

# ТЕХНИЧЕСКО ПРЕДЛОЖЕНИЕ AOS-20013

за изпълнение на поръчката

Подписаният **Пеню Димитров Махмудиев**  
в качеството си на **Управител**  
на **„ЦЕ ЦЕ ЕС – БЪЛГАРИЯ“ ООД**  
с ЕИК/код по Регистър БУЛСТАТ: **040329224**

**УВАЖАЕМА ГОСПОЖО ИЗПЪЛНИТЕЛЕН ДИРЕКТОР,**

1. С настоящото заявяваме нашето желание за участие в обявената от Вас процедура за възлагане на обществена поръчка с предмет „**ДОСТАВКА, МОНТАЖ, КАЛИБРИРАНЕ И ИЗПИТАНИЕ НА ГАЗ АНАЛИЗАТОРНАТА АПАРАТУРА ЗА МОНИТОРИНГ И ЕМИСИОНЕН КОНТРОЛ НА ДИМНИТЕ ГАЗОВЕ ОТ ИНСИНЕРАТОРА**“. С подаване на настоящата оферта се съгласяваме с всички условия на Възложителя, в. т.ч. с определения в обявленietо за поръчка срок на валидност на офертите и с проекта на договор.

2. Декларираме, че сме запознати с указанията и условията за участие в обявената от Вас процедура, и изискванията на ЗОП.

3. Предлагаме да извършим доставка газ анализаторната апаратура за мониторинг и емисионен контрол на димните газове от инженератора, със следните технически характеристики:

| №  | Наименование                  | Технически характеристики<br>съгласно техническата<br>спецификация на възложителя  | Описание на предлаганото оборудване<br>/марка, модел и технически<br>характеристики/   | Количество |
|----|-------------------------------|--|--|------------|
| 1. | Подгреваема пробовземна сонда | Дължина: 300 mm<br>Захранващо напрежение: 230V AC<br>Температура на подгряване: 180 °C<br>Алармен изход при излизане на температурата от зададените граници<br>Керамичен или метален филтър от неръждаема стомана за прах<br>Клас на защита IP 54. | Подгреваема пробовземна сонда от неръждаема стомана, модел SP 46<br>Дължина: 300 mm<br>Захранващо напрежение: 230V AC<br>Температура на подгряване: 180°C<br>Алармен изход при излизане на температурата от зададените граници<br>Керамичен филтър за прах, Viton 3 μ, компл. с O-образни уплътнения<br>Фланец DN65, PN6<br>Клас на защита IP 54 | 1 бр.      |

*Лале Чекова* - 14-

|    |   |   |   |       |
|----|---|---|---|-------|
| 2. | Подгреваема пробовземна линия                                       | <p>Сърцевина тефлонов шлаух с диаметър от 6 до 8 mm</p> <p>Дължина на линията: 15 m.</p> <p>Захранващо напрежение: 230V AC</p> <p>С регулируема температура на подгряване от 0 до 200 °C</p> <p>Алармен изход при излизане на температурата от зададените граници</p>   | <p>Подгреваема пробовземна линия със сърцевина тефлонов шлаух с диаметър от 6 до 8 mm</p> <p>Дължина на линията: 15 м</p> <p>Захранващо напрежение: 230V AC</p> <p>Регулатор за контрол на температурата на подгряване от 0 до 200°C</p> <p>Алармен изход при излизане на температурата от зададените граници</p>   | 1 бр. |
| 3. | Газанализаторен шкаф с включена пробоподготовка                     | <p>Размери: 800x2000x600 (ШxВxД)</p> <p>Клас на защита IP 54, за монтаж в невзривоопасни зони</p> <p>Работна температура: +5 до +40°C</p> <p>Захранващо напрежение: 230V AC, 50 Hz</p> <p>Охладител за охлаждане на пробата</p> <p>Филтър за отстраняване на прахови частици от пробата</p> <p>Помпи, електромагнитни вентили и др. компоненти на пробоподготовката</p> <p>Връзки за тестови газове и автоматично превключване на нулев и тестов газ.</p> <p>Подмяната на всички консумативи да може да се извършва от предната страна на шкафа.</p> <p>Устройство за отстраняване на SO<sub>3</sub> от пробата</p> <p>Съд за събиране на кондензата с аларма за препълване на съда</p> | <p>Газанализаторен шкаф с включена пробоподготовка модел <b>ENDA 5000</b></p> <p>Размери: 800x2000x600 (ШxВxД)</p> <p>Клас на защита IP 54, за монтаж в невзривоопасни зони</p> <p>Филтър и вентилатор с терморегулатор за вентилиране на шкафа</p> <p>Работна температура: +5 до +40°C</p> <p>Захранващо напрежение: 230V AC, 50 Hz</p> <p>Охладител за охлаждане на пробата до 5°C</p> <p>Филтър за отстраняване на праховите частици от пробата</p> <p>Ротаметър за измерване на разхода на пробовземния газ с аларми при регистрирано отклонение</p> <p>Помпи, електромагнитни вентили и др. компоненти на пробоподготовката</p> <p>Електромагнитни вентили за калибровка</p> <p>Връзки за тестови газове и автоматично превключване на нулев и тестов газ</p> <p>Подмяната на всички консумативи и резервни части, както и калибровката и сервиза се извършва от предната страна на шкафа</p> <p>Устройство за отстраняване на SO<sub>3</sub> от пробата</p> <p>Съд за събиране на кондензата с аларма за препълване на съда</p> | 1 бр. |
| 4. | Газанализатор за измерване на NOx, SO <sub>2</sub> , O <sub>2</sub> | Измервателен обхват за NOx: 0 ÷ 1000 mg/m <sup>3</sup>  | <p>Газанализатор за измерване на NOx, SO<sub>2</sub> и O<sub>2</sub> модел <b>CMA 5400E</b></p> <p>Измервателен обхват за NOx: 0÷1000mg/m<sup>3</sup></p>   | 1 бр. |

