

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No: 0000062065\_02

**Certified AMS:** DGA-X for NO and SO<sub>2</sub>

**Manufacturer:** Dongwoo Optron Co., Ltd.  
102-8, Hoesan-Daero  
Opo-Eup, Gwangju-Si  
Republic Korea

**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 7 pages).

The present certificate replaces certificate 0000062065\_01 dated 5 November 2019.



Suitability Tested  
EN 15267  
QAL1 Certified  
Regular  
Surveillance

www.tuv.com  
ID 0000062065

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

German Environment Agency

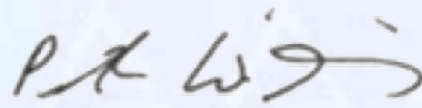
Dessau, 3 July 2024

This certificate will expire on:  
21 July 2029

TÜV Rheinland Energy &  
Environment GmbH  
Cologne, 2 July 2024



Dr. Marcel Langner  
Head of Section II 4



ppa. Dr. Peter Wilbring

[www.umwelt-tuv.eu](http://www.umwelt-tuv.eu)  
[tre@umwelt-tuv.eu](mailto:tre@umwelt-tuv.eu)  
Tel. + 49 221 806-5200

TÜV Rheinland Energy & Environment GmbH  
Am Grauen Stein  
51105 Köln

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.

<b>Test report:</b>	936/21239654/B dated 6 March 2019
<b>Initial certification:</b>	26 March 2019
<b>Expiry date:</b>	21 July 2029
<b>Certificate:</b>	Renewal (of previous certificate 0000062065_01 of 5 November 2019 valid until 21 July 2024)
<b>Publication:</b>	BAnz AT 22.07.2019 B8, chapter I No. 1.2

### Approved application

The tested AMS is suitable for use at plants according to Directive 2010/75/EC chapter III (combustion plants / 13<sup>th</sup> BImSchV:2017), chapter IV (waste incineration plants / 17<sup>th</sup> BImSchV:2013), Directive 2015/2193/EC (44<sup>th</sup> BImSchV:2019), 30<sup>th</sup> BImSchV: 2019 and TA Luft:2002. 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 six month field test at a waste incineration.

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 936/21239654/B dated 6 March 2019 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 22.07.2019 B8, chapter I No. 1.2,  
Announcement by UBA dated 28 June 2019:

**AMS designation:**

DGA-X for NO and SO<sub>2</sub>

**Manufacturer:**

Dongwoo Optron Co., Ltd., Gwangju-Si, South Korea

**Field of application:**

For plants requiring official approval and for plants according to the 27th BImSchV

**Measuring ranges during the performance test:**

Component	Certification range	supplementary range	Unit
NO	0 – 100	0 – 1,000	mg/m <sup>3</sup>
SO <sub>2</sub>	0 – 75	0 – 1,000	mg/m <sup>3</sup>

**Software version:**

20000-8

**Restrictions:**

None

**Notes:**

1. The maintenance interval is three months.
2. The test cycle was deactivated during the determination of the maintenance interval.
3. The instrument version submitted to testing had an optical path length of 300 mm.
4. The AMS is suitable for velocities above 1 m/s.
5. Optical filters have to be deactivated.
6. Normalisation of measured signals referred to the operating status require the use of an external temperature sensor.
7. The output of measured values refers to the operating conditions without any moisture correction.
8. Supplementary testing (extension of the maintenance interval to three months) as regards Federal Environment Agency (UBA) notice of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter I number 2.3).

**Test Institute:**

TÜV Rheinland Energy GmbH, Cologne  
Report No.: 936/21239654/B dated 6 March 2019

### Certified product

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

The DGA-X is an in-situ measuring system which continuously monitors gaseous components present in the waste gas of industrial plants. The AMS uses differential optical absorption spectroscopy as its measuring principle which relies on the absorption of specific frequencies or wavelengths of light by gaseous components. The certified AMS includes a main control unit (MU), an auto calibration unit (ACU), a probe and a purge air pump unit. The main control unit consists of a UV light source, a spectrometer a controller and an input/output control unit. The calibration unit includes a sliding table with a reflector (which modifies the UV light path) and a standard gas cell. The probe contains a purge air window, a reflector and a purge air tube at both ends of the measurement section, which is located in the middle. The probe is an integral part of the gas analyser. Depending on the size of the sensor, the former serves as reference for gas measurement calibration. The purge unit prevents the instrument and the probe from being contaminated. To this effect, fresh and filtered air is taken in through the purge unit.

The main control unit's display shows all current concentrations of measured components and status signals. The display is equipped with a touchscreen. The system provides a number of outputs for analogue and digital signals such as an RS Modbus.

The AMS tested here comprises the following components:

- DGA-X gas analyser main control unit (MU),
- DGA-X gas analyser calibration unit (ACU),
- DGA-X gas analyser panel for gas control range,
- Purge unit (pump, filter, hose),
- DGA-X gas analyser probe (measurement path 300 mm),
- Flange, tube, and flange cover for mounting the probe,

## 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](http://qal1.de).

## History of documents

Certification of DGA-X 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. 0000062065\_00: 12 June 2019  
Expiry date of the certificate: 25 March 2024  
Test report: 936/21239654/A dated 10 October 2018  
TÜV Rheinland Energy GmbH, Cologne  
Publication: BAnz AT 26.03.2019 B7, chapter I number 2.3  
UBA announcement dated 27 February 2019

### Supplementary testing according to EN 15267

Certificate No. 0000062065\_01: 5 November 2019  
Expiry date of the certificate: 21 July 2024  
Test report: 936/21239654/B dated 25 February 2019  
TÜV Rheinland Energy GmbH  
Publication: BAnz AT 22.07.2019 B8, chapter I number 1.2  
UBA announcement dated 28 June 2019

### Renewal of certificates

Certificate No. 0000062065\_02: 3 July 2024  
Expiry date of the certificate: 21 July 2029

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

#### Measuring system

Manufacturer	Dongwoo Optron Co., Ltd.
AMS designation	DGA-X
Serial number of units under test	DGA-X-16-036-Nox/Sox / DGA-X-16-037-Nox/Sox
Measuring principle	DOAS

#### Test report

Test laboratory	936/21239654/B TÜV Rheinland
Date of report	2019-03-06

#### Measured component

Certification range	NO 0 - 100 mg/m <sup>3</sup>
---------------------	---------------------------------

#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.00 mg/m <sup>3</sup>
Sum of negative CS at span point	-1.60 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-1.60 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ -0.924 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	1.200 mg/m <sup>3</sup>	1.440 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.098 mg/m <sup>3</sup>	0.010 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.115 mg/m <sup>3</sup>	0.013 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	1.501 mg/m <sup>3</sup>	2.253 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.462 mg/m <sup>3</sup>	0.213 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.062 mg/m <sup>3</sup>	0.004 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-0.924 mg/m <sup>3</sup>	0.854 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas pressure	$u_p$	0.104 mg/m <sup>3</sup>	0.011 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.808 mg/m <sup>3</sup>	0.653 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 2.33 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c \cdot k = u_c \cdot 1.96 \quad 4.58 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

##### Requirement of 2010/75/EU

Requirement of EN 15267-3

<b>U in % of the ELV 67 mg/m<sup>3</sup></b>	<b>6.8</b>
<b>U in % of the ELV 67 mg/m<sup>3</sup></b>	<b>20.0</b>
U in % of the ELV 67 mg/m <sup>3</sup>	15.0

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

#### Measuring system

Manufacturer	Dongwoo Optron Co., Ltd.
AMS designation	DGA-X
Serial number of units under test	DGA-X-16-036-Nox/Sox / DGA-X-16-037-Nox/Sox
Measuring principle	DOAS

#### Test report

Test laboratory	936/21239654/B TÜV Rheinland
Date of report	2019-03-06

#### Measured component

	SO <sub>2</sub>
Certification range	0 - 75 mg/m <sup>3</sup>

#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.40 mg/m <sup>3</sup>
Sum of negative CS at span point	-0.50 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-0.50 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ -0.290 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$ 0.630 mg/m <sup>3</sup>		0.397 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$ -0.169 mg/m <sup>3</sup>		0.029 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$ 0.260 mg/m <sup>3</sup>		0.068 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$ 0.953 mg/m <sup>3</sup>		0.908 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$ 0.635 mg/m <sup>3</sup>		0.403 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$ 0.038 mg/m <sup>3</sup>		0.001 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$ -0.290 mg/m <sup>3</sup>		0.084 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas pressure	$u_p$ 0.212 mg/m <sup>3</sup>		0.045 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$ 0.606 mg/m <sup>3</sup>		0.368 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 1.52 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 2.97 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

##### Requirement of 2010/75/EU

Requirement of EN 15267-3

<b>U in % of the ELV 50 mg/m<sup>3</sup></b>	<b>5.9</b>
<b>U in % of the ELV 50 mg/m<sup>3</sup></b>	<b>20.0</b>
U in % of the ELV 50 mg/m <sup>3</sup>	15.0