

# CERTIFICATE

## on Product Conformity (QAL1)

Certificate No.: 0000038501

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**Certified AMS:** M100E / T100 for SO<sub>2</sub>

**Manufacturer:** Teledyne Advanced Pollution Instrumentation  
9480 Carroll Park Drive  
San Diego  
CA 92121-5201  
USA

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**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: 2002, VDI 4203-3: 2004, EN 14212: 2005,  
EN 15267-1: 2009, EN 15267-2: 2009**

Certification is awarded in respect of the conditions stated in this certificate  
(also see the following pages).



- Complying with 2008/50/EC
- TUV approved
- Annual inspection

Publication in the German Federal Gazette  
(BAnz.) of 05 March 2013

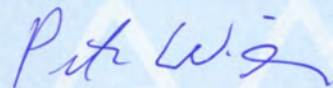
German Federal Environment Agency  
Dessau, 22 March 2013

The certificate will expire on:  
04 March 2018

TÜV Rheinland Energie und Umwelt GmbH  
Cologne, 21 March 2013



i. A. Dr. Marcel Langner



ppa. Dr. Peter Wilbring

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Am Grauen Stein  
51105 Cologne

Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.

<b>Test report:</b>	936/21205926/B of 22 June 2007 Addendum 936/21219874/A of 11 October 2012
<b>Initial certification:</b>	05 March 2013
<b>Date of expiry:</b>	04 March 2018
<b>Publication:</b>	BAnz AT 05 March 2013 B10, chapter V, notification 3

#### **Approved application**

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

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a threemonth field test.

The AMS is approved for the temperature range of +5 °C to +40 °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 936/21205926/B of 22 June 2007 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and addendum 936/21219874/A of 11 October 2012 of TÜV Rheinland Energie und Umwelt GmbH
- suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- the on-going surveillance of the product and the manufacturing process
- publication in the German Federal Gazette: BAnz. 06 November 2007, p. 7925, chapter II, No. 1.1
- publication in the German Federal Gazette: BAnz. 26 January 2011, p. 294, chapter IV, notification 19 and 20
- publication in the German Federal Gazette: BAnz AT 05 March 2013 B10, chapter V, notification 3

**AMS designation:**

M100E for SO<sub>2</sub>

**Manufacturer:**

Teledyne Advanced Pollution Instrumentation, San Diego, USA / EAS GmbH, Brunn, Austria

**Field of application:**

For continuous ambient air monitoring of SO<sub>2</sub> (stationary operation)

**Measuring ranges during the performance test:**

SO<sub>2</sub>: 0 - 700 µg/m<sup>3</sup>  
0 - 1000 µg/m<sup>3</sup>

**Software version:**

Revision C.3

**Test report:**

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne,  
TÜV Rheinland Group  
Report No.: 936/21205926/B dated 22 June 2007

**19 Notification as regards Federal Environmental Agency notices  
of 23 September 2007 (BAnz. p. 7925, chapter II, No. 1.1)**

The current software version of the ambient air measuring system M100E for SO<sub>2</sub> of the company Teledyne Advanced Pollution Instrumentation is:

G.4 with Library Version 6.3

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 29 September 2010

**20 Notification as regards Federal Environmental Agency notices  
of 23 September 2007 (BAnz. p. 7925, chapter II, No. 1.1)**

The measuring system M100E for SO<sub>2</sub> of the company Teledyne Advanced Pollution Instrumentation is manufactured in the old design M100E as well as in the new design Model T100. The new design differs from the old design only by a new display, a new front plate and extended possibilities for communication.

The current name of the new design of the measuring system is:

Model T100

The current software version of the new design of the measuring system is:

1.0.0 bld 54 with Library Version 7.0.0 bld 57

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 29. September 2010

**3 Notification as regards Federal Environmental Agency notices  
of 23 September 2007 (BAnz. p. 7925, chapter II, No. 1.1) and  
of 10 January 2011 (BAnz. p. 294, chapter IV, 19<sup>th</sup> and 20<sup>th</sup> notification)**

The measuring system M100E respectively T100 for SO<sub>2</sub> of the company Teledyne Advanced Pollution Instrumentation fulfills the requirements of EN 14212 (issue June 2005). Furthermore the manufacturing and the quality management of the measuring system M100E respectively T100 for SO<sub>2</sub> fulfill the requirements of EN 15267.

