

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040329_02

AMS designation: AF22M for SO₂

Manufacturer: ENVEA
111 Boulevard Robespierre
78304 Poissy Cedex
France

Test Laboratory: TÜV Rheinland Energy 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),
EN 15267-1 (2009) and EN 15267-2 (2009).

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 13 pages).
The present certificate replaces certificate 0000040329_01 of 01 April 2019.



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

Publication in the German Federal Gazette
(BAnz) of 01 April 2014

This certificate will expire on:
30 June 2025

German Federal Environment Agency
Dessau, 01 July 2020

TÜV Rheinland Energy GmbH
Cologne, 30 June 2020



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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 certificate D-PL-11120-02-00.

Test Report:	936/21206773/A dated 09 November 2007
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Certificate:	Renewal (of previous certificate 0000040329_01 dated 01 April 2019 valid until 30 June 2020)
Publication:	BAnz AT 01.04.2014 B12, chapter VI notification 19

Approved application

The certified AMS is suitable for continuous monitoring of sulphur dioxide in ambient air.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three-months 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, in consultation with the manufacturer, that this AMS is suitable for monitoring the AMS readings relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended purpose.

Basis of the certification

This certification is based on:

- Test report no. 936/21206773/A dated 09 November 2007 issued by TÜV Rheinland Immissionschutz und Energiesysteme GmbH and Addendum 936/21221709/B dated 28 September 2013 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 number 1.1, UBA announcement 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 performance testing

SO₂ 0–700 µg/m³
0–1 000 µg/m³

Software version:

V1.22

Test Laboratory:

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, chapter VI notification 19, UBA announcement dated 27 February 2014:

19 Notification as regards Federal Environment Agency (UBA) notices of 14 February 2008 (BAnz. p. 901, chapter III number 1.1)

The Model AF22M air quality monitor for SO₂ manufactured by Environnement complies with the requirements of EN 14212 (August 2012 version). Furthermore, the manufacturing process and the quality management for the Model AF22M for SO₂ measuring system meet the requirements of EN 15267.

The test report on performance testing No. 936/21206773/A and the addendum no. 936/21221709/B as an integral part of this report are available online at www.qal1.de.

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

Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, chapter V notification 50, UBA announcement 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 19th notification)

The latest software version of the AF22M measuring system for SO₂ manufactured by Environnement S.A. is:

v1.0.4 (calculation process)
v3.6.f (display process)

To extend the means of communication, the measuring system will be equipped with a USB port and a TCP/IP interface.

The clamp of the UV lamp has been supplemented with a protective device.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 14 March 2015

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notification 23, UBA announcement dated 27 February 2019:

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

The latest 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 2018

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV notification 27, UBA announcement dated 24 February 2020:

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

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 certification 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 with length L follows the principle of the Beer-Lambert law:

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

where "I₀" is the intensity at the entry to the chamber, "α" is the characteristic absorption efficiency for SO₂ and "c" = [SO₂], the concentration of the gas to be analysed.

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

$$\frac{K_f}{K_f + K_q + K_d}$$

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

$$i_f = Gi_a \frac{Kf}{Kf + Kq + Kd}$$

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

$$i_f = Gi_0 \frac{Kf}{Kf + Kq + Kd} \times (1 - e^{-\alpha Lc})$$

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

$$1 - e^{-\alpha Lc} \cong +\alpha Lc$$

The result is thus:

$$i_f = \frac{Gi_0 Kf \alpha L}{Kf + Kq + Kd} c = \beta \cdot c$$

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 remarks

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 manufacturing process for 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 document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at qal1.de.

Document history

Certification of the AF22M measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Basic testing

Test Report: 936/21206773/A dated 9 November 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
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

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

Notifications in accordance with EN 15267

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
(Design and software changes)

Renewal of the certificate

Certificate no. 0000040329_01: 01 April 2019
Expiry date of the certificate: 30 June 2020

Notifications in accordance with EN 15267

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 updates)

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 updates)

Renewal of the certificate

Certificate no. 0000040329_02: 01 July 2020
Expiry date of the certificate: 30 June 2025

Expanded uncertainty from the results obtained in the laboratory tests for analyser 1

Measuring device: Environnement AF22M		Serial-No.: Gerät 1		1h-limit value: 132		nmol/mol			
Measured component: SO ₂		Performance criterion		Result		Partial uncertainty		Square of partial uncertainty	
No.	Performance characteristic	≤	Performance criterion	Result	Partial uncertainty	1h-limit value:	1h-limit value:	1h-limit value:	1h-limit value:
1	Repeatability standard deviation at zero	≤	1.0 nmol/mol	0.000	u _{r,z}	0.00	0.0000	0.0000	0.0000
2	Repeatability standard deviation at 1h-limit value	≤	3.0 nmol/mol	0.200	u _{r,h}	0.05	0.0026	0.0026	0.0026
3	"lack of fit" at 1h-limit value	≤	4.0% of measured value	-1.500	u _{l,h}	-1.14	1.3068	1.3068	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	1.1384	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	0.0307	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	5.5815	5.5815
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤	0.30 nmol/mol/V	-0.010	u _y	-0.10	0.0094	0.0094	0.0094
8a	Interferent H ₂ O with 21 nmol/mol	≤	10 nmol/mol (Zero)	-0.300	u _{H2O}	-1.44	2.0624	2.0624	2.0624
8b	Interferent H ₂ S with 200 nmol/mol	≤	10 nmol/mol (Span)	-1.900	u _{Int,pos}				
8c	Interferent NH ₃ with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	0.300					
8d	Interferent NO with 500 nmol/mol	≤	5.0 nmol/mol (Span)	0.300					
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)	0.400					
9	Averaging effect	≤	5.0 nmol/mol (Zero)	1.200	or	1.34	1.8013	1.8013	1.8013
18	Difference sample/calibration port	≤	5.0 nmol/mol (Zero)	0.000					
21	Uncertainty of test gas	≤	10 nmol/mol (Span)	0.700	u _{Int,neg}				
		≤	7.0% of measured value	0.100	u _{av}	1.37	1.8818	1.8818	1.8818
		≤	1.0%	0.190	u _{Asc}	0.25	0.0629	0.0629	0.0629
		≤	3.0%	2.000	u _{cg}	1.32	1.7424	1.7424	1.7424
			Combined standard uncertainty	1.800	u _c		3.9522	3.9522	3.9522
			Expanded uncertainty	0.190	U		7.9045	7.9045	7.9045
			Relative expanded uncertainty	2.000	W		5.99	5.99	5.99
			Maximum allowed expanded uncertainty		W _{req}		15	15	15

