

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040203_02

AMS designation: Serinus 30 for CO
Manufacturer: Ecotech Pty Ltd.
1492 Ferntree Gully Road
Knoxfield, VIC, 3180
Australia

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 (2010), VDI 4203-3 (2010), EN 14626 (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 0000040203_01 of 01 April 2019.



Suitability Tested
Equivalent to
2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000040203

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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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:	936/21221977/D dated 08 October 2013
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Certificate:	Renewal (of previous certificate 0000040203_01 dated 01 April 2019 valid until 30 June 2020)
Publication:	BAnz AT 01.04.2014 B12, chapter IV number 2.1

Approved application

The certified AMS is suitable for continuous ambient air monitoring of carbon monoxide (stationary operation).

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. 936/21221977/D dated 08 October 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 AT 01.04.2014 B12, chapter IV number 2.1, UBA announcement dated 27 February 2014:

AMS designation:

Serinus 30 for CO

Manufacturer:

Ecotech Pty Ltd., Knoxfield, Australia

Field of application:

Continuous measurement of carbon monoxide concentrations in ambient air (stationary operation)

Measuring range during performance testing:

Component	Certification range	Unit
Carbon monoxide	0 – 100	mg/m ³

Software version:

Firmware: 2.09.0005

Restrictions:

None

Notes:

1. The measuring system must be operated inside a lockable measuring cabinet or measurement container.
2. The test report on performance testing is available on the internet at www.qal1.de.

Test Laboratory:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21221977/D dated 08 October 2013

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 5, UBA announcement dated 25 February 2015:

5 Notification as regards Federal Environment Agency (UBA) notice of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 2.1).

The Serinus 30 measuring system for CO manufactured by Ecotech Pty Ltd. will be equipped with a new micro processor board (C010014) in the future. This entails changes to the power supply and the software.

The following software versions apply:

2.20.0009 for instruments with the previous processor board (C010001)

3.10.001 for instruments with the new processor board (C010014)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 12 September 2014

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, chapter V notification 6, UBA announcement dated 22 February 2017:

6 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 2.1) and of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter IV 5th notification)

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010001 manufactured by Ecotech Pty Ltd. is: V 2.31.0004.

Moreover, the following software version are approved for this instrument version: V 2.21.0000, V 2.22.0000, V 2.23.0000, V 2.24.0000, V 2.25.0004, V 2.26.0000, V 2.27.0000, V 2.28.0000, V 2.29.0003 und V 2.30.0000.

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010014 manufactured by Ecotech Pty Ltd. is: V 3.48.011.

Moreover, the following software version are approved for this instrument version: V 3.13.000, V 3.14.001, V 3.15.010, V 3.16.001, V 3.18.003, V 3.20.000, V 3.22.000, V 3.23.015, V 3.24.000, V 3.26.000, V 3.27.000, V 3.28.000, V 3.29.013, V 3.30.005, V 3.31.002, V 3.32.003, V 3.33.004, V 3.34.000, V 3.35.004, V 3.36.000, V 3.37.004, V 3.38.006, V 3.39.000, V 3.40.001, V 3.41.004, V 3.42.000, V 3.43.000, V 3.44.004, V 3.45.011, V 3.46.002, V 3.47.006.

Statement issued by TÜV Rheinland Energy GmbH dated 13 October 2016

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notification 16, UBA announcement dated 27 February 2019:

16 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 2.1) and of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter IV 6th notification)

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010001 manufactured by Ecotech Pty Ltd. is:
V 2.35.0001.

Moreover, the following software version are approved for this instrument version:
V 2.32.0000, V 2.33.0000, V 2.34.0000

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010014 manufactured by Ecotech Pty Ltd. is:
V 3.74.0003.

Moreover, the following software version are approved for this instrument version:
V 3.49.0000, V 3.51.0011, V 3.52.0000, V 3.53.0012, V 3.54.0000, V 3.55.0000,
V 3.56.0001, V 3.57.0002, V 3.58.0000, V 3.59.0004, V 3.60.0005, V 3.61.0000,
V 3.62.0000, V 3.63.0001, V 3.64.0000, V 3.65.0001, V 3.66.0000, V 3.67.0003,
V 3.68.0009, V 3.69.0001,
V 3.70.0000, V 3.71.0000.

The instrument's display shows the software version in the following format:
2.XX or 3.XX.

Statement issued by TÜV Rheinland Energy GmbH dated 10 October 2018

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV notification 20, UBA announcement dated 24 February 2020:

20 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 2.1) and of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV 16th notification)

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010001 manufactured by Ecotech Pty Ltd. remains:
V 2.35.0001.

The latest software version of the Serinus 30 measuring system for CO with micro-processor C010014 manufactured by Ecotech Pty Ltd. is:
V 3.87.0000.

Moreover, the following software version are approved for this instrument version:
V 3.75.0003, V 3.76.0004, V 3.77.0009, V 3.78.0000, V 3.79.0001, V 3.81.0000,
V 3.83.0000, V 3.84.0000, V 3.85.0001, V 3.86.0000.