The test report on the type approval with the report no. 936/21205926/B as well as an addendum to the test report with the report no. 936/21219874/A are available on the internet at [www.qal1.de](http://www.qal1.de).

The current software version of the measuring system M100E is:

G.6 with Library Version 6.4

The current software version of the measuring system T100 is:

1.0.3 with Library Version 7.0.3

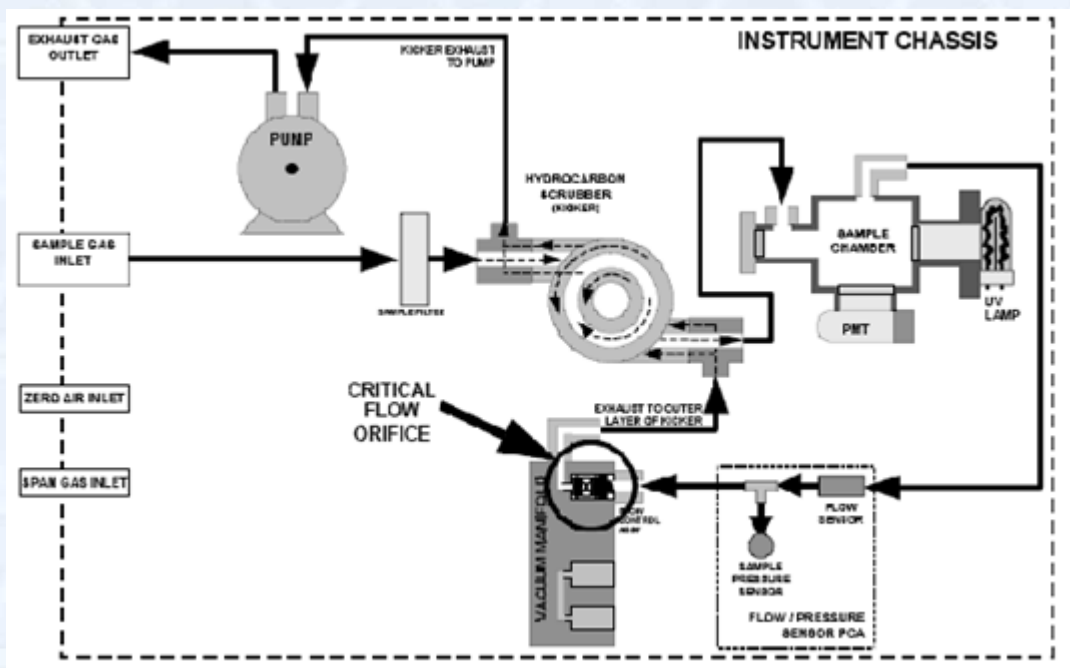
Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 11. Oktober 2012

**Certified product**

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

The physical principle on which the measuring principle of the measuring system M100E respectively T100 underlies, is based on the fluorescence, which appears when sulphur dioxide (SO<sub>2</sub>) is activated by UV-light with a wave length in the range between 190 nm and 230 nm and thus complies with the reference method described in the standard EN 14212.

The schematic set-up / flow diagram of the measuring system M100E respectively T100 (with optional zero/span gas port) is as follows:



**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 M100E / T100 for SO<sub>2</sub> is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

**Basic test:**

Test report: 936/21205926/B dated 22 June 2007  
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Publication: BAnz. 6 November 2007, No. 206, p. 7925, chapter II, No. 1.1  
Announcement by UBA from 23 September 2007

**Notification:**

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 19 and notification 20  
Announcement by UBA from 10 January 2011

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 3  
Announcement by UBA from 12 February 2013

**Initial certification according to EN 15267:**

Certificate No. 0000038501: 22 March 2013

Expiration date of the certificate: 04 March 2018

Test report: 936/21205926/B dated 22 June 2007  
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Addendum: 936/21219874/A dated 11 October 2012  
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Statement of TÜV Rheinland Energie und Umwelt GmbH from 11 October 2012

