

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000040203

**Certified AMS:** Serinus 30 for CO

**Manufacturer:** Ecotech Pty Ltd.  
1492 Ferntree Gully Road  
Knoxfield, VIC, 3180  
Australia

**Test Institute:** TÜV Rheinland Energie und Umwelt GmbH

**This is to certify that the AMS has been tested  
and found to comply with:**

**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  
(see also the following pages).



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

www.tuv.com  
ID 0000040203

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

German Federal Environment Agency  
Dessau, 29 April 2014



i. A. Dr. Marcel Langner

This certificate will expire on:  
31 March 2019

TÜV Rheinland Energie und Umwelt GmbH  
Cologne, 28 April 2014



ppa. Dr. Peter Wilbring

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TÜV Rheinland Energie und Umwelt GmbH  
Am Grauen Stein  
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Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.

**Certificate:**  
0000040203 / 29 April 2014

**Test report:** 936/21221977/D of 08 October 2013  
**Initial certification:** 01 April 2014  
**Date of expiry:** 31 March 2019  
**Publication:** BAnz AT 01 April 2014 B12, chapter IV, No. 2.1

**Approved application**

The tested AMS is suitable for the continuous measurement of concentrations of carbon monoxide in ambient air (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 a temperature range of 0 °C to +30 °C.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for ambient air applications at which it will be installed.

**Basis of the certification**

This certification is based on:

- test report 936/21221977/D of 08 October 2013 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 April 2014 B12, chapter IV, No. 2.1  
Announcement by UBA from 27 February 2014



**AMS designation:**

Serinus 30 for CO

**Manufacturer:**

Ecotech Pty Ltd., Knoxfield, Australia

**Field of application:**

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

**Measuring range during the performance test:**

Component	Certification range	Unit
Carbon monoxide	0 - 100	mg/m <sup>3</sup>

**Software version:**

Firmware: 2.09.0005

**Restrictions:**

None

**Notes:**

1. The measuring system has to be operated in a lockable measuring cabinet or container.
2. The test report on the performance test is available online at [www.qal1.de](http://www.qal1.de).

**Test institute:**

TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Report No.: 936/21221977/D of 8 October 2013

### Certified product

This certificate 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. The instrument is designed for the continuous measurement of carbon monoxide concentrations in ambient air.

Measurements are made 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. In order to make sure that only light at a wavelength of 4.7 µm is led through, a band-pass filter is attached to the signal detector.

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 ozone in the gas sample
- $a$  is the CO absorption coefficient at 253.7 nm
- $c$  is the mass concentration of CO in  $\text{mg/m}^3$
- $d$  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, N<sub>2</sub>-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 N<sub>2</sub> window, containing 100% N<sub>2</sub>, 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.

#### **Particulate filter**

The particulate filter is a Teflon 5 micron ( $\mu\text{m}$ ) filter with a diameter of 47 mm. This filter eliminates all particles larger than 5  $\mu\text{m}$  that could interfere with sample measurement.

#### **Sample gas pump**

Manufacturer: Thomas, type: 617CD22-194 C

During performance testing the above-mentioned sample gas pump was used in the laboratory as well as in the field test. As far as the models Serinus 10 (ozone), Serinus 30 (CO) and Serinus 50 (SO<sub>2</sub>) are concerned, one pump can be operated with up to two analysers. However, for the Serinus 40 (NO<sub>x</sub>) one sample gas pump per analyser is required.

#### **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 Energie und Umwelt 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 is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energie und Umwelt GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energie und Umwelt GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and the validity is also accessible on the internet: [qal1.de](http://qal1.de).