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|----|---|--|-------|
|    | <p>0 ÷ 25 % vol.</p> <p>Сертифициран по ISO-EN-14181 и ISO-EN-15267 (QAL-1)</p> <p>С модулация тип кръстосан поток</p> <p>Захранващо напрежение:<br/>230V AC, 50 Hz</p> <p>Аналогови изходи 4 ÷ 20 mA</p> <p>Повторяемост: &lt; 0.5% от пълната скала</p> <p>Плаване на нулата (zero drift): &lt; 1% от пълната скала за седмица</p> <p>Плаване на обхвата (span drift): &lt; 2% от пълната скала за седмица</p> <p>Линейност: &lt; 1% от пълната скала</p> <p>Време за реакция (T90): &lt; 60 сек.<br/>(&lt; 120 сек. за SO<sub>2</sub>)</p> <p>Калибровката на нулата за NOx и SO<sub>2</sub> да може да се прави с околен въздух</p> <p>Калибровката на обхвата за O<sub>2</sub> да може да се прави с околен въздух</p> | <p>0÷25 % vol.</p> <p>Сертифициран по ISO-EN-14181 и ISO-EN-15267 (QAL-1)</p> <p>Модулация тип кръстосан поток, която благодарение на референтния газ поддържа клетката чиста и така се осигурява висока стабилност на измерванията.</p> <p>Захранващо напрежение:<br/>230V AC, 50 Hz</p> <p>Аналогови изходи 4 ÷ 20 mA</p> <p>Цифров дисплей за показване на измерените стойности в ppm, mg/m<sup>3</sup>, %</p> <p>Повторяемост: &lt; 0.5% от пълната скала</p> <p>Плаване на нулата (zero drift): &lt; 1% от пълната скала за седмица</p> <p>Плаване на обхвата (span drift): &lt; 2% от пълната скала за седмица</p> <p>Линейност: &lt; 1% от пълната скала</p> <p>Време за реакция (T90):<br/>&lt; 60 сек. за NOx/O<sub>2</sub><br/>&lt; 120 сек. за SO<sub>2</sub></p> <p>Калибровката на нулата за NOx и SO<sub>2</sub> се прави с околен въздух</p> <p>Калибровката на обхвата за O<sub>2</sub> се прави с околен въздух</p> |       |
| 5. | <p>Газанализатор за Хлороводород</p> <p>За монтаж на място на димохода</p> <p>Сертифициран по ISO-EN-14181 и ISO-EN-15267 (QAL-1)</p> <p>С обхват за HCl: 0 ÷ 150 mg/m<sup>3</sup></p> <p>С обхват за H<sub>2</sub>O: 0 ÷ 30 % vol.</p> <p>Захранващо напрежение 230V AC, 50Hz</p> <p>Повторяемост: 1% от обхвата</p> <p>Време за реакция: &lt;= 2 сек.</p> <p>Аналогов изход 4 ÷ 20 mA</p>   | <p>Газанализатор за измерване на HCl и H<sub>2</sub>O модел <b>LaserGas II SP</b></p> <p>Монтаж на място на газохода</p> <p>Сертифициран по ISO-EN-14181 и ISO-EN-15267 (QAL-1)</p> <p>Измервателен обхват за HCl: 0÷150 mg/m<sup>3</sup></p> <p>Измервателен обхват за H<sub>2</sub>O: 0÷30 % vol.</p> <p>Захранващо напрежение 230V AC, 50Hz</p> <p>Повторяемост: 1% от обхвата</p> <p>Време за реакция: 1-2 сек.</p> <p>Аналогови изходи 4 ÷ 20 mA (3 бр.)</p> <p>Вентилатор за продухване на измервателните елементи на анализатора</p>  | 1 бр. |

