

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000051690\_02

**Certified AMS:** AF22e for SO<sub>2</sub>

**Manufacturer:** ENVEA  
111, Boulevard Robespierre  
78304 Poissy Cedex  
France

**Test Institute:** TÜV Rheinland Energy GmbH

**This is to certify that the AMS has been tested  
and found to comply with the standards  
VDI 4202-1 (2018), EN 14212 (2012),  
Guide to Demonstration of Equivalence of Ambient Air Monitoring Meth. (2010),  
EN 15267-1 (2009) and EN 15267-2 (2009).**

Certification is awarded in respect of the conditions stated in this certificate  
(this certificate contains 11 pages).  
The present certificate replaces certificate 0000051690\_01 dated 31 July 2021.



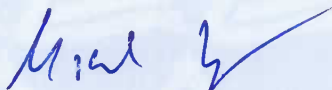
Suitability Tested  
Complying with  
2008/50/EC  
EN 15267  
Regular  
Surveillance  
[www.tuv.com](http://www.tuv.com)  
ID 0000051690

Publication in the German Federal Gazette  
(BAnz) of 01 August 2016

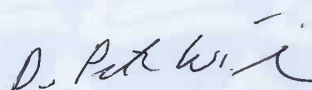
German Environment Agency  
Dessau, 29 July 2022

This certificate will expire on:  
31 July 2027

TÜV Rheinland Energy GmbH  
Cologne, 28 July 2022



Dr. Marcel Langner  
Head of Section II 4.1



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 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>	936/21228317/C dated 18 December 2015
<b>Initial certification:</b>	19 August 2016
<b>Expiry date:</b>	31 July 2027
<b>Certificate:</b>	Renewal (of previous certificate 0000051690_01 of 31. Juli 2021 valid until 31 July 2022)
<b>Publication:</b>	BAnz AT 01.08.2016 B11, Chap. III No. 2.1

### **Approved application**

The tested AMS is suitable for continuous ambient air monitoring of SO<sub>2</sub> (stationary operation).

The suitability of the AMS for these applications was assessed based on a laboratory test and a 3-month field test.

The AMS is approved for an ambient temperature range of +0° 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 936/21228317/C dated 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, Chap. III No. 2.1,  
Announcement by UBA dated 14 July 2016:

**AMS designation:**AF22e for SO<sub>2</sub>**Manufacturer:**

Environnement S.A., Poissy, France

**Field of application:**For continuous ambient air monitoring of SO<sub>2</sub> (stationary operation)**Measuring ranges during the performance test:**

Component	Certification range	Unit
SO <sub>2</sub>	0 - 1000	µg/m <sup>3</sup>

**Software version:**

Firmware: 1.0.a

**Restrictions:**

None

**Notes:**

1. Performance testing also covered the AF 22e\* version (without its own display) of the measuring system. This version displays measured values via a PC or laptop accompanying the measuring system.
2. The test report on performance testing is available on the internet at [www.qal1.de](http://www.qal1.de).

**Test report:**

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

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notification 22, Announcement by UBA dated 27 February 2019:

**22 Notification as regards Federal Environment Agency (UBA) notice of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter III number 2.1)**

The current software version of the measuring system AF 22e/AF 22e\* for SO<sub>2</sub> of the company Environnement S.A. is:  
1.0.p

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2018

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV notification 26, Announcement by UBA dated 24 February 2020:

**26 Notification as regards Federal Environment Agency (UBA) notices of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter III number 2.1) and of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV notification 22)**

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

The latest software version of the AF 22e/AF 22e\* measuring system for SO<sub>2</sub> manufactory by ENVEA is:  
v1.0.s

Statement issued by TÜV Rheinland Energy GmbH dated 1 October 2019

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, chapter III notification 20, Announcement by UBA dated 31 March 2021:

**20 Notification as regards Federal Environment Agency (UBA) notices of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter III number 2.1) and of 24 February 2020 (BAnz AT 24.03.2020 B7, chapter IV notification 26)**

The latest software version of the AF 22e\*/AF 22e measuring system for SO<sub>2</sub> manufactured by ENVEA is:  
v1.1.a.

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2020

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, chapter VI notification 11, Announcement by UBA dated 09 March 2022:

**20 Notification as regards Federal Environment Agency (UBA) notices of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter III number 2.1) and of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter III notification 20)**

The current software version for the measuring device AF 22e\*/AF 22e for SO<sub>2</sub> of the company ENVEA is:  
v1.1.b

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2021

### Certified product

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

The measuring principle of the AF 22e is based on the principle of UV fluorescence. Sampling is done by a pump at the end of the circuit via a Teflon tube attached to the back of the unit. A Teflon filter provides protection from dust.