Certification of Serinus 30 CO Analyzer 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. 0000040203: 29 April 2014

Validity of the certificate until: 31 March 2019

Test report: 936/21221977/D of 08 October 2019  
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 01 April 2014 B12, chapter IV, No. 2.1  
Announcement by UBA from 27 February 2014

Expanded uncertainty based on the results of the laboratory testing of Device 1

Measuring device: Ecotech 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	$u_{r,z}$	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	$u_{gt}$	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 <sub>2</sub> O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	0.100	$u_{i,z0}$	0.0055	
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	≤ 1.0 µmol/mol (Span)	0.230	$u_{int,pos}$		
		≤ 0.5 µmol/mol (Zero)	-0.050			
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Span)	0.000	or	0.0039	
		≤ 0.5 µmol/mol (Zero)	0.010			
		≤ 0.5 µmol/mol (Span)	-0.110			
8d	Interferent N <sub>2</sub> O with 50 nmol/mol	≤ 0.5 µmol/mol (Span)	0.010	$u_{int,neg}$		
9	Averaging effect	≤ 7.0% of measured value	-0.080	$u_{av}$	0.0000	
18	Difference sample/calibration port	≤ 1.0%	-0.090	$u_{isc}$	0.0001	
21	Uncertainty of test gas	≤ 3.0%	2.000	$u_{sg}$	0.0074	
Combined standard uncertainty				$u_c$	0.1892	µmol/mol
Expanded uncertainty				U	0.3784	µmol/mol
Relative expanded uncertainty				W	4.39	%
Maximum allowed expanded uncertainty				$W_{req}$	15	%



Expanded uncertainty based on the results of the laboratory testing of Device 2

Measuring device: Ecotech Serinus 30		Serial No.: 13-0093 (Device 2)		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	$u_{r,z}$ 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	$u_l$ 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 <sub>2</sub> O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	-0.110	$u_{H_2O}$ -0.07	0.0046
		≤ 1.0 µmol/mol (Span)	0.090		
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.050	$u_{H_2CO_2}$	
		≤ 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	or	
8d	Interferent N <sub>2</sub> O with 50 nmol/mol	≤ 0.5 µmol/mol (Zero)	0.000	$u_{H_2NO}$	
		≤ 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 sample/calibration port	≤ 1.0%	-0.170	$u_{asc}$ -0.01	0.0002
21	Uncertainty of test gas	≤ 3.0%	2.000	$u_{tg}$ 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				$W_{reg}$	15



Expanded uncertainty based on the results of the laboratory and field testing of Device 1

Measuring device: Ecotech Serinus 30		Serial No.: 12-1183 (Device 1)		8h-limit value: 8.62		µmol/mol	
Measured component: CO		Performance characteristic		Partial uncertainty		Square of partial uncertainty	
No.	Performance characteristic	Result	Performance criterion	Partial uncertainty	8h-limit value:	µmol/mol	
1	Repeatability standard deviation at zero	0.020	≤ 0.3 µmol/mol	u <sub>r,z</sub>	0.00	0.0000	
2	Repeatability standard deviation at 8h-limit value	0.030	≤ 0.4 µmol/mol	u <sub>r</sub>	not considered, as u <sub>r</sub> = 0 < u <sub>r,f</sub>	-	
3	"lack of fit" at 8h-limit value	0.860	≤ 4.0% of measured value	u <sub>f</sub>	0.04	0.0018	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	0.040	≤ 0.7 µmol/mol/kPa	u <sub>sp</sub>	0.09	0.0087	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	0.000	≤ 0.3 µmol/mol/K	u <sub>gt</sub>	0.00	0.0000	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	0.040	≤ 0.3 µmol/mol/K	u <sub>st</sub>	0.09	0.0083	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	0.001	≤ 0.3 µmol/mol/V	u <sub>v</sub>	0.00	0.0000	
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	0.230	≤ 1.0 µmol/mol (Zero)	u <sub>h<sub>2</sub>O</sub>	0.07	0.0055	
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	-0.050	≤ 0.5 µmol/mol (Zero)	u <sub>int,pos</sub>			
8c	Interferent NO with 1 µmol/mol	0.000	≤ 0.5 µmol/mol (Span)				
8d	Interferent N <sub>2</sub> O with 50 mmol/mol	0.010	≤ 0.5 µmol/mol (Zero)	or	0.06	0.0039	
9	Averaging effect	0.010	≤ 0.5 µmol/mol (Span)	u <sub>int,neg</sub>			
10	Reproducibility standard deviation under field conditions	-0.080	≤ 7.0% of measured value	u <sub>av</sub>	0.00	0.0000	
11	Long term drift at zero level	3.450	≤ 5.0% of average over 3 months	u <sub>r,t</sub>	0.30	0.0884	
12	Long term drift at span level	-0.230	≤ 0.5 µmol/mol	u <sub>q,z</sub>	-0.13	0.0176	
18	Difference sample/calibration port	0.640	≤ 5.0% of max. of certification range	u <sub>q,sh</sub>	0.03	0.0010	
21	Uncertainty of test gas	-0.090	≤ 1.0%	u <sub>sc</sub>	-0.01	0.0001	
				u <sub>cg</sub>	0.09	0.0074	
				Combined standard uncertainty		u <sub>c</sub>	0.3779
				Expanded uncertainty		U	0.7559
				Relative expanded uncertainty		W	8.77
				Maximum allowed expanded uncertainty		W <sub>req</sub>	15

