

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000081162_00

Certified AMS: N100 for Sulphur dioxide

Manufacturer: Teledyne API
9970 Carroll Canyon Road
San Diego, CA, 92131
USA

Test Institute: TÜV Rheinland Energy & Environment 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),
as well as EN 15267-1 (2009) and EN 15267-2 (2023).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 7 pages).



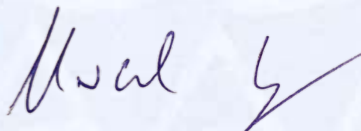
Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance
www.tuv.com
ID 0000081162

Publication in the German Federal Gazette
(BAnz) of 10 May 2024

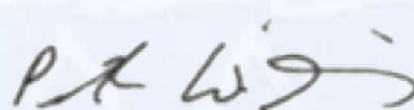
German Environment Agency
Environment GmbH
Dessau, 12 June 2024

This certificate will expire on:
9 May 2029

TÜV Rheinland Energy &
Cologne, 11 June 2024



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51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

Test report:	EuL/21255654/C dated 28 August 2023
Initial certification:	10 May 2024
Expiry date:	9 May 2029
Publication:	BAnz AT 10.05.2024 B7, chapter III No. 1.1

Approved application

The tested AMS is suitable for continuous immission measurement of SO₂ in stationary use.

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 an ambient temperature range of 0 °C to 45 °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 EuL/21255654/C dated 28 August 2023 of TÜV Rheinland Energy 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 10.05.2024 B7, chapter III No. 1.1,
Announcement by UBA dated 19 March 2024:

AMS designation:

N100 for Sulphur dioxide

Manufacturer:

Teledyne API, San Diego, USA

Field of application:

For the continuous determination of sulphur dioxide concentrations in ambient air in stationary use

Measuring ranges during the performance test:

Component	Certification range	Unit
Sulphur dioxide	0 – 1,000	µg/m ³

Software version:

Rev. 1.11.1

Restrictions:

none

Notes:

1. The test report on the performance test is available at www.qal1.de.
2. The measuring system is approved for an ambient temperature range of 0 - 45 °C.
3. The N100 measuring system can be equipped with both a regulated pump (PID controlled) and a non-regulated pump (HD Non-PID).
4. The N100 measuring system can be equipped with a standard Teflon particle filter with a pore size of 5 µm and a diameter of 47 mm as well as with a DFU filter cartridge with a pore size of 0.01 µm.

Test institute: TÜV Rheinland Energy GmbH, Cologne

Report No.: EuL/21255654/C dated 28 August 2023

Certified product

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

The immission measuring device N100 is a continuous sulfur dioxide analyzer. The measuring principle is based on UV fluorescence. The device was developed for continuous measurement of sulfur dioxide in ambient air.

The measurement method is based on the physical principle that fluorescence occurs when sulfur dioxide (SO₂) is excited to an excited state by UV light with wavelengths in the range of 190 nm - 230 nm (SO₂^{*}).

The optical design of the measurement chamber optimizes the fluorescence reaction between SO₂ and UV light, ensuring that only the UV light produced by the decay of SO₂^{*} to SO₂ is detected by the instrument's fluorescence detector.

The N100 Sulfur Dioxide Analyzer determines the concentration of sulfur dioxide (SO₂) in the sample air drawn into the instrument. In doing so, the measurement and also calibration gases must be supplied at atmospheric pressure.

UV radiation is generated by a low pressure zinc vapor lamp. A reference detector converts UV light to a DC current that is used to measure the intensity of the UV excitation source. It is located directly opposite the UV lamp at the end of a narrow tubular light trap, and is thus directly in the path of the UV excitation light.

A window that is transparent to UV light forms an airtight seal to prevent ambient air from contaminating the measurement chamber. Due to the shape of the light trap, and because the detector only detects UV wavelengths, no further optical filtering is necessary. Multiple focusing lenses and optical filters ensure that both detectors are exposed to the optimal amount of light at only the correct wavelength of UV. To ensure that the PMT detects only the light emitted by the decaying SO₂^{*}, the path of the UV excitation light and the field of view of the PMT are perpendicular to each other. Furthermore, the inner surfaces of the measuring chamber are coated with a layer of black Teflon, which absorbs stray light.

