

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040329_03

Certified AMS: AF22M for SO₂

Manufacturer: ENVEA
111, Boulevard Robespierre
78304 Poissy Cedex
France

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 (2002), VDI 4203-3 (2004), EN 14212 (2012),
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 11 pages).
The present certificate replaces certificate 0000040329_02 dated 1 July 2020.



Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance
www.tuv.com
ID 0000040329

Publication in the German Federal Gazette
(BAnz) of 7 March 2008

German Environment Agency

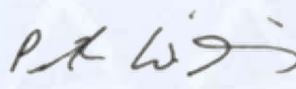
Dessau, 27 June 2025

This certificate will expire on:
30 June 2030

TÜV Rheinland Energy &
Environment GmbH
Cologne, 26 June 2025



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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.

Test report:	936/21206773/A dated 9 November 2007 and Addendum 936/21221709/B dated 28 September 2013 i
Initial certification:	1 April 2014
Expiry date:	30 June 2030
Certificate:	Renewal (of previous certificate 0000040329_02 of 1 July 2020 valid until 30 June 2025)
Publication:	BAnz. 07 March 2008, No. 38, p. 901, chapter III No. 1.1 and Banz AT 01.04.2014 B12, chapter VI notification 19

Approved application

The tested AMS is suitable for continuous immission measurement of SO₂ in stationary use.

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 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 use.

Basis of the certification

This certification is based on:

- Test report 936/21206773/A dated 9 November 2007 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and Addendum 936/21221709/B dated 28 September issued by 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. 07 March 2008, No. 38, p. 901, chapter III
No. 1.1, Announcement by UBA dated 14 February 2008:

AMS designation:

AF22M for SO₂

Manufacturer:

Environnement S.A., Poissy Cedex, France

Distribution in Germany:

Ansyco GmbH, Karlsruhe

Field of application:

For continuous monitoring of sulphur dioxide in ambient air

Measuring ranges during the performance test:

SO ₂	0 – 700	µg/m ³
	0 – 1,000	µg/m ³

Software version:

V1.22

Test institute:

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

TÜV Rheinland Group

Report No.: 936/21206773/A dated 9 November 2007

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, Chap. VI
notification 19, Announcement by UBA dated 27 February 2014:

**19 Notification of announcement by the German Federal Environment Agency
of 14 February 2008 (BAnz. p. 901, Chapter III Number 1.1)**

The measuring system AF22M for SO₂ manufactured by Environnement fulfils the requirements of EN 14212 (November 2012). Furthermore, the manufacturing process and quality management system of the measuring system AF22M for SO₂ fulfil the requirements of EN 15267.

The test report of the performance test with report number 936/21206773/A and an addendum as an integral part of to the test report with report number 936/21221709/B can be viewed on the internet at www.qal1.de.

Statement by TÜV Rheinland Energie und Umwelt GmbH dated 28 September 2013

Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, Chap. V notification 50,
Announcement by UBA dated 22 July 2015:

**50 Notification as regards Federal Environment Agency (UBA) notices
of 14 February 2008 (BAnz. p. 901, chapter III number 1.1) and
of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI notification 19)**

The current software version for the AF22M measuring system for SO₂,
manufactured by Environnement S.A., is:
v1.0.4 (Calculation process)
v3.6.f (Display process)

For additional means of communication, the AMS was equipped with a USB and a
TCP/IP interface. A protective device was added to the UV lamp bracket.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 14 March 2015

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, Chap. IV
notification 23, Announcement by UBA dated 27 February 2019:

**23 Notification as regards Federal Environment Agency notices
of 14 February 2008 (BAnz. S. 901, chapter III number 1.1) and
of 22 July 2015 (BAnz AT 26.08.2015 B4, chapter V notification 50)**

The current software version of the AF22M measuring system for SO₂
manufactured by Environnement S.A. is:
v1.05 (calculation process)
v3.6.i (display process)

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2019

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, Chap. IV
notification 27, Announcement by UBA dated 24 February 2020:

**27 Notification as regards Federal Environment Agency (UBA) notices
of 14 February 2008 (BAnz. p. 901, chapter III number 1.1) and
of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV notification 23)**

Environnement S.A., Poissy, France have changed their company name to ENVEA.

The latest software version of the AF22M measuring system for SO₂
manufactured by ENVEA is:
v1.0.5 (calculation process)
v3.8.b (display process)

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2018

Certified product

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

The sample is taken by a Teflon tube connected to the back of the monitor through a pump placed at the end of the circuit. A Teflon filter provides dust protection.

The sample to be analyzed is firstly filtered by an elimination device of aromatic hydrocarbon molecule. This device consists of two concentric tubes. The internal tube is made of a special polymer. The sample to be analyzed with aromatic HC molecules comes in the internal tube. Aromatic HC molecules are transferred by permeation to the external silicon tube.

The sample to be analyzed, exempt from HC molecules, is directed to a reaction chamber in which it is irradiated by an ultraviolet radiation centred at 214 nm, the absorption wavelength of SO₂ molecules. A photodiode measures the ultraviolet radiation generated by the UV lamp via a mirror. This measurement is used during signal processing in order to compensate for any variation of the UV energy.