Expanded uncertainty based on the results of the laboratory and field testing of Device 2

Measuring device:		Serial-No.:		13-0093 (Device 2)		8.62		µmol/mol	
Measured component:		8h-limit value:		8h-limit value:		8h-limit value:		8h-limit value:	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty	Partial uncertainty	Square of partial uncertainty	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.020	U <sub>r,z</sub>	0.000	0.00	0.0000	0.00	0.0000
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.000	U <sub>r</sub>	-	not considered, as u <sub>r</sub> = 0 < u <sub>r,f</sub>	-	-	-
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.930	U <sub>l</sub>	0.0021	0.05	0.0021	0.05	0.0021
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.030	U <sub>sp</sub>	0.0049	0.07	0.0049	0.07	0.0049
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.000	U <sub>gt</sub>	0.0000	0.00	0.0000	0.00	0.0000
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.046	U <sub>st</sub>	0.0109	0.10	0.0109	0.10	0.0109
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.001	U <sub>v</sub>	0.0000	0.00	0.0000	0.00	0.0000
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero) ≤ 1.0 µmol/mol (Span)	0.090 -0.110	U <sub>iso</sub>	0.0046	-0.07	0.0046	-0.07	0.0046
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.050 0.050	U <sub>tipos</sub>					
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.080 0.050	or	0.0035	0.06	0.0035	0.06	0.0035
8d	Interferent N <sub>2</sub> O with 50 nmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.000 0.000	U <sub>linneg</sub>					
9	Averaging effect	≤ 7.0% of measured value	-1.550	U <sub>av</sub>	0.0060	-0.08	0.0060	-0.08	0.0060
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.450	U <sub>r,f</sub>	0.0884	0.30	0.0884	0.30	0.0884
11	Long term drift at zero level	≤ 0.5 µmol/mol	-0.470	U <sub>l,z</sub>	0.0736	-0.27	0.0736	-0.27	0.0736
12	Long term drift at span level	≤ 5.0% of max. of certification range	-0.900	U <sub>l,sh</sub>	0.0020	-0.04	0.0020	-0.04	0.0020
18	Difference sample/calibration port	≤ 1.0%	-0.170	U <sub>asc</sub>	0.0002	-0.01	0.0002	-0.01	0.0002
21	Uncertainty of test gas	≤ 3.0%	2.000	U <sub>sg</sub>	0.0074	0.09	0.0074	0.09	0.0074
				Combined standard uncertainty		U <sub>c</sub>	0.4514	µmol/mol	
				Expanded uncertainty		U	0.9028	µmol/mol	
				Relative expanded uncertainty		W	10.47	%	
				Maximum allowed expanded uncertainty		W <sub>req</sub>	15	%	



# CONFIRMATION

Notification: 0000040203\_00\_01\_rev1  
on changes according to EN 15267 regarding certificate 0000040203 dated 29 April 2014

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**Measuring system:** Serinus 30 for CO

**Manufacturer:** Ecotech PTY Ltd.  
1492 Ferntree Gully Road  
Knoxfield, VIC, 3180  
Australia

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## German Federal Environmental Agency (UBA)

Announcement about the uniform practice in  
monitoring emissions and ambient air.  
25 February 2015  
Federal Gazette BAnz AT 02 April 2015 B5

**IV. Notifications to the uniform practice for the continuous monitoring of  
emission and ambient air:**

**5 Notification as regards Federal Environment Agency (UBA) notice of  
27 February 2014 (Federal Gazette (BAnz) AT 1 April 2014 B12, chapter IV number 2.1)**

Hereafter, the Serinus 30 measuring system for CO, manufactured by Ecotech Pty Ltd., will be equipped with a new microprocessor board (CO10014). This results in modifications of the power plug as well as software changes.

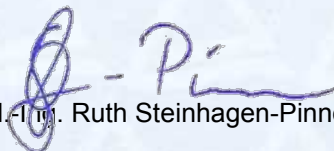
The current two software versions are designated as follows:

- 2.20.0009 for systems using the old microprocessor board (C010001)
- 3.10.001 for systems using the new microprocessor board (C010014).

Statement of TÜV Rheinland Energie und Umwelt GmbH of 12 September 2014

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TÜV Rheinland Energie und Umwelt GmbH  
Cologne, 30. April 2015

  
i. A. Dipl.-Ing. Ruth Steinhagen-Pinnow

  
i. A. Dipl. Ing. Carsten Röllig

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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.

# CONFIRMATION

Notification: 0000040203\_00\_02  
on changes according to EN 15267 regarding certificate 0000040203\_00 dated 29 April 2014

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**Measuring system:** Serinus 30 for CO

**Manufacturer:** Ecotech PTY Ltd.  
1492 Ferntree Gully Road  
Knoxfield, VIC, 3180  
Australia

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## German Federal Environmental Agency (UBA)

**Announcement about the uniform practice in  
monitoring emissions and ambient air  
dated 22 February 2017  
Federal Gazette: BAnz AT 15.03.2017 B6**

**V Notifications to the uniform practice for the continuous monitoring  
of emission and ambient air:**

- 6 Notification as regards Federal Environment Agency 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 5<sup>th</sup> notification)

The current software version of the Serinus 30 for CO manufactured by Ecotech Pty  
Ltd. for systems with micro processor board (C010001) is: V 2.31.0004.

The following software versions 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 and V 2.30.0000.

The current software version of the Serinus 30 for CO manufactured by Ecotech Pty  
Ltd. for systems with micro processor board (C010014) is: V 3.48.011.

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This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

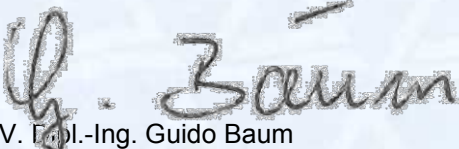


The following software versions are approved for this instrument version: V 3.13.000, V 3.14.001, V 3.15.010, V 3.16.001, V 3.18.003, V 3.20.000, V 3.22.000, V 3.23.015, V 3.24.000, V 3.26.000, V 3.27.000, V 3.28.000, V 3.29.013, V 3.30.005, V 3.31.002, V 3.32.003, V 3.33.004, V 3.34.000, V 3.35.004, 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

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TÜV Rheinland Energy GmbH  
Cologne, 28 March 2017



i. V. Dipl.-Ing. Guido Baum



i. A. Dipl. Ing. Carsten Röllig

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