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|----|------------------------------|--|---|--|
| 6. | Консумативи и резервни части | за т.1, т.2, т.3, т.4, т.5, препоръчани от производителя на доставената апаратура, за 2 г. редовна работа. | Препоръчаните от производителя консумативи и резервни части за 2 г. редовна работа за приборите по т.1 ÷ т.5 са посочени в приложен списък. |  |
|----|------------------------------|--|---|--|

4. Задължаваме се да извършим доставка на апаратурата, детайлно описана в т. 3 по-горе в срок от **120 (сто и двадесет) календарни дни**, считано от подписане на договора между страните.

**Освен специфицираната по-горе газ анализаторна апаратура ще доставим и спомагателно КИП табло, в което ще разположим сега използваното електромонтажно оборудване (релета, контактори, захранващи устройство и т.н.), необходимо за нормалното функциониране на измервателните устройства от системата за мониторинг на емисии, които остават непроменени: сonda за скоростта за потока димни газове, прахомер, температура и налягане на димните газове. В същото табло ще бъде монтиран и показващ прибор за визуализиране на измерените стойности на HCl и H<sub>2</sub>O, за да няма нужда оперативния персонал да отчита тези стойности от разположения на газохода газ анализатор.**

**За извършване на проверки за точност, настройки и калибровки на газанализаторите ще доставим бутилки с редуцир-вентили с еталонни газови смеси. Собствеността на бутилките не се прехвърля на Възложителя, тъй като се отдават само под наем от доставчиците на такива газови смеси. След изтичане на гаранционния срок наемните отношения ще бъдат прехвърлени на Възложителя.**

**По време на провеждане на комплексните изпитания и настройки (72-часовите преби) ще бъдат обучени за работа със системата 2-3 представители на експлоатационния персонал на Възложителя.**

5. Задължаваме се да изпълним и следните дейности (услуги):

5.1. демонтаж на съществуващото оборудване и монтаж на новата система.

5.2. проверка, настройка и калибиране на отделните модули и елементи на системата.

5.3. комплексни изпитания и настройки (72-часови преби).

5.4. интегриране на измервателната система към съществуващата система за събиране и обработка на данните.

5.5. калибиране от независима акредитирана лаборатория.

6. Задължаваме се да изпълним дейностите по т. 5 в срок от **45 (четиридесет и пет) календарни дни** след извършване на доставка на системата.

7. Задължаваме се да доставим апаратурата, детайлно описана в т. 3 по-горе, придружена с всички сертификати съгласно Наредба № 6 от 26.03.1999 г. за реда и начина за измерване на емисиите на вредни вещества, изпускати в атмосферния въздух от обекти с неподвижни източници, посочени и в техническата спецификация, както следва:

7.1. първоначален сертификат (доклад) за проверка на функционалната годност на средствата за измерване, като за СНИ се спазват изискванията на EN 14181 (QAL1);

7.2. сертификат (доклад) за електромагнитна съвместимост, издаден от фирмата - производител на съответната апаратура, в съответствие с изискванията на Наредбата за съществените изисквания и оценяване на съответствието за електромагнитна съвместимост (ДВ, бр. 23 от 2016 г.);

7.3. сертификат за внедрена система за управление на качеството съгласно EN ISO 9001 на производителя на съответните средства за измерване;

7.4. сертификат на производителя за първоначално калибриране;

7.5. свидетелство\* за калибриране, издадено от акредитирана лаборатория, притежаваща сертификат от национален орган за акредитация, страна по Многостранното споразумение на Европейската организация за акредитация или пълноправен член на Международната организация за акредитация на лаборатории.

\* свидетелството за калибриране, се издава след осигуряване от изпълнителя на дейност 5.5, посочена по-горе.

8. Предлагаме гаранционен срок на системата от **24 (двадесет и четири) месеца**, считано от подписване на приемо-предавателния протокол за извършената доставка.

9. Прилагаме копия, заверени „вярно с оригинала“ на брошури от производителя, съдържащи описание и технически характеристики на предлаганото от нас оборудване.

10. Прилагаме списък с препоръчаните от производителя консумативи и бързоизносващи се резервни части за 2 г. редовна работа на приборите по т.1, т.2, т.3, т.4 и т.5.

11. Прилагаме 2 броя сертификати QAL-1 за специфицираните по-горе в предложението газоанализатори ENDA 5000 и LaserGas II SP.

24.01.2020 г.

Подпись и печать: .....  