Molecules restore a specific fluorescence in the ultraviolet, which is optically filtered between 300 and 400 nm at the outlet in order to eliminate some interfering gases. This fluorescence is visualized by the PM tube placed near the reaction chamber.

At the start of each "zero-ref", a shutter is placed between the UV lamp and the reaction chamber inlet for 40 seconds. This electrical zero corresponds to the PM tube darkness current and the offset voltage of the preamplifier, incorporated into the signal processing, it eliminates the possibility of drifts with temperature and time.

Then PM tube signal is amplified and is converted into digital values for processing by a microprocessor that calculates the average of measurement values, checks the alarms and carries out monitor operation diagnosis. These various values and information are displayed on an alphanumeric display unit on the monitor front panel.

The AF22M analyser measures sulphur dioxide (SO₂) in ambient air. The measuring principle is based on UV fluorescence.

The intensity of the radiation absorbed by the sulphur dioxide in the interior of an optical chamber follows the principle of the Beer-Lambert law:

$$i_a = i_0 \times (1 - e^{-\alpha L c})$$

where

- i_0 intensity at the entry to the chamber,
- α characteristic absorption efficiency for SO₂
- L length of optical chamber
- c = [SO₂], the concentration of the gas to be analysed.

The probability that an excited molecule fluoresces is also expressed by the following formula:

$$\frac{Kf}{Kf + Kq + Kd}$$

The intensity of the fluorescence received by the photomultiplier (PM) is thus expressed as follows:

$$i_f = G i_a \frac{K_f}{K_f + K_q + K_d}$$

where G is a constant which is dependent on the illuminated proportion of the chamber measured by the PM. Thus:

$$i_f = G i_0 \frac{K_f}{K_f + K_q + K_d} \times (1 - e^{-\alpha L c})$$

In this case, $\alpha L c \ll 1$ and $1 - e^{-\alpha L c}$ can be developed in the first order as follows:

$$1 - e^{-\alpha L c} \cong +\alpha L c$$

The result is thus:

$$i_f = \frac{G i_0 K_f \alpha L}{K_f + K_q + K_d} c = \beta \cdot c$$

The radiation absorbed by the PM is thus directly proportional to the SO₂ concentration.

This measuring principle corresponds to the standard reference method as described in EN 14212.

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 AF22M is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test

Test report: 936/21206773/A dated 9 November 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 07 March 2008, No. 38, p. 901, chapter III number 1.1
UBA announcement dated 14 February 2008

Initial certification according to EN 15267 based on a notification

Certificate No. 0000040329_00: 29 April 2014
Expiry date of the certificate: 31 March 2019
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 28 September 2013
Test report: 936/21206773/A dated 9 November 2007 and Addendum 936/21221709/B dated 28 September 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI no. 19
UBA announcement dated 27 February 2014

Notifications

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 14 March 2015
Publication: BAnz AT 26.08.2015 B4, chapter V notification 50
UBA announcement dated 22 July 2015
(Soft- and hardware changes)

Renewal of certificates

Certificate No. 0000040329_01: 1 April 2019
Expiry date of the certificate: 30 June 2020

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 23
UBA announcement dated 27 February 2019
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 27
UBA announcement dated 24 February 2020
(Software changes and new producer name formerly Environnement S.A.)

Renewal of certificates

Certificate No. 0000040329_02: 1 July 2020
Expiry date of the certificate: 30 June 2025

Renewal of certificates

Certificate No. 0000040329_03: 27 June 2025
Expiry date of the certificate: 30 June 2030

Expanded uncertainty laboratory, system 1

Measuring device:					
Environmental AF22M					
SO ₂					
Serial-No.: Gerät 1					
1h-limit value:					
nmol/mol					
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.000	U _{r,z}	0.0000
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	U _{r,lh}	0.0026
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-1.500	U _{l,ln}	1.3068
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	-0.140	U _{gp}	1.1384
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.023	U _{gt}	0.0307
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.310	U _{st}	5.5815
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	-0.010	U _v	0.0094
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	-0.300	U _{H2O}	2.0624
		≤ 10 nmol/mol (Span)	-1.900		
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.300	U _{int,pos}	
		≤ 5.0 nmol/mol (Span)	0.300		
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		
		≤ 5.0 nmol/mol (Span)	-0.400		
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.400		
		≤ 5.0 nmol/mol (Span)	1.200	or	
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		1.8013
		≤ 5.0 nmol/mol (Span)	0.700		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.000	U _{int,neg}	
		≤ 10 nmol/mol (Span)	0.100		
9	Averaging effect	≤ 7.0% of measured value	1.800	U _{av}	1.8818
18	Difference sample/calibration port	≤ 1.0%	0.190	U _{isc}	0.0629
21	Uncertainty of test gas	≤ 3.0%	2.000	U _{cg}	1.7424
			Combined standard uncertainty		
			Expanded uncertainty		
			Relative expanded uncertainty		
			Maximum allowed expanded uncertainty		
			W _{rel}		
			15 %		
			nmol/mol		
			nmol/mol		
			%		
			%		

