performance test:

Component	Certification range	Unit
Temperature	50 - 1500	°C

Software version: 4.3

Restrictions: None

Notes:

1. The maintenance interval is four weeks.
2. The manufacturer must provide a transmission cone that is individually adapted to the respective installation situation. If, for example, the transfer cone has to be installed by the boiler manufacturer, the equipment manufacturer must send a corresponding technical drawing and check that the installation is correct.
3. A computer with an up-to-date web browser is required to display measured values and status messages.

Test Report: TÜV Rheinland Energy GmbH, Cologne

Report No.: 936/21247465/A dated 17 August 2020

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, Chap. VI
notification 31, Announcement by UBA dated 9 March 2022:

**31 Notification as regards Federal Environment Agency (UBA) notice
of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter II number 4.1)**

The current software version of the measuring device AGAM Q1 for the component
temperature of the manufacturer Bonnenberg & Drescher GmbH reads:
4.4

Statement issued by TÜV Rheinland Energy GmbH dated 6 September 2021

Certified product

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

The measuring system AGAM Q1 consists of transmitter and receiver units, transmission cones and the control unit.

Each unit can act as a transmitter and / or receiver. Compressed air serves as the sound source. The transmission signal is generated by opening a solenoid valve in the compressed air line. The transfer cones form the connection between the sound horn and the combustion chamber.

The control unit switches the 24 V solenoid valves of the units acting as transmitters, records and digitizes the preamplifier signals and calculates and visualizes path and zone temperatures as well as the tomography image.

This process data is processed and displayed via the CPU module. The user accesses the CPU module directly via the web UI and can, for example, display the current process data.

Transmitter and receiver units

The transmitter and receiver units on the boiler are used to generate and record the sound signals generated with compressed air. The units are identical, they differ in their function for the respective path.

A transmitter and receiver unit consists of:

- Preamplifier box with preamplifier, terminal block and on / off switch
- Sound horn with flange for connection to the transmission cone
- Piezo microphone at the end of the horn
- Solenoid valve with nozzle at the beginning of the horn
- Transfer cone

Sound horn

The sound horn is a conical socket made of cast high-quality stainless steel. A DN80 / PN6 socket is used to connect to the combustion chamber. In front of the flange there are two R 3/4" pipe tapped holes for the piezo microphone and a dummy plug. At the end of the horn there are tapped holes for the valve / sound nozzle connection and a G 1 1/4" dummy plug for inspection.

Piezo microphone

The piezo microphone is a robust pressure transducer made of stainless steel (Hastelloy C276) that is screwed into one of two threaded holes just before the flange. The signal line is protected against damage by a metal hose and is connected to the pre-amplifier in the pre-amplifier box.

Solenoid valve with sound nozzle

The transmission signal is generated by opening the solenoid valve (24 V DC). The valve is connected to the acoustic horn via a sonic nozzle, through which the generated signal is transmitted to the boiler. Due to the geometry of the sound horn - the design of a built-in funnel in the nozzle - a white noise signal with high intensity is generated by compressed air.

Pre-amplifier box

In addition to the preamplifier, the 24 V control cable for the solenoid valve is placed in the preamplifier box and routed over a switch. This switch can stop the transmission process, the energization of the solenoid valve. In addition, the switch is coupled to the control unit, which can recognize the switch position. The pre-amplifier converts the charge delivered by the microphone into voltage and passes this on to the control unit. The send / receive signals are tapped at the "out" contact of the pre-amplifier. A sound horn can be connected to each pre-amplifier box.

Transmission cone

The transmission cone is used to connect the sound horn to the boiler opening. This is manufactured individually for each AGAM measuring system. The flange, the cone diameter and the cone length are varied on the customer side.

The transmission cone does not apply to the conical design of the wall duct.

Control unit

The control unit is placed in a separate control cabinet and contains the IPC, which undertakes all central tasks.

The control of the solenoid valves, the acquisition and digitization of the preamplifier signals and the calculation and visualization of the path temperatures, zone temperatures and the tomography image.

CPU module with hard disk extension and power supply unit

The CPU module undertakes all relevant tasks in the AGAM Q1 measuring system. This includes the control of the solenoid valves via the I / O modules, the processing of the pre-amplified received signals and the processing, display and saving of the raw and process data. The operator accesses the CPU module directly via the web UI and can thus access current or historical data and displays.

All programs and functions are saved together with the operating system (Windows 10 IOT) on a CFast card. All process data are saved on a separate hard disk.

User interface Web UI

All work steps required for operation are carried out via the browser-based network user interface (web UI). After starting the control unit, all necessary processes are started automatically. The prerequisite for operating the AGAM measuring system is the Ethernet connection between PC and CPU module in the same IP address range.

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: gal1.de.

History of documents

Certification of AGAM Q1 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267

Certificate No. 0000074626_00: 2 June 2021
Expiry date of the certificate: 2 May 2026
Test report: 936/21247465/A dated 17 August 2020
TÜV Rheinland Energy GmbH
Publication: BAnz AT 03.05.2021 B9, chapter II number 4.1
UBA announcement dated 31 March 2021

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 6 September 2021
Publication: BAnz AT 11.04.2022 B10, chapter VI notification 31
UBA announcement dated 9 March 2022
(Software changes)

Renewal of certificates

Certificate No. 0000074626_01: 3 May 2026
Expiry date of the certificate: 2 May 2031

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

Measuring system

Manufacturer	Bonnenberg & Drescher GmbH
AMS designation	AGAM Q1
Serial number of units under test	PCU-G3-QAL-2019-P780-1910I-1 / PCU-G3-QAL-2019-P780-1910I-2
Measuring principle	sound velocity

Test report

Test laboratory	936/21247465/A
Date of report	TÜV Rheinland
	2020-08-17

Measured component

Certification range	Temperature
	50 - 1500 °C

Evaluation of the cross-sensitivity (CS)

(system with largest CS)	
Sum of positive CS at zero point	0.00 °C
Sum of negative CS at zero point	0.00 °C
Sum of positive CS at span point	0.00 °C
Sum of negative CS at span point	0.00 °C
Maximum sum of cross-sensitivities	0.00 °C
Uncertainty of cross-sensitivity	u_i 0.000 °C

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Standard deviation from paired measurements under field conditions *	u_D 7.600 °C		57.760 (°C) ²
Lack of fit	u_{lof} 3.464 °C		11.999 (°C) ²
Zero drift from field test	$u_{d,z}$ 0.000 °C		0.000 (°C) ²
Span drift from field test	$u_{d,s}$ 0.866 °C		0.750 (°C) ²
Influence of ambient temperature at span	u_t 1.097 °C		1.203 (°C) ²
Influence of supply voltage	u_v 0.000 °C		0.000 (°C) ²
Cross-sensitivity (interference)	u_i 0.000 °C		0.000 (°C) ²
Uncertainty of reference material at 70% of certification range	u_{rm} 12.124 °C		147.000 (°C) 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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	14.79 °C
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	28.99 °C

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the LV 850 °C	3.4
Requirement of EN 15267-3	U in % of the LV 850 °C	10.0
	U in % of the LV 850 °C	7.5