The sample to be analysed is first passed through a carbon kicker, which removes the aromatic hydrocarbons it contains. The carbon kicker consists of two concentric tubes with the inner tube made of a special polymer.

The sample to be analysed, which contains aromatic hydrocarbons, is fed in via the inner tube. The aromatic hydrocarbon molecules reach the external tube, which is flushed with a zero air, by permeation. The hydrocarbon-free sample is then passed into a reaction chamber where it is irradiated with ultraviolet light (centred on 214 nm). The wavelength of 214 nm corresponds to the absorption wavelength of SO<sub>2</sub> molecules.

A photodiode measures the ultraviolet radiation generated by the UV lamp. This measurement is taken into account during signal processing to compensate for any fluctuations in UV energy.

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

The main switch of the measuring system and a TFT-LCD colour display with background lighting and touch screen is located at the front of the instrument. The SO<sub>2</sub> analyser AF 22e is operated via this touch-screen display. The AF 22e\* version is identical to the AF 22e unit version (except for the front), but does not have its own display. The AF 22e\* version of the unit is operated exclusively via Ethernet on an externally connected 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 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 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).

### **History of documents**

Certification of AF22e 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\_00: 19 August 2016  
Expiry date of the certificate: 31 July 2021  
Test report 936/21228317/C dated 18 December 2015  
TÜV Rheinland Energie und Umwelt GmbH  
Publication BAnz AT 01.08.2016 B11, chapter III number 2.1  
UBA announcement dated 14 July 2016

#### **Notifications**

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2018  
Publication BAnz AT 26.03.2019 B7, chapter IV notification 22  
UBA announcement dated 27 February 2019  
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 1 October 2019  
Publication BAnz AT 24.03.2020 B7, chapter IV notification 26  
UBA announcement dated 24 February 2020  
(Software changes and new producer name formerly Environnement S.A.)

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2020  
Publication BAnz AT 03.05.2021 B9, chapter III notification 20  
UBA announcement dated 31 March 2021  
(Software changes)

#### **Renewal of certificate**

Certificate No. 0000051690\_01: 31 July 2021  
Expiry date of the certificate: 31 July 2022

#### **Notifications**

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2021  
Publication BAnz AT 11.04.2022 B10, chapter VI notification 11  
UBA announcement dated 9 March 2022  
(Software changes)

#### **Renewal of certificate**

Certificate No. 0000051690\_02: 01 August 2022  
Expiry date of the certificate: 31 July 2027

Expanded uncertainty for laboratory, system 1

Measuring device:		AF 22e		Serial-No.:		SN 12	
Measured component:		SO2		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	0.330	$u_{r,z}$	0.07	0.0051	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.490	$u_{r,ph}$	0.11	0.0116	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.920	$u_{l,ph}$	0.70	0.4916	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.270	$u_{gp}$	2.20	4.8260	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.040	$u_{gt}$	0.32	0.1044	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.316	$u_{st}$	2.57	6.6104	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	$u_{ly}$	0.09	0.0090	
8a	Interferent H <sub>2</sub> O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	0.490	$u_{H_2O}$	-2.60	6.7429	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.460	$u_{H_2S, pos}$			
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.320				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.140				
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.590				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.070				
9	Averaging effect	≤ 5.0 nmol/mol (Zero)	0.370	or	2.42	5.8520	
18	Difference sample/calibration port	≤ 5.0 nmol/mol (Zero)	0.600				
21	Uncertainty of test gas	≤ 10 nmol/mol (Zero)	1.570				
		≤ 10 nmol/mol (Span)	3.270	$u_{int, neg}$			
		≤ 7.0% of measured value	5.090	$u_{av}$	3.88	15.0474	
		≤ 1.0%	-0.330	$u_{ssc}$	-0.44	0.1897	
		≤ 3.0%	2.000	$u_{cg}$	1.32	1.7424	
		Combined standard uncertainty		$u_c$		6.4523	
		Expanded uncertainty		U		12.9047	
		Relative expanded uncertainty		W		9.78	
		Maximum allowed expanded uncertainty		$W_{req}$		15	



Expanded uncertainty for laboratory, system 2

Measuring device:		AF 22e		Serial-No.:		SN 14	
Measured component:		SO2		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	0.340	$u_{r,z}$ 0.08	0.0058		
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.480	$u_{r,1h}$ 0.11	0.0119		
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.960	$u_{lf}$ 0.73	0.5353		
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.410	$u_{sp}$ 3.34	11.1282		
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.010	$u_{gt}$ 0.08	0.0065		
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.099	$u_{st}$ 0.81	0.6488		
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	$u_v$ 0.09	0.0090		
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	-1.100 -2.920	$u_{H_2O}$ -2.18	4.7474		
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	-0.630 1.570	$u_{H_2S, pos}$			
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.110 -1.600				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.220 -1.640	3.23	10.4533		
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.390 0.870	or			
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	0.740 3.160	$u_{int, neg}$			
9	Averaging effect	≤ 7.0% of measured value	5.250	$u_{av}$ 4.00	16.0083		
18	Difference sample/calibration port	≤ 1.0%	0.060	$u_{asc}$ 0.08	0.0063		
21	Uncertainty of test gas	≤ 3.0%	2.000	$u_{cg}$ 1.32	1.7424		
				Combined standard uncertainty		$u_c$ nmol/mol	
				Expanded uncertainty		U nmol/mol	
				Relative expanded uncertainty		W %	
				Maximum allowed expanded uncertainty		$W_{req}$ %	