The instrument's display shows the software version in the following format:
2.XX or 3.XX.

Statement issued by TÜV Rheinland Energy GmbH dated 20 September 2019

Certified product

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

The Serinus 30 measuring system is a continuous carbon monoxide monitor which uses the method of non-dispersive infrared photometry designed for the continuous measurement of carbon monoxide in ambient air.

Measurements are performed by means of the following components:

- microprocessor control
- proven Gas Filter Correlation (GFC)
- combined with Non-Dispersive Infrared Spectrophotometry (NDIR) technology

The CO concentration is automatically corrected for gas temperature and pressure changes and referenced to 0 °C, 20 °C or 25 °C at 1 atmosphere. This allows the Serinus 30 to accurately measure CO in all ambient applications.

Carbon monoxide is measured on the basis of the following principles and methods:

CO absorbs infrared radiation (IR) at a wavelength of approx. 4.7 µm. IR radiation (at 4.7 µm) passes through the sample air with the measurement path being 5 m. According to the Beer-Lambert law, the intensity of the received signal is proportional to the CO concentration within the sample. A band-pass filter is attached to the signal detector to ensure that only light at a wavelength of 4.7 µm is let through.

The Beer-Lambert equation is used to calculate the gas concentration from the ratio of two measured light intensities:

$$I/I_0 = \exp(-acd)$$

Where:

- I is the light intensity measured with CO in the gas sample
- I_0 is the light intensity measured with no CO in the gas sample
- a is the CO absorption coefficient at 253.7 nm
- c is the mass concentration of CO in mg/m³
- d is the optical path length in m

The system includes a gas filter correlation wheel. It contains three parts which improve the accuracy of the measurements: CO-chamber, N₂-chamber and a mask.

- The CO window contains a certain saturation (40%) of CO which acts as a reference beam – absorbing a known amount of light.
- The N₂ window, containing 100% N₂, does not absorb IR at 4.7 microns at all and is used during normal CO measurement.
- The mask totally blocks the light source and is used to determine background signals and the strength of other signals relative to each other and the background.

The carbon monoxide analyser consists of five main modules:

The pneumatics to transfer sample and exhaust gas,

The sensors for the measurement of carbon monoxide (optical cell) and other relevant parameters,

The control system which encompasses all circuit boards controlling sensors and pneumatic,

The power supply which supplies power for all the instrument processors,

The communication module to access data.

Particle filter:

The particulate filter is a Teflon 5 micron (μm) filter with a diameter of 47 mm. This filter eliminates all particles larger than 5 μm that could interfere with sample measurements.

Sample gas pump

Manufacturer: Thomas, Type: 617CD22-194 C

During performance testing, the sample gas pump mentioned above was used for the laboratory as well as in the field test. As far as the models Serinus 10 (ozone), Serinus 30 (CO) and Serinus 50 (SO₂) are concerned, one pump can be operated with up to two analysers. However, operation of the Serinus 40 (NO_x) requires one sample gas pump per analyser.

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 Serinus 30 measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Initial certification according to EN 15267

Certificate no. 0000040203: 29 April 2014
Expiry date of the certificate: 31 March 2019
Test report no.: 936/21221977/D dated 8 October 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 01.04.2014 B12, chapter IV number 2.1
UBA announcement dated 27 February 2014

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 12 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 5
UBA announcement dated 25 February 2015
(Design and software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 13 October 2016
Publication: BAnz AT 15.03.2017 B6, chapter V notification 6
UBA announcement dated 22 February 2017
(software updates)

Renewal of the certificate

Certificate no.: 0000040203_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 10 October 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 16
UBA announcement dated 27 February 2019
(New software version)

Statement issued by TÜV Rheinland Energy GmbH dated 20 September 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 20
UBA announcement dated 24 February 2020
(New software version)

Renewal of the certificate

Certificate no. 0000040203_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:		Serial-No.:		12-1183 (Device 1)	
Measured component:		8h-limit value:		8.62	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.020	u _{r,z}	0.0000
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.030	u _r	0.0000
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.860	u _l	0.0018
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.040	u _{sp}	0.0087
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.000	u _{st}	0.0000
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.040	u _{st}	0.0083
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.001	u _y	0.0000
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero) ≤ 1.0 µmol/mol (Span)	0.100 0.230	u _{co}	0.0055
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	-0.050 0.000	u _{nc, pos}	
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.010 -0.110	or	0.0039
8d	Interferent N ₂ O with 50 mmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.010 0.010	u _{nc, neg}	
9	Averaging effect	≤ 7.0% of measured value	-0.080	u _{av}	0.0000
18	Difference sample/calibration port	≤ 1.0%	-0.090	u _{sc}	0.0001
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{sg}	0.0074
Combined standard uncertainty				u _c	0.1892
Expanded uncertainty				U	0.3784
Relative expanded uncertainty				W	4.39
Maximum allowed expanded uncertainty				W _{res}	15