Име и фамилия: Пеню

Должност: Управител

## Препоръчителни от Хориба резервни части и консумативи

за период от: 2 години

### 1 ENDA-5000 система

|  | Интервал за смяна (години) | Препоръчителни бройки | Общо за 2 години | Продуктов № |
|--|----------------------------|-----------------------|------------------|-------------|
| Пробовземни филтри (25 бр./опак.)            | 1                          | 1                     | 2                | 2624000A14  |
| Влагоуловител MC-050                         | 0,25                       | 1                     | 8,0              | 90270002000 |
| Катализатор COM-50                           | 1                          | 1                     | 2                | 3014038044  |
| Катализатор PUR-50                           | 1                          | 1                     | 2                | 3014038045  |
| Газоочистител ESU-050                        | 1                          | 1                     | 2                | 90570034000 |
| S-филтър SF-025                              | 1                          | 1                     | 2                | 3014038043  |
| Силикагел                                    | 1                          | 1                     | 2                | 2804000A08  |
| Мембрана тип 4 за GP-46                      | 2                          | 3                     | 3                | 2109100A40  |
| Вентил комплект GP-46                        | 2                          | 3                     | 3                | 2109000A62  |
| Въздушен филтър 3μ                           | 1                          | 1                     | 2                | 3200082574  |
| Ротор PP-46D                                 | 1                          | 1                     | 2                | 2109000A69  |
| Маркуч за перисталтична помпа PP 0,3l/h, 4/6 | 1                          | 2                     | 4                | 2109000A70  |

### 1 Пробовземна сонда SP-46

|   |     |   |   |            |
|---|-----|---|---|------------|
| Керамичен филърен елемент вкл. O-пръстени, Viton SP-46, 3 μ | 0,5 | 1 | 4 | 2623000A25 |
|---|-----|---|---|------------|

### 1 Анализатор за хлороводород LaserGas II SP

Няма необходимост от консумативи, а само визуален контрол на 3-6 месеца

24.01.2020г.

София

Подпис:

ИНЖ. ГЕОРГИ МАЛАЧУДИЕВ

управител

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000035010\_01

**Certified AMS:** ENDA-5000 with analysing module CMA-5800 E  
for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub>

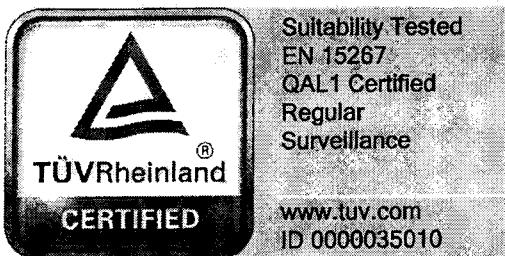
**Manufacturer:** Horiba GmbH  
Kaplanstr. 5  
3430 Tulln  
Austria

**Test Institute:** TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified  
according to the standards

EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2007)  
and EN 14181 (2004)

Certification is awarded in respect of the conditions stated in this certificate  
(this certificate contains 14 pages).



Publication in the German Federal Gazette  
(BAnz.) of 02 March 2012

This certificate will expire on:  
01 March 2022

German Federal Environment Agency  
Dessau, 28 February 2017

TÜV Rheinland Energy GmbH  
Cologne, 27 February 2017

Dr. Marcel Langner  
Head of Section II 4.1

ppa. Dr. P

[www.umwelt-tuv.eu](http://www.umwelt-tuv.eu)  
tre@umwelt-tuv.eu  
Tel. + 49 221 806-5200

TÜV Rheinland Energy GmbH  
Am Grauen Stein  
51105 Köln

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.

**Test report:** 936/21212266/A of 18 October 2011  
**Initial certification:** 16 March 2012  
**Expiry date:** 01 March 2022  
**Certificate** renewal (previous certificate 0000035010 dated from 16 March 2012 with validity up to the 01 March 2017)  
**Publication:** BAnz. 02 March 2012, Nr. 36, Seite 920, Kapitel I, Nr. 4.5

#### **Approved application**

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU chapter III (13. BlmSchV), at waste incineration plants according to Directive 2010/75/EU chapter IV (17. BlmSchV) and other plants requiring official approval. The tested range have been chosen with respect to the wide application range of the AMS.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a five months field test at a municipal waste incinerator.

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

The notification of suitability of the AMS, performance testing, and the uncertainty calculation have been effected on the basis of the regulations valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure that this AMS is suitable for monitoring the limit value and Oxygen concentration relevant to the application.