Expanded uncertainty laboratory, system 2

Measuring device:		Environnement AF22M		Serial-No.:		Gerät 2	
Measured component:		SO ₂		1h-limit value:		132	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.000	U _{r,z}	0.000	0.0000	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	U _{r,1h}	0.05	0.0027	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.100	U _{l,1h}	0.08	0.0058	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.250	U _{gp}	1.91	3.6300	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.012	U _{gt}	-0.09	0.0084	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.340	U _{st}	2.59	6.7140	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	U _v	0.10	0.0094	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	-0.100 -2.300	U _{H2O}	-1.74	3.0327	
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.000 1.200	U _{int,pos} or	2.40	5.7600	
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.000 0.500				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.500 1.900				
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.000 0.000				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	-0.100 0.500				
9	Averaging effect	≤ 7.0% of measured value	2.900	U _{av}	2.21	4.8845	
18	Difference sample/calibration port	≤ 1.0%	0.010	U _{Δsc}	0.01	0.0002	
21	Uncertainty of test gas	≤ 3.0%	2.000	U _{cg}	1.32	1.7424	
Combined standard uncertainty				U _c	5.0784	nmol/mol	
Expanded uncertainty				U	10.1568	nmol/mol	
Relative expanded uncertainty				W	7.69	%	
Maximum allowed expanded uncertainty				W _{req}	15	%	

Combined uncertainty, laboratory and field, system 1

Measuring device:			Environnement AF22M		Serial-No.:		Gerät 1	
Measured component:			SO ₂		1h-limit value:			
					132			
					nmol/mol			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty			
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.000	u _{r,z}	0.00	0.0000		
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	u _{r,1h}	not considered, as u _{r,1h} = 0.05 < u _{r,f}	-		
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-1.500	u _{l,1h}	-1.14	1.3068		
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	-0.140	u _{gp}	-1.07	1.1384		
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.023	u _{gt}	-0.18	0.0307		
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.310	u _{st}	2.36	5.5815		
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	-0.010	u _v	-0.10	0.0094		
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	-0.300					
8b	Interferent H ₂ S with 200 nmol/mol	≤ 10 nmol/mol (Span)	-1.900	u _{H2O}	-1.44	2.0624		
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.300	u _{int,pos}				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	0.000					
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Span)	-0.400					
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.400					
9	Averaging effect	≤ 5.0 nmol/mol (Span)	1.200	or	1.34	1.8013		
10	Reproducibility standard deviation under field conditions	≤ 5.0 nmol/mol (Zero)	0.000					
11	Long term drift at zero level	≤ 10 nmol/mol (Span)	0.700	u _{int,neg}				
12	Long term drift at span level	≤ 7.0% of measured value	0.000	u _{av}	1.37	1.8818		
18	Difference sample/calibration port	≤ 5.0% of max. of certification range	2.240	u _{r,f}	2.96	8.7427		
21	Uncertainty of test gas	≤ 4.0 nmol/mol	-0.610	u _{d,l,z}	-0.35	0.1240		
		≤ 5.0% of max. of certification range	-0.940	u _{d,l,1h}	-0.72	0.5132		
		≤ 1.0%	0.190	u _{isc}	0.25	0.0629		
		≤ 3.0%	2.000	u _{cg}	1.32	1.7424		
				Combined standard uncertainty		u _c	4.9997	
				Expanded uncertainty		U	9.9995	
				Relative expanded uncertainty		W	7.58	
				Maximum allowed expanded uncertainty		W _{req}	15	
							%	

Combined uncertainty, laboratory and field, system 2

Measuring device:		Serial-No.:		Gerät 2	
Measured component:		1h-limit value:		132	
				nmol/mol	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.000	u _{r,z}	0.0000
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	u _{r,1h}	-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.100	u _{1h}	0.0058
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.250	u _{pp}	3.6300
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.012	u _{gt}	0.0084
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.340	u _{st}	6.7140
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	u _v	0.0094
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	-0.100		
8b	Interferent H ₂ S with 200 nmol/mol	≤ 10 nmol/mol (Span)	-2.300	u ₂₀	3.0327
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000	u _{int,pos}	
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	1.200		
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Span)	0.500	or	5.7600
9	Averaging effect	≤ 7.0% of measured value	2.900	u _{int,neg}	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	2.240	u _{av}	4.8845
11	Long term drift at zero level	≤ 4.0 nmol/mol	-0.690	u _{r,f}	8.7427
12	Long term drift at span level	≤ 5.0% of max. of certification range	2.460	u _{0,1,z}	0.1587
18	Difference sample/calibration port	≤ 1.0%	0.010	u _{0,1,h}	3.5148
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{sc}	0.0002
				u _{cg}	1.7424
				u _c	6.1809
				U	12.3618
				W	9.37
				W _{req}	15