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

Measuring device:		Serial-No.:		13-0093 (Device 2)	
Measured component:		8h-limit value:		8.62	
CO				µmol/mol	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.020	U _{r,z} 0.00	0.0000
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.000	U _r 0.00	0.0000
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.930	U _f 0.05	0.0021
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.030	U _{sp} 0.07	0.0049
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.000	U _{gt} 0.00	0.0000
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.046	U _{st} 0.10	0.0109
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.001	U _y 0.00	0.0000
8a	Interferent H ₂ O with 21 nmol/mol	≤ 1.0 µmol/mol (Zero)	-0.110	U _{HO} -0.07	0.0046
		≤ 1.0 µmol/mol (Span)	0.090		
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.050	U _{ri,pos}	
		≤ 0.5 µmol/mol (Span)	0.050		
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.080	0.06	0.0035
		≤ 0.5 µmol/mol (Span)	0.050	0f	
8d	Interferent N ₂ O with 50 nmol/mol	≤ 0.5 µmol/mol (Zero)	0.000	U _{ri,neg}	
		≤ 0.5 µmol/mol (Span)	0.000		
9	Averaging effect	≤ 7.0% of measured value	-1.550	U _{av} -0.08	0.0060
18	Difference sampler/calibration port	≤ 1.0%	-0.170	U _{asc} -0.01	0.0002
21	Uncertainty of test gas	≤ 3.0%	2.000	U _{sg} 0.09	0.0074
Combined standard uncertainty				U _c	0.1992
Expanded uncertainty				U	0.3983
Relative expanded uncertainty				W	4.62
Maximum allowed expanded uncertainty				W _{req}	15

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

Measuring device: Ecolec Serinus 30		Serial-No.: 12-1183 (Device 1)		µmol/mol	
Measured component: CO		8h-limit value: 8.62			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.020	U _z	0.0000
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.030	U _r	-
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.860	U _i	0.0018
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.040	U _{sp}	0.0087
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.000	U _{tr}	0.0000
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.040	U _{st}	0.0083
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.001	U _v	0.0000
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	0.230	U _{qo}	0.0055
		≤ 1.0 µmol/mol (Span)	0.100		
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero)	-0.050	U _{int,pos}	
		≤ 0.5 µmol/mol (Span)	0.000		
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.010	or	0.0039
		≤ 0.5 µmol/mol (Span)	-0.110		
8d	Interferent N ₂ O with 50 mmol/mol	≤ 0.5 µmol/mol (Zero)	0.010	U _{int,neg}	
		≤ 0.5 µmol/mol (Span)	0.010		
9	Averaging effect	≤ 7.0% of measured value	-0.080	U _{av}	0.0000
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.450	U _{r,f}	0.0884
11	Long term drift at zero level	≤ 0.5 µmol/mol	-0.230	U _{l,z}	0.0176
12	Long term drift at span level	≤ 5.0% of max. of certification range	0.640	U _{l,sh}	0.0010
18	Difference sample/calibration port	≤ 1.0%	-0.090	U _{ssc}	0.0001
21	Uncertainty of test gas	≤ 3.0%	2.000	U _{sg}	0.0074
Combined standard uncertainty				U _c	0.3779
Expanded uncertainty				U	0.7559
Relative expanded uncertainty				W	8.77
Maximum allowed expanded uncertainty				W _{res}	15

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

Measuring device: Ecolec h Serinus 30		Serial No.: 13-0093 (Device 2)		8h-limit value: 8.62		µmol/mol	
Measured component: CO		8h-limit value:		8h-limit value:		8h-limit value:	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.020	U _{r,z}	0.00	0.0000	
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.000	U _r	not considered, as u _r = 0 < u _{r,f}	-	
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.930	U _i	0.05	0.0021	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.030	U _{sp}	0.07	0.0049	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.000	U _{gt}	0.00	0.0000	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.046	U _{st}	0.10	0.0109	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.001	U _v	0.00	0.0000	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero) ≤ 1.0 µmol/mol (Span)	0.090 -0.110	U _{z0} U _{z0}	-0.07	0.0046	
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.050 0.050	U _{ri,pos} U _{ri,pos}			
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.080 0.050	U _{ri,pos} U _{ri,pos}	0.06	0.0035	
8d	Interferent N ₂ O with 50 mmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.000 0.000	U _{ri,neg} U _{ri,neg}			
9	Averaging effect	≤ 7.0% of measured value	-1.550	U _{av}	-0.08	0.0060	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.450	U _{r,f}	0.30	0.0884	
11	Long term drift at zero level	≤ 0.5 µmol/mol	-0.470	U _{d,z}	-0.27	0.0736	
12	Long term drift at span level	≤ 5.0% of max. of certification range	-0.900	U _{d,sh}	-0.04	0.0020	
18	Difference sample/calibration port	≤ 1.0%	-0.170	U _{asc}	-0.01	0.0002	
21	Uncertainty of test gas	≤ 3.0%	2.000	U _{sg}	0.09	0.0074	
Combined standard uncertainty						U _c	µmol/mol
Expanded uncertainty						U	µmol/mol
Relative expanded uncertainty						W	%
Maximum allowed expanded uncertainty						W _{eq}	%