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

#### **Basis of the certification**

This certification is based on:

- test report 936/21212266/A of 18 October 2011 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. 02 March 2012, No. 36, page 920,  
chapter I, No 4.5, Announcement by UBA from 23 February 2012

**AMS name:**

ENDA-5000 with analysing module CMA-5800 for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub>

**Manufacturer:**

Horiba GmbH, Tulln, Austria

**Field of application:**

For measurements at plants requiring official approval and  
plants according to 27<sup>th</sup> BlmSchV

**Measuring ranges during the suitability test:**

| Component       | Certification range   | supplementary measurement ranges | Unit              |
|-----------------|-----------------------|----------------------------------|-------------------|
| NO <sub>x</sub> | 0 – 153 <sup>1)</sup> | 0 - 1,530 <sup>2)</sup>          | mg/m <sup>3</sup> |
| SO <sub>2</sub> | 0 - 75                | 0 - 750                          | mg/m <sup>3</sup> |
| CO              | 0 - 50                | 0 - 500                          | mg/m <sup>3</sup> |
| CO <sub>2</sub> | 0 - 20                | 0 - 25                           | Vol.-%            |
| O <sub>2</sub>  | 0 - 25                | 0 - 10                           | Vol.-%            |

1) as NO<sub>2</sub>, this corresponds to app. 0 – 100 mg/m<sup>3</sup> NO

2) as NO<sub>2</sub>, this corresponds to app. 0 – 1,000 mg/m<sup>3</sup> NO

**Software version:**

P1000877001I

**Restrictions:**

None

**Note:**

A four weeks period has been specified as maintenance interval with a reservoir size of 40 l for the phosphoric acid.

**Test report:**

TÜV Rheinland Energie und Umwelt GmbH, Köln  
Report No.: 936/21212266/A of 18 October 2011

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, chapter IV notification 4, announcement by UBA dated 06 July 2012:

**4 Notification as regards Federal Environment Agency (UBA) notices dated 23 February 2012 (BAnz. page 920, chapter I number 4.5)**

The ENDA-5000 multi-component measuring system with CMA-5800 analyser manufactured by Horiba GmbH may either be supplied with the given, previously known type SP2000 gas sampling probe manufactured by M&C or with either of the probe types SP2200-H/C/I/BB or SP2200-H/I/BB-F of the same manufacturer.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 20 March 2012

Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, chapter V notification 28, announcement by UBA dated 12 February 2013:

**28 Notification as regards Federal Environment Agency (UBA) notices dated 23 February 2012 (BAnz. page 920, chapter I number 4.5) and dated 6 July 2012 (BAnz AT 20.07.2012 B11, chapter IV, notification 4)**

The ENDA-5000 measuring system with analyser module CMA-5800 for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> manufactured by Horiba GmbH can also be operated with the gas sampling probe GAS 222.21 manufactured by SICOM Prozeß- und Umwelttechnik GmbH instead of with the already notified sampling probe. The former is identical in design to a probe manufactured by Bühlert Technologies GmbH with the same designation.

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

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 2, announcement by UBA dated 03 July 2013:

**2 Notification as regards Federal Environment Agency (UBA) notices dated 23 February 2012 (BAnz. page 920, chapter I number 4.5) and dated 12 February 2013 (BAnz AT 5.03.2013 B10, chapter V, notification 28)**

The ENDA-5000 measuring system with its CMA-5800 analyser module monitoring NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> manufactured by Horiba GmbH may also be sold with a variety of measuring channel combinations. The AMS designations for each respective combination of components are listed below:

| Model:<br>ENDA-5000<br>with analysing<br>module | Component 1     | Component 2     | Component 3     | Component 4     | Component 5    |
|---|-----------------|-----------------|-----------------|-----------------|----------------|
| CFA-5140  | CO <sub>2</sub> | -               | -               | -               | -              |
| CFA-5150  | CO              | -               | -               | -               | -              |
| CMA-5160  | O <sub>2</sub>  | -               | -               | -               | -              |
| CMA-5220  | NO <sub>x</sub> | O <sub>2</sub>  | -               | -               | -              |
| CMA-5230  | SO <sub>2</sub> | O <sub>2</sub>  | -               | -               | -              |
| CMA-5240  | CO <sub>2</sub> | O <sub>2</sub>  | -               | -               | -              |
| CMA-5250  | CO              | O <sub>2</sub>  | -               | -               | -              |
| CFA-5370  | CO              | CO <sub>2</sub> | -               | -               | -              |
| CMA-5400  | NO <sub>x</sub> | SO <sub>2</sub> | O <sub>2</sub>  | -               | -              |
| CMA-5410  | NO <sub>x</sub> | CO <sub>2</sub> | O <sub>2</sub>  | -               | -              |
| CMA-5420  | NO <sub>x</sub> | CO              | O <sub>2</sub>  | -               | -              |
| CMA-5440  | SO <sub>2</sub> | CO <sub>2</sub> | O <sub>2</sub>  | -               | -              |
| CMA-5450  | SO <sub>2</sub> | CO              | O <sub>2</sub>  | -               | -              |
| CMA-5470  | CO              | CO <sub>2</sub> | O <sub>2</sub>  | -               | -              |
| CMA-5600  | NO <sub>x</sub> | SO <sub>2</sub> | CO <sub>2</sub> | O <sub>2</sub>  | -              |
| CMA-5610  | NO <sub>x</sub> | SO <sub>2</sub> | CO              | O <sub>2</sub>  | -              |
| CMA-5620  | NO <sub>x</sub> | CO              | CO <sub>2</sub> | O <sub>2</sub>  | -              |
| CMA-5630  | SO <sub>2</sub> | CO              | CO <sub>2</sub> | O <sub>2</sub>  | -              |
| CMA-5800  | NO <sub>x</sub> | SO <sub>2</sub> | CO              | CO <sub>2</sub> | O <sub>2</sub> |