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 3  
Announcement by UBA from 12 February 2013

Expanded measurement uncertainty based on the results of the laboratory test for device 1

Measuring device:		Teledyne API M100E		Serial number:		SN 1 (1177)	
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	0.300	u <sub>r,z</sub>	0.04	0.0020	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.500	u <sub>r,lv</sub>	0.08	0.0058	
3	"lack of fit" at 1h-limit value	≤ 4.0% of meas. value	-0.400	u <sub>i,lv</sub>	-0.30	0.0929	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 3.0 nmol/mol/kPa	0.020	u <sub>gp</sub>	0.53	0.2846	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.013	u <sub>gt</sub>	-0.10	0.0105	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.050	u <sub>st</sub>	0.39	0.1554	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	-0.010	u <sub>v</sub>	-0.11	0.0117	
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol	-1.935	u <sub>h2o</sub>	1.31	1.7066	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol	0.909	u <sub>int,pos</sub>	3.45	11.8950	
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.097				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol	3.242	or	3.45	11.8950	
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.508				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol	1.218	u <sub>int,neg</sub>			
9	Averaging effect	≤ 7.0% of meas. value	2.400	u <sub>av</sub>	1.83	3.3454	
18	Difference sample/calibration port	≤ 1%	0.000	u <sub>Dsc</sub>	0.00	0.0000	
23	Uncertainty of test gas	≤ 3%	1.000	u <sub>cg</sub>	0.66	0.4356	
Combined standard uncertainty				u <sub>c</sub>		4.2362	nmol/mol
Expanded uncertainty				U <sub>c</sub>		8.4724	nmol/mol
Relative expanded uncertainty				U <sub>c,rel</sub>		6.42	%
Maximum allowed expanded uncertainty				U <sub>req,rel</sub>		15	%

Expanded measurement uncertainty based on the results of the laboratory and field test for device 1

Measuring device:		Teledyne API M100E		Serial number:		SN 1 (1177)	
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	0.300	u <sub>r,z</sub>	0.04	0.0020	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.500	u <sub>r,lv</sub>	not considered, as u <sub>r,lv</sub> = 0,07 < u <sub>r,f</sub>	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of meas. value	-0.400	u <sub>i,lv</sub>	-0.30	0.0929	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 3.0 nmol/mol/kPa	0.020	u <sub>gp</sub>	0.53	0.2846	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.013	u <sub>gt</sub>	-0.10	0.0105	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.050	u <sub>st</sub>	0.39	0.1554	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	-0.010	u <sub>v</sub>	-0.11	0.0117	
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol	-1.935	u <sub>h2o</sub>	1.31	1.7066	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol	0.909	u <sub>int,pos</sub>	3.45	11.8950	
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.097				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol	3.242	or	3.45	11.8950	
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.508				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol	1.218	u <sub>int,neg</sub>			
9	Averaging effect	≤ 7.0% of meas. value	2.400	u <sub>av</sub>	1.83	3.3454	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of 3 month average	4.800	u <sub>r,f</sub>	6.34	40.1449	
11	Long term drift at zero level	≤ 5.0 nmol/mol	1.060	u <sub>d,l,z</sub>	0.61	0.3745	
12	Long term drift at 1h-limit value	≤ 5.0% of max. of cert. range	1.490	u <sub>d,l,lv</sub>	1.14	1.2894	
18	Difference sample/calibration port	≤ 1%	0.000	u <sub>Dsc</sub>	0.00	0.0000	
23	Uncertainty of test gas	≤ 3%	1.000	u <sub>cg</sub>	0.66	0.4356	
Combined standard uncertainty				u <sub>c</sub>		7.7297	nmol/mol
Expanded uncertainty				U <sub>c</sub>		15.4594	nmol/mol
Relative expanded uncertainty				U <sub>c,rel</sub>		11.71	%
Maximum allowed expanded uncertainty				U <sub>req,rel</sub>		15	%

Expanded measurement uncertainty based on the results of the laboratory test for device 2

Measuring device:		Teledyne API M100E		Serial number		SN 2 (1183)	
Measured component:		SO <sub>2</sub>		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	0.500	U <sub>r,z</sub>	0.07	0.0056	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.900	U <sub>r,lv</sub>	0.14	0.0185	
3	"lack of fit" at 1h-limit value	≤ 4.0% of meas. value	0.200	U <sub>l,lv</sub>	0.15	0.0232	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 3.0 nmol/mol/kPa	0.060	U <sub>sp</sub>	1.60	2.5613	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.013	U <sub>gt</sub>	0.10	0.0105	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.030	U <sub>st</sub>	0.24	0.0559	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.020	U <sub>v</sub>	0.22	0.0467	
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol	-1.826	U <sub>H2O</sub>	1.23	1.5196	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol	0.400	U <sub>int,pos</sub>	3.56	12.6928	
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	1.112				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol	2.938	or	3.56	12.6928	
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.811				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol	0.909	U <sub>int,neg</sub>			
9	Averaging effect	≤ 7.0% of meas. value	1.100	U <sub>av</sub>	0.84	0.7028	
18	Difference sample/calibration port	≤ 1%	0.000	U <sub>Dsc</sub>	0.00	0.0000	
23	Uncertainty of test gas	≤ 3%	1.000	0	0.66	0.4356	
Combined standard uncertainty				U <sub>c</sub>		4.2512	nmol/mol
Expanded uncertainty				U <sub>e</sub>		8.5024	nmol/mol
Relative expanded uncertainty				U <sub>e,rel</sub>		6.44	%
Maximum allowed expanded uncertainty				U <sub>req,rel</sub>		15	%

Expanded measurement uncertainty based on the results of the laboratory and field test for device 2

Measuring device:		Teledyne API M100E		Serial number:		SN 2 (1183)	
Measured component:		SO <sub>2</sub>		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	0.500	U <sub>r,z</sub>	0.07	0.0056	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.900	U <sub>r,lv</sub>	not considered, as ur,lv = 0,13 < ur,f	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of meas. value	0.200	U <sub>l,lv</sub>	0.15	0.0232	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 3.0 nmol/mol/kPa	0.060	U <sub>sp</sub>	1.60	2.5613	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.013	U <sub>gt</sub>	0.10	0.0105	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.030	U <sub>st</sub>	0.24	0.0559	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.020	U <sub>v</sub>	0.22	0.0467	
8a	Interferent H <sub>2</sub> O with 21 mmol/mol	≤ 10 nmol/mol	-1.826	U <sub>H2O</sub>	1.23	1.5196	
8b	Interferent H <sub>2</sub> S with 200 nmol/mol	≤ 5.0 nmol/mol	0.400	U <sub>int,pos</sub>	3.56	12.6928	
8c	Interferent NH <sub>3</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	1.112				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol	2.938	or	3.56	12.6928	
8e	Interferent NO <sub>2</sub> with 200 nmol/mol	≤ 5.0 nmol/mol	0.811				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol	0.909	U <sub>int,neg</sub>			
9	Averaging effect	≤ 7.0% of meas. value	1.100	U <sub>av</sub>	0.84	0.7028	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of 3 month average	4.800	U <sub>r,f</sub>	6.34	40.1449	
11	Long term drift at zero level	≤ 5.0 nmol/mol	1.350	U <sub>d,1,z</sub>	0.78	0.6075	
12	Long term drift at 1h-limit value	≤ 5.0% of max. of cert. range	1.560	U <sub>d,1,lv</sub>	1.19	1.4134	
18	Difference sample/calibration port	≤ 1%	0.000	U <sub>Dsc</sub>	0.00	0.0000	
23	Uncertainty of test gas	≤ 3%	1.000	0	0.66	0.4356	
Combined standard uncertainty				U <sub>c</sub>		7.7602	nmol/mol
Expanded uncertainty				U <sub>e</sub>		15.5203	nmol/mol
Relative expanded uncertainty				U <sub>e,rel</sub>		11.76	%
Maximum allowed expanded uncertainty				U <sub>req,rel</sub>		15	%