Expanded uncertainty from the results obtained in the laboratory tests for analyser 2

Measuring device: Environment AF22M		Serial-No.: Gerät 2		nmol/mol	
Measured component: SO ₂		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	0.000	u _{r,z}	0.0000
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	u _{r,1h}	0.0027
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.100	u _{l,1h}	0.0058
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.250	u _{sp}	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 mmol/mol	≤ 10 nmol/mol (Zero)	-0.100	u _{H2O}	-1.74
		≤ 10 nmol/mol (Span)	-2.300		
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000	u _{int,pos}	
		≤ 5.0 nmol/mol (Span)	1.200		
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		
		≤ 5.0 nmol/mol (Span)	0.500		
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.500	2.40	5.7600
		≤ 5.0 nmol/mol (Span)	1.900		
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		
		≤ 5.0 nmol/mol (Span)	0.000		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	-0.100	u _{int,neg}	
		≤ 10 nmol/mol (Span)	0.500		
9	Averaging effect	≤ 7.0% of measured value	2.900	u _{av}	4.8845
18	Difference sample/calibration port	≤ 1.0%	0.010	u _{asc}	0.0002
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{cg}	1.7424
			Combined standard uncertainty		u _c
			Expanded uncertainty		U
			Relative expanded uncertainty		W
			Maximum allowed expanded uncertainty		W _{req}
					15
					%

Expanded uncertainty from the results obtained in the laboratory and field tests for analyser 1

Measuring device: Environnement AF22M		Serial-No.: Gerät 1		nmol/mol	
Measured component: SO ₂		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	0.000	u _{r,z}	0.0000
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.200	u _{r,lh}	-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-1.500	u _{l,ih}	1.3068
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	-0.140	u _{sp}	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 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}	2.0624
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.300		
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	0.000	u _{NH3,pos}	
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-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	1.8013
10	Reproducibility standard deviation under field conditions	≤ 10 nmol/mol (Span)	0.000		
11	Long term drift at zero level	≤ 7.0% of measured value	1.800	u _{pl,neg}	
12	Long term drift at span level	≤ 5.0% of average over 3 months	2.240	u _{av}	1.8818
18	Difference sample/calibration port	≤ 5.0% of max. of certification range	0.190	u _{r,f}	8.7427
21	Uncertainty of test gas	≤ 1.0%	0.250	u _{dl,z}	0.1240
		≤ 3.0%	2.000	u _{dl,lh}	0.5132
				u _{asc}	0.0629
				u _{cg}	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

Expanded uncertainty from the results obtained in the laboratory and field tests for analyser 2

Measuring device:		Serial-No.:		Gerät 2																					
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	0.000	$u_{r,z}$	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	0.100	$u_{l,1h}$	0.0058																				
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.250	u_{sp}	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_{H_2O}	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)	0.000																						
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000	or	5.7600																				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Span)	0.000																						
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	$u_{r,l}$	8.7427																				
12	Long term drift at span level	≤ 5.0% of max. of certification range	2.460	$u_{l,z}$	0.1587																				
18	Difference sampler/calibration port	≤ 1.0%	0.010	$u_{d,1h}$	3.5148																				
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{asc}	0.0002																				
<table border="1"> <tr> <td colspan="2">Combined standard uncertainty</td> <td>u_c</td> <td>6.1809</td> <td>nmol/mol</td> </tr> <tr> <td colspan="2">Expanded standard uncertainty</td> <td>U</td> <td>12.3618</td> <td>nmol/mol</td> </tr> <tr> <td colspan="2">Relative expanded uncertainty</td> <td>W</td> <td>9.37</td> <td>%</td> </tr> <tr> <td colspan="2">Maximum allowed expanded uncertainty</td> <td>W_{req}</td> <td>15</td> <td>%</td> </tr> </table>						Combined standard uncertainty		u_c	6.1809	nmol/mol	Expanded standard uncertainty		U	12.3618	nmol/mol	Relative expanded uncertainty		W	9.37	%	Maximum allowed expanded uncertainty		W_{req}	15	%
Combined standard uncertainty		u_c	6.1809	nmol/mol																					
Expanded standard uncertainty		U	12.3618	nmol/mol																					
Relative expanded uncertainty		W	9.37	%																					
Maximum allowed expanded uncertainty		W_{req}	15	%																					