Statement of TÜV Rheinland Energie und Umwelt GmbH dated 26 March 2013

Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter V notifical 8, announcement by UBA dated 17 July 2014:

**8 Notification as regards Federal Environment Agency (UBA) notices dated 23 February 2012 (BAnz. page 920, chapter I number 4.5) and dated 3 July 2013 (BAnz AT 23.07.2013 B4, chapter V notification 2)**

Due to the name change which has been made the new device designations for the ENDA-5000 measuring system manufactured by Horiba GmbH are:

| previous designation model:<br>ENDA-5000<br>with analysis<br>module | new designation<br>model: ENDA-<br>5000 with anal-<br>ysis module | Compo-<br>nent 1 | Compo-<br>nent 2 | Compo-<br>nent 3 | Compo-<br>nent 4 | Compo-<br>nent 5 |
|---|---|------------------|------------------|------------------|------------------|------------------|
| CFA-5140  | CFA-5140 E  | CO <sub>2</sub>  | -                | -                | -                | -                |
| CFA-5150  | CFA-5150 E  | CO               | -                | -                | -                | -                |
| CMA-5160  | CMA-5160 E  | O <sub>2</sub>   | -                | -                | -                | -                |
| CMA-5220  | CMA-5220 E  | NO <sub>x</sub>  | O <sub>2</sub>   | -                | -                | -                |
| CMA-5230  | CMA-5230 E  | SO <sub>2</sub>  | O <sub>2</sub>   | -                | -                | -                |
| CMA-5240  | CMA-5240 E  | CO <sub>2</sub>  | O <sub>2</sub>   | -                | -                | -                |
| CMA-5250  | CMA-5250 E  | CO               | O <sub>2</sub>   | -                | -                | -                |
| CFA-5370  | CFA-5370 E  | CO               | CO <sub>2</sub>  | -                | -                | -                |
| CMA-5400  | CMA-5400 E  | NO <sub>x</sub>  | SO <sub>2</sub>  | O <sub>2</sub>   | -                | -                |
| CMA-5410  | CMA-5410 E  | NO <sub>x</sub>  | CO <sub>2</sub>  | O <sub>2</sub>   | -                | -                |
| CMA-5420  | CMA-5420 E  | NO <sub>x</sub>  | CO               | O <sub>2</sub>   | -                | -                |
| CMA-5440  | CMA-5440 E  | SO <sub>2</sub>  | CO <sub>2</sub>  | O <sub>2</sub>   | -                | -                |
| CMA-5450  | CMA-5450 E  | SO <sub>2</sub>  | CO               | O <sub>2</sub>   | -                | -                |
| CMA-5470  | CMA-5470 E  | CO               | CO <sub>2</sub>  | O <sub>2</sub>   | -                | -                |
| CMA-5600  | CMA-5600 E  | NO <sub>x</sub>  | SO <sub>2</sub>  | CO <sub>2</sub>  | O <sub>2</sub>   | -                |
| CMA-5610  | CMA-5610 E  | NO <sub>x</sub>  | SO <sub>2</sub>  | CO               | O <sub>2</sub>   | -                |
| CMA-5620  | CMA-5620 E  | NO <sub>x</sub>  | CO               | CO <sub>2</sub>  | O <sub>2</sub>   | -                |
| CMA-5630  | CMA-5630 E  | SO <sub>2</sub>  | CO               | CO <sub>2</sub>  | O <sub>2</sub>   | -                |
| CMA-5800  | CMA-5800 E  | NO <sub>x</sub>  | SO <sub>2</sub>  | CO               | CO <sub>2</sub>  | O <sub>2</sub>   |

The current software version for the ENDA-5000 measuring system manufactured by Horiba GmbH is: P1000877001K

As far as the analysis modules without SO<sub>2</sub> measurement channel listed above are concerned there is no need for injecting phosphoric acid.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 1 April 2014

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, chapter V notification 7, announcement by UBA dated 14 July 2016:

**7 Notification as regards Federal Environment Agency (UBA) notices dated 23 February 2012 (BAnz. page 920, chapter I number 4.5) and dated 17 July 2014 (BAnz AT 05.08.2014 B11, chapter V notification 8)**

The ENDA 5000 measuring system with the CMA-5800 analyser module for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> manufactured by HORIBA GmbH is equipped with a new display which, in design and functionally, largely corresponds to its predecessor. In addition, the power supply ZWS-BAF may also be used.