Combined measurement uncertainty for laboratory and field tests, system 1

Measuring device:		AF 22e		Serial-No.:		SN 12	
Measured component:		SO <sub>2</sub>		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	0.330	$u_{r,z}$	0.07	0.0051	
2	Repeatability standard deviation at 1h-limit value	3.0 nmol/mol	0.490	$u_{r,h}$	not considered, as $u_{r,h} = 0.1 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	4.0% of measured value	0.920	$u_{l,h}$	0.70	0.4916	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	2.0 nmol/mol/kPa	0.270	$u_{sp}$	2.20	4.8260	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	1.0 nmol/mol/K	0.040	$u_{gt}$	0.32	0.1044	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	1.0 nmol/mol/K	0.316	$u_{st}$	2.57	6.6104	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	0.30 nmol/mol/V	0.010	$u_v$	0.09	0.0090	
8a	Interferent H <sub>2</sub> O with 21 nmol/mol	10 nmol/mol (Zero)	0.490				
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	10 nmol/mol (Span)	-3.480	$u_{H_2O}$	-2.60	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	$u_{NH_3, pos}$			
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				
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 (Zero)	0.600				
18	Difference sample/calibration port	5.0 nmol/mol (Zero)	1.570				
21	Uncertainty of test gas	10 nmol/mol (Span)	3.270				
		7.0% of measured value	5.090	$u_{m, neg}$			
		5.0% of average over 3 months	1.240	$u_{av}$	3.88	15.0474	
		4.0 nmol/mol	0.630	$u_{r,f}$	1.64	2.6791	
		5.0% of max. of certification range	0.750	$u_{f,z}$	0.36	0.1323	
		1.0%	-0.330	$u_{d,l,h}$	0.57	0.3267	
		3.0%	2.000	$u_{h,sc}$	-0.44	0.1897	
		Combined standard uncertainty		$u_{cg}$	1.32	1.7424	
		Expanded uncertainty		$u_c$		6.6902	nmol/mol
		Relative expanded uncertainty		U		13.3805	nmol/mol
		Maximum allowed expanded uncertainty		W		10.14	%
				$W_{req}$		15	%

Combined measurement uncertainty for laboratory and field tests, system 2

Measuring device:		AF 22e		Serial-No.:		SN 14	
Measured component:		SO2		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	0.340	$u_{r,z}$	0.08	0.0058	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.480	$u_{r,h}$	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	$u_{l,h}$	0.73	0.5353	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.410	$u_{sp}$	3.34	11.1282	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.010	$u_{Tt}$	0.08	0.0065	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.099	$u_{st}$	0.81	0.6488	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	$u_V$	0.09	0.0090	
8a	Interferent H <sub>2</sub> O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	-1.100				
		≤ 10 nmol/mol (Span)	-2.920	$u_{zco}$	-2.18	4.7474	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.630				
		≤ 5.0 nmol/mol (Span)	1.570	$u_{int, pos}$			
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.110				
		≤ 5.0 nmol/mol (Span)	0.220				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	-1.640		3.23	10.4533	
		≤ 5.0 nmol/mol (Span)	0.390				
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.870				
		≤ 5.0 nmol/mol (Span)	0.740				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	3.160	$u_{int, neg}$			
9	Averaging effect	≤ 7.0% of measured value	5.250	$u_{av}$	4.00	16.0083	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	1.240	$u_{r,f}$	1.64	2.6791	
11	Long term drift at zero level	≤ 4.0 nmol/mol	0.740	$u_{l,z}$	0.43	0.1825	
12	Long term drift at span level	≤ 5.0% of max. of certification range	-0.570	$u_{l,h}$	-0.43	0.1887	
18	Difference sample/calibration port	≤ 1.0%	0.060	$u_{diff}$	0.08	0.0063	
21	Uncertainty of test gas	≤ 3.0%	2.000	$u_{tg}$	1.32	1.7424	
				Combined standard uncertainty		$u_c$	
				Expanded uncertainty		U	
				Relative expanded uncertainty		W	
				Maximum allowed expanded uncertainty		W <sub>req</sub>	
						15	
						nmol/mol	
						nmol/mol	
						%	
						%	