

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate number: 0000051690

**Certified AMS:** AF 22e for SO<sub>2</sub>

**Manufacturer:** Environnement S.A.,  
111 bd, Robespierre  
78304 Poissy Cedex  
France

**Test Institute:** TÜV Rheinland Energy GmbH

**This is to certify that the AMS has been tested and certified according to the standards**

**VDI 4202-1 (2010), VDI 4203-3 (2010), EN 14212 (2012),  
EN 15267-1 (2009), EN 15267-2 (2009) and EN 15267-3 (2008)**

Certification is awarded in respect of the conditions stated in this certificate  
(this certificate contains 9 pages).

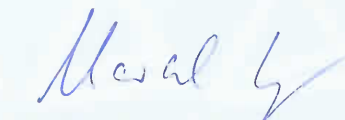


Suitability Tested  
Complying with  
2008/50/EC  
EN 15267  
Regular  
Surveillance

[www.tuv.com](http://www.tuv.com)  
ID 0000051690

Publication in the German Federal Gazette  
(BAnz.) of 1 August 2016


German Federal Environment Agency  
Dessau, 19 August 2016



Dr. Marcel Langner  
Head of Section II 4.1

This certificate will expire on:  
31 July 2021

TÜV Rheinland Energy GmbH  
Cologne, 18 August 2016



ppa. Dr. Peter Wilbring

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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

**Certificate:**  
0000051690 / 19 August 2016

**Test report:** 936/21228317/C of 18 December 2015  
**Initial certification:** 1 August 2016  
**Expiry date:** 31 July 2021  
**Publication:** BAnz AT 01.08.2016 B11, chapter III number 2.1

#### **Approved application**

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

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three-month field test.

The AMS is approved for an ambient temperature range of 0 °C to +30 °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 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 ambient air application at which it will be installed.

#### **Basis of the certification**

This certification is based on:

- Test report 936/21228317/C of 18 December 2015 of TÜV Rheinland Energie und Umwelt 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 01.08.2016 B11, chapter III number 2.1,  
Announcement by UBA from 14 July 2016:

**AMS designation:**

AF 22e for SO<sub>2</sub>

**Manufacturer:**

Environnement S.A., Poissy, France

**Field of application:**

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

**Measuring ranges during the performance test:**

Component	Certification range	Unit
Sulphur dioxide	0 - 1000	µg/m <sup>3</sup>

**Software version:**

Firmware: 1.0.a

**Restrictions:**

None

**Notes:**

1. The performance test includes also the version AF 22e\* (without integrated Display). In this case the measured values are displayed by means of a PC or Laptop which is part of the measuring system.
2. The report on the performance test is available online at [www.qal1.de](http://www.qal1.de).

**Test report:**

TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Report No.: 936/21228317/C of 18 December 2015

### Certified product

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

The measuring principle of AF 22e is based on the principle of ultraviolet fluorescence.

Sampling is effected by means of a pump at the end of the circle through a Teflon tube located at the analyser's rear side. Dust protection is ensured by a Teflon filter.

The sample is first led through a Carbon Kicker, which eliminates aromatic hydrocarbons in the sample. The Carbon Kicker consists of two concentric tubes where the inner tube is made of a special polymer.

The sample contaminated with aromatic hydrocarbons is fed through the inner tube. Through permeation, the aromatic hydrocarbons reach the external tube rinsed with zero air. The sample, now free of hydrocarbons, is led to the reaction chamber where it is irradiated with ultraviolet light (centered to 214 nm). The wavelength of 214 nm corresponds to the absorption wavelength of the SO<sub>2</sub> molecules.

A photodiode measures the UV radiation coming from the UV light source. This measurement is taken in to account in order to even out potential fluctuations of the UV energy.

The molecules emit a specific fluorescence in UV light, which is optically filtered at the output between 300 and 400 nm. This fluorescence is visualized using the PM tube near the reaction chamber.

The AMS front side is fitted with the main switch as well as a TFT LCD colored display with backlight and a touch screen display. AF 22e for SO<sub>2</sub> is operated via the touch screen display. Version AF 22e\* is identical to version AF 22e, expect for the fact that it is not fitted with a display. AF 22e\* can only be operated via Ethernet using an external PC.

Fluid inputs and outputs as well as electrical connections are located on the rear side of the AMS.

### 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 can be applied to the product or used in publicity material 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: [qal1.de](http://qal1.de).

Certification of AF 22e 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. 0000051690: 19 August 2016  
Expiry date of the certificate: 31 July 2021

Test report: 936/21228317/C of 18 December 2015  
TÜV Rheinland Energie und Umwelt GmbH, Cologne,

Publication: BAnz AT 01.08.2016 B11, chapter III number 2.1  
Announcement by UBA from 14 July 2016

Expanded uncertainty for laboratory, system 1

Measuring device:		Serial-No.:		SN 12	
Measured component:		1h-limit value:		132	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0,330	$U_{r,z}$	0,0051
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0,490	$U_{r,1h}$	0,0116
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0,920	$U_{l,1h}$	0,4916
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0,270	$U_{gp}$	4,8260
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,040	$U_{gt}$	0,1044
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,316	$U_{st}$	6,6104
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0,010	$U_v$	0,0090
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0,490	$U_{H_2O}$	6,7429
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 10 nmol/mol (Span)	-3,480	$U_{int, pos}$	2,42
		≤ 5.0 nmol/mol (Zero)	-0,460		
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Span)	0,320	or	5,8520
		≤ 5.0 nmol/mol (Zero)	0,140		
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	-0,590	$U_{int, neg}$	15,0474
		≤ 5.0 nmol/mol (Zero)	0,070		
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Span)	-0,110	$U_{av}$	0,1897
		≤ 5.0 nmol/mol (Zero)	0,370		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Span)	0,600	$U_{asc}$	1,7424
		≤ 10 nmol/mol (Zero)	1,570		
9	Averaging effect	≤ 10 nmol/mol (Span)	3,270	$U_{reg}$	6,4523
18	Difference sample/calibration port	≤ 7.0% of measured value	5,090	$U_c$	12,9047
21	Uncertainty of test gas	≤ 1.0%	-0,330	$U$	9,78
		≤ 3.0%	2,000	$W_{req}$	15
Combined standard uncertainty					
Expanded uncertainty					
Relative expanded uncertainty					
Maximum allowed expanded uncertainty					

Expanded uncertainty for laboratory, system 2

Measuring device:		Serial-No.:		SN 14		nmol/mol	
Measured component:		1h-limit value:		132			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0,340	$u_{r,z}$	0,0058		
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0,480	$u_{r,h}$	0,0119		
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0,960	$u_{l,h}$	0,5353		
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0,410	$u_{gp}$	11,1282		
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,010	$u_{gt}$	0,0065		
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,099	$u_{st}$	0,6488		
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0,010	$u_v$	0,0090		
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	-1,100	$u_{H_2O}$	4,7474		
		≤ 10 nmol/mol (Span)	-2,920				
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0,630	$u_{int, pos}$			
		≤ 5.0 nmol/mol (Span)	1,570				
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0,110				
		≤ 5.0 nmol/mol (Span)	-1,600				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0,220				
		≤ 5.0 nmol/mol (Span)	-1,640				
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0,390				
		≤ 5.0 nmol/mol (Span)	0,870				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0,740	$u_{int, neg}$			
		≤ 10 nmol/mol (Span)	3,160				
9	Averaging effect	≤ 7.0% of measured value	5,250	$u_{av}$	16,0083		
18	Difference sample/calibration port	≤ 1.0%	0,060	$u_{asc}$	0,0063		
21	Uncertainty of test gas	≤ 3.0%	2,000	$u_{cg}$	1,7424		
				Combined standard uncertainty		$u_c$	
				Expanded uncertainty		nmol/mol	
				Relative expanded uncertainty		%	
				Maximum allowed expanded uncertainty		%	

Combined standard uncertainty for laboratory and field, system 1

Measuring device:		Serial No.:		SN 12	
Measured component:		1h-limit value:		132	
AF 22e		SO2		nmol/mol	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0,330	u <sub>r,z</sub>	0,0051
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0,490	u <sub>r,h</sub>	not considered, as u <sub>r,h</sub> = 0,1 < u <sub>r,f</sub>
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0,920	u <sub>l,h</sub>	0,4916
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0,270	u <sub>sp</sub>	4,8260
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,040	u <sub>gt</sub>	0,1044
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,316	u <sub>st</sub>	6,6104
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0,010	u <sub>y</sub>	0,0090
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0,490		
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 10 nmol/mol (Span)	-3,480	u <sub>H2O</sub>	6,7429
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0,460		
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	0,320	u <sub>H2, pos</sub>	
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0,140		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Span)	-0,590		
9	Averaging effect	≤ 5.0 nmol/mol (Zero)	0,070		
10	Reproducibility standard deviation under field conditions	≤ 5.0 nmol/mol (Span)	-0,110	or	5,8520
11	Long term drift at zero level	≤ 5.0 nmol/mol (Zero)	0,370		
12	Long term drift at span level	≤ 5.0 nmol/mol (Span)	0,600		
18	Difference sample/calibration port	≤ 10 nmol/mol (Span)	1,570	u <sub>pl, neg</sub>	
21	Uncertainty of test gas	≤ 7.0% of measured value	3,270		
		≤ 5.0% of average over 3 months	5,090	u <sub>av</sub>	15,0474
		≤ 5.0% of max. of certification range	1,240	u <sub>r,f</sub>	2,6791
		≤ 1.0%	0,630	u <sub>d,l,z</sub>	0,1323
		≤ 3.0%	0,750	u <sub>d,l,h</sub>	0,3267
			-0,330	u <sub>asc</sub>	0,1897
			2,000	u <sub>cg</sub>	1,7424
		Combined standard uncertainty		u <sub>c</sub>	6,6902
		Expanded uncertainty		U	13,3805
		Relative expanded uncertainty		W	10,14
		Maximum allowed expanded uncertainty		W <sub>req</sub>	15



Combined standard uncertainty for laboratory and field, system 2

Measuring device: AF 22e		Serial No.: SN 14		132		nmol/mol	
Measured component: SO2		1h-limit value:		Square of partial uncertainty			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	1h-limit value:	1h-limit value:	nmol/mol
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0,340	U <sub>r,z</sub>	0,08	0,0058	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0,480	U <sub>r,h</sub>	not considered, as $u_{r,h} = 0,1 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0,960	U <sub>l,h</sub>	0,73	0,5353	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0,410	U <sub>sp</sub>	3,34	11,1282	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,010	U <sub>gt</sub>	0,08	0,0065	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0,099	U <sub>st</sub>	0,81	0,6488	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0,010	U <sub>v</sub>	0,09	0,0090	
8a	Interferent H <sub>2</sub> O with 21 nmol/mol	≤ -1,100	-1,100				
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ -2,920	-2,920	U <sub>H2O</sub>	-2,18	4,7474	
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ -0,630	-0,630	U <sub>int,pos</sub>			
8d	Interferent NO with 500 nmol/mol	≤ 1,570	1,570				
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 0,110	0,110				
8f	Interferent m-Xylene with 1 µmol/mol	≤ -1,600	-1,600				
9	Averaging effect	≤ 0,220	0,220	or	3,23	10,4533	
10	Reproducibility standard deviation under field conditions	≤ -1,640	-1,640	U <sub>int,neg</sub>			
11	Long term drift at zero level	≤ 0,390	0,390	U <sub>spv</sub>	4,00	16,0083	
12	Long term drift at span level	≤ 0,870	0,870	U <sub>r,f</sub>	1,64	2,6791	
18	Difference sample/calibration port	≤ 10 nmol/mol (Zero)	0,740	U <sub>l,z</sub>	0,43	0,1825	
21	Uncertainty of test gas	≤ 7.0% of measured value	5,250	U <sub>l,h</sub>	-0,43	0,1887	
		≤ 5.0% of average over 3 months	1,240	U <sub>asc</sub>	0,08	0,0063	
		≤ 5.0% of max. of certification range	2,000	U <sub>cg</sub>	1,32	1,7424	
		≤ 3.0%	2,000				
		Combined standard uncertainty		U <sub>c</sub>		6,9528	nmol/mol
		Expanded uncertainty		U		13,9056	nmol/mol
		Relative expanded uncertainty		W		10,53	%
		Maximum allowed expanded uncertainty		W <sub>reg</sub>		15	%