The current software version of the measuring system is:  
P1000877001L

Statement of TÜV Rheinland Energie und Umwelt GmbH dated 29 February 2016



**Certificate:**  
0000035010\_01 / 28 February 2017



**TÜVRheinland®**  
Precisely Right.

### **Certified product**

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

The measuring system is a multicomponent gas analyser for the measurement of emissions. The analyser of the type series ENDA-5000 is a measuring device to observe continuously the concentration of NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> at stationary emission sources. It measures simultaneously the five above listed gas components. The system measures the concentration of the components NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> in dry conditions because the moisture from the measuring gas is removed with help of sample gas chillers. For the measuring channels NO<sub>x</sub>, SO<sub>2</sub>, CO and CO<sub>2</sub> the non-dispersive infrared ray absorptiometry with cross modulation system (NDIR) is used.

For the determination of the oxygen concentration a magneto-pneumatic system (MPA) is applied, which is free from cylinder gas as a carrier gas.

For the minimisation of the SO<sub>2</sub> losses in the sample conditioning system a 10 percent phosphoric acid is added upstream of the sample gas chiller into the hot sample gas.

The software version is: P1000877001L.

### **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 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.

This document as well as the certification mark remains property of TÜV Rheinland Energy 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 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:  
[gal1.de](http://gal1.de).



**Certificate:**  
0000035010\_01 / 28 February 2017



Certification of ENDA-5000 with analysing module CMA-5800 E for NO<sub>x</sub>, SO<sub>2</sub>, CO, CO<sub>2</sub> and O<sub>2</sub> 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. 0000035010: 16 March 2012  
Expiry date of the certificate: 01 March 2017

Test report: 936/21212266/A dated 18 October 2011

TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz. 02 March 2012, No. 36, page 920, chapter I, No. 4.5,  
Announcement by UBA dated 23 February 2012

#### **Notifications according to EN 15267**

Statement of TÜV Rheinland Energie und Umwelt GmbH, dated 20 March 2012  
Publication: BAnz AT 20.07.2012 B11, chapter IV notification 4,  
Announcement by UBA dated 06 July 2012  
(hardware extension)

Statement of TÜV Rheinland Energie und Umwelt GmbH, dated 11 October 2012  
Publication: BAnz AT 05.03.2013 B10, chapter V notification 28,  
Announcement by UBA dated 12 Februar 2013  
(hardware extension)

Statement of TÜV Rheinland Energie und Umwelt GmbH, dated 26 March 2013  
Publication: BAnz AT 23.07.2013 B4, chapter V notification 2,  
Announcement by UBA dated 03 Juli 2013  
(Module arranging)

Statement of TÜV Rheinland Energie und Umwelt GmbH, dated 1 April 2014  
Publication: BAnz AT 05.08.2014 B11, chapter V notification 8,  
Announcement by UBA dated 17 July 2014  
(new software version and changing of system name)

Statement of TÜV Rheinland Energie und Umwelt GmbH, dated 29 February 2016  
Publication: BAnz AT 01.08.2016 B11, chapter V notification 7,  
Announcement by UBA dated 14 July 2016  
(Hard- and software changing)

#### **Renewal of the certificate**

Certificate No. 0000035010\_01: 28 February 2017  
Expiry date of the certificate: 01 March 2022



### Calculation of overall uncertainty according to EN 14181 and EN 15267-3

#### Measuring system

Manufacturer Horiba GmbH  
 Name of measuring system ENDA-5000  
 Serial number of the candidates 0900500 / 09105800  
 Measuring principle NDIR

#### Test report

Test laboratory TÜV Rheinland  
 Date of report 2011-10-18

#### Measured component

Certification range NO<sub>x</sub> as NO 0 - 100 mg/m<sup>3</sup>

#### Evaluation of the cross sensitivity (CS) (system with largest CS)

|                                       |       |                   |
|---------------------------------------|-------|-------------------|
| Sum of positive CS at zero point      | 1.30  | mg/m <sup>3</sup> |
| Sum of negative CS at zero point      | 0.00  | mg/m <sup>3</sup> |
| Sum of positive CS at reference point | 3.00  | mg/m <sup>3</sup> |
| Sum of negative CS at reference point | 0.00  | mg/m <sup>3</sup> |
| Maximum sum of cross sensitivities    | 3.00  | mg/m <sup>3</sup> |
| Uncertainty of cross sensitivity      | 1.732 | mg/m <sup>3</sup> |