The N100 measuring device has a standard Teflon particle filter with a pore size of 5 µm directly behind the sample gas inlet. The particle filter is located on a flap secured with two screws on the rear of the measuring device. As an alternative to the Teflon filter, the N100 measuring device can be fitted with a DFU-filter cartridge with a pore size of 0.01 µm (a so-called long-life filter). The manufacturer specifies a replacement interval of up to 6 months for this filter. The replacement interval of the particle filter naturally depends on the dust load at the installation site and must be determined individually for each measuring point

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 & Environment 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 & Environment 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 & Environment 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.

History of documents

Certification of N100 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. 0000081162_00: 12 June 2024

Expiry date of the certificate: 9 May 2029

Test report: EuL/21255654/C dated 28 August 2023

TÜV Rheinland Energy GmbH

Publication: BAnz AT 10.05.2024 B7, chapter III number 1.1

UBA announcement dated 19 March 2024

Expanded uncertainty laboratory, system 1

Measuring device:	N100	Serial-No.:	SN: 54
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	0.120	$u_{r,z}$	0.03	0.0009
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.300	$u_{r,h}$	0.07	0.0053
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.400	u_{lf}	0.30	0.0929
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.390	u_{sp}	3.17	10.0690
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.050	u_{st}	0.60	0.3645
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.347	u_{st}	4.25	18.0632
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	u_v	0.09	0.0088
8a	Interferent H ₂ O with 19 nmol/mol	≤ 10 nmol/mol (Zero)	-0.080	u_{fco}	-2.40	5.7372
		≤ 10 nmol/mol (Span)	-3.210			
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.230	$u_{f, pos}$		
		≤ 5.0 nmol/mol (Span)	-0.470			
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.160	or	3.21	10.3045
		≤ 5.0 nmol/mol (Span)	-2.350			
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.080			
		≤ 5.0 nmol/mol (Span)	1.180			
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.550			
		≤ 5.0 nmol/mol (Span)	2.190			
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.940	$u_{f, neg}$		
		≤ 10 nmol/mol (Span)	2.190			
9	Averaging effect	≤ 7.0% of measured value	-1.200	u_{av}	-0.91	0.8364
18	Difference sample/calibration port	≤ 1.0%	-0.140	u_{ssc}	-0.18	0.0342
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{tg}	1.32	1.7424

Combined standard uncertainty	u_c	6.8745	nmol/mol
Expanded uncertainty	U	13.7491	nmol/mol
Relative expanded uncertainty	W	10.42	%
Maximum allowed expanded uncertainty	W_{req}	15	%

Expanded uncertainty laboratory, system 2

Measuring device:	N100	Serial-No.:	SN: 55
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	0.100	$u_{r,z}$	0.02	0.0006
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.230	$u_{r,h}$	0.06	0.0032
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.800	u_{lf}	0.61	0.3717
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.400	u_{sp}	3.25	10.5920
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.060	u_{st}	0.72	0.5249
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.356	u_{st}	4.36	19.0123
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.030	u_v	0.28	0.0794
8a	Interferent H ₂ O with 19 nmol/mol	≤ 10 nmol/mol (Zero)	0.000	u_{fco}	-2.22	4.9445
		≤ 10 nmol/mol (Span)	-2.980			
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.160	$u_{f, pos}$		
		≤ 5.0 nmol/mol (Span)	0.080			
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.160	or	2.35	5.5216
		≤ 5.0 nmol/mol (Span)	-2.580			
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000			
		≤ 5.0 nmol/mol (Span)	-1.490			
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.780			
		≤ 5.0 nmol/mol (Span)	1.650			
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.860	$u_{f, neg}$		
		≤ 10 nmol/mol (Span)	1.410			
9	Averaging effect	≤ 7.0% of measured value	-1.700	u_{av}	-1.30	1.6785
18	Difference sample/calibration port	≤ 1.0%	-0.280	u_{ssc}	-0.37	0.1366
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{tg}	1.32	1.7424

Combined standard uncertainty	u_c	6.6789	nmol/mol
Expanded uncertainty	U	13.3578	nmol/mol
Relative expanded uncertainty	W	10.12	%
Maximum allowed expanded uncertainty	W_{req}	15	%

Combined uncertainty, laboratory and field, system 1

Measuring device:		N100		Serial-No.:		SN: 54	
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	0.120	$u_{r,z}$	0.03	0.0009	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.300	$u_{r,h}$	not considered, as $u_{r,h} = 0.07 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.400	u_{fit}	0.30	0.0929	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.390	u_{sp}	3.17	10.0690	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.050	u_{st}	0.60	0.3645	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.347	u_{st}	4.25	18.0632	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	u_v	0.09	0.0088	
8a	Interferent H ₂ O with 19 nmol/mol	≤ 10 nmol/mol (Zero)	-0.080	$u_{int,CO}$	-2.40	5.7372	
		≤ 10 nmol/mol (Span)	-3.210				
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.230	$u_{int,pos}$			
		≤ 5.0 nmol/mol (Span)	-0.470				
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.160	or	3.21	10.3045	
		≤ 5.0 nmol/mol (Span)	-2.350				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.080				
		≤ 5.0 nmol/mol (Span)	-1.180				
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.550	$u_{int,neg}$			
		≤ 5.0 nmol/mol (Span)	2.190				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.940				
		≤ 10 nmol/mol (Span)	2.190				
9	Averaging effect	≤ 7.0% of measured value	-1.200	u_{av}	-0.91	0.8364	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	1.830	$u_{r,f}$	2.42	5.8351	
11	Long term drift at zero level	≤ 4.0 nmol/mol	-1.020	$u_{d1,z}$	-0.59	0.3468	
12	Long term drift at span level	≤ 5.0% of max. of certification range	1.020	$u_{d1,h}$	0.78	0.6043	
18	Difference sample/calibration port	≤ 1.0%	-0.140	u_{acc}	-0.18	0.0342	
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{tg}	1.32	1.7424	
				Combined standard uncertainty		u_c	7.3512 nmol/mol
				Expanded uncertainty		U	14.7024 nmol/mol
				Relative expanded uncertainty		W	11.14 %
				Maximum allowed expanded uncertainty		W_{req}	15 %

Combined uncertainty, laboratory and field, system 2

Measuring device:		N100		Serial-No.:		SN: 55	
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	0.100	$u_{r,z}$	0.02	0.0006	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.230	$u_{r,h}$	not considered, as $u_{r,h} = 0.05 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.800	u_{fit}	0.61	0.3717	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.400	u_{sp}	3.25	10.5920	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.060	u_{st}	0.72	0.5249	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.356	u_{st}	4.36	19.0123	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.030	u_v	0.28	0.0794	
8a	Interferent H ₂ O with 19 nmol/mol	≤ 10 nmol/mol (Zero)	0.000	$u_{int,CO}$	-2.22	4.9445	
		≤ 10 nmol/mol (Span)	-2.980				
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.160	$u_{int,pos}$			
		≤ 5.0 nmol/mol (Span)	0.080				
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.160	or	2.35	5.5216	
		≤ 5.0 nmol/mol (Span)	-2.580				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000				
		≤ 5.0 nmol/mol (Span)	-1.490				
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.780	$u_{int,neg}$			
		≤ 5.0 nmol/mol (Span)	1.650				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.860				
		≤ 10 nmol/mol (Span)	1.410				
9	Averaging effect	≤ 7.0% of measured value	-1.700	u_{av}	-1.30	1.6785	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	1.830	$u_{r,f}$	2.42	5.8351	
11	Long term drift at zero level	≤ 4.0 nmol/mol	-0.630	$u_{d1,z}$	-0.36	0.1323	
12	Long term drift at span level	≤ 5.0% of max. of certification range	0.880	$u_{d1,h}$	0.67	0.4498	
18	Difference sample/calibration port	≤ 1.0%	-0.280	u_{acc}	-0.37	0.1366	
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{tg}	1.32	1.7424	
				Combined standard uncertainty		u_c	7.1430 nmol/mol
				Expanded uncertainty		U	14.2859 nmol/mol
				Relative expanded uncertainty		W	10.82 %
				Maximum allowed expanded uncertainty		W_{req}	15 %