#### Calculation of the combined standard uncertainty

##### Tested parameter

| Standard deviation from paired measurements under field conditions * | u <sub>D</sub>   | u                        | u <sup>2</sup>                          |
|--|------------------|--------------------------|---|
| Lack of fit  | u <sub>lof</sub> | 0.173 mg/m <sup>3</sup>  | 0.030 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Zero drift from field test   | u <sub>d,z</sub> | -0.543 mg/m <sup>3</sup> | 0.295 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Span drift from field test   | u <sub>d,s</sub> | -1.547 mg/m <sup>3</sup> | 2.393 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of ambient temperature at span                             | u <sub>t</sub>   | 0.954 mg/m <sup>3</sup>  | 0.910 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of supply voltage  | u <sub>v</sub>   | 0.580 mg/m <sup>3</sup>  | 0.336 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Cross sensitivity (interference)                                     | u <sub>i</sub>   | 1.732 mg/m <sup>3</sup>  | 3.000 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of sample gas flow   | u <sub>b</sub>   | 0.204 mg/m <sup>3</sup>  | 0.042 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Uncertainty of reference material at 70% of certification range      | u <sub>rm</sub>  | 0.808 mg/m <sup>3</sup>  | 0.653 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Converter efficiency for AMS measuring NOx                           | u <sub>ce</sub>  | 1.900 mg/m <sup>3</sup>  | 3.610 (mg/m <sup>3</sup> ) <sup>2</sup> |

\* The larger value is used:

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,j})^2}$$

$$U = u_c * k = u_c * 1.96$$

3.38 mg/m<sup>3</sup>

6.62 mg/m<sup>3</sup>

Relative total expanded uncertainty

U in % of the ELV 131 mg/m<sup>3</sup>

5.1

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 131 mg/m<sup>3</sup>

20.0

Requirement of EN 15267-3

U in % of the ELV 131 mg/m<sup>3</sup>

15.0



### Calculation of overall uncertainty according to EN 14181 and EN 15267-3

#### Measuring system

Manufacturer: Horiba GmbH  
 Name of measuring system: ENDA-5000  
 Serial number of the candidates: 0900500 / 09105800  
 Measuring principle: NDIR

#### Test report

Test laboratory: TÜV Rheinland  
 Date of report: 2011-10-18

#### Measured component

Certification range: SO<sub>2</sub> 0 - 75 mg/m<sup>3</sup>

#### Evaluation of the cross sensitivity (CS)

(system with largest CS)

|                                       |                         |
|---------------------------------------|-------------------------|
| Sum of positive CS at zero point      | 2.85 mg/m <sup>3</sup>  |
| Sum of negative CS at zero point      | 0.00 mg/m <sup>3</sup>  |
| Sum of positive CS at reference point | 2.80 mg/m <sup>3</sup>  |
| Sum of negative CS at reference point | -0.90 mg/m <sup>3</sup> |
| Maximum sum of cross sensitivities    | 2.85 mg/m <sup>3</sup>  |
| Uncertainty of cross sensitivity      | 1.645 mg/m <sup>3</sup> |

#### Calculation of the combined standard uncertainty

##### Tested parameter

|  | u   | u <sup>2</sup>                          |
|--|---|---|
| Standard deviation from paired measurements under field conditions * | u <sub>D</sub> 0.416 mg/m <sup>3</sup>    | 0.173 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Lack of fit  | u <sub>lof</sub> 0.346 mg/m <sup>3</sup>  | 0.120 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Zero drift from field test   | u <sub>d,z</sub> -0.624 mg/m <sup>3</sup> | 0.389 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Span drift from field test   | u <sub>d,s</sub> 0.784 mg/m <sup>3</sup>  | 0.615 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of ambient temperature at span                             | u <sub>t</sub> 0.755 mg/m <sup>3</sup>    | 0.570 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of supply voltage  | u <sub>v</sub> 0.367 mg/m <sup>3</sup>    | 0.135 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Cross sensitivity (interference)                                     | u <sub>i</sub> 1.645 mg/m <sup>3</sup>    | 2.708 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Influence of sample gas flow   | u <sub>b</sub> 0.045 mg/m <sup>3</sup>    | 0.002 (mg/m <sup>3</sup> ) <sup>2</sup> |
| Uncertainty of reference material at 70% of certification range      | u <sub>rm</sub> 0.606 mg/m <sup>3</sup>   | 0.368 (mg/m <sup>3</sup> ) <sup>2</sup> |

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,i})^2}$$

2.25 mg/m<sup>3</sup>

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96$$

4.42 mg/m<sup>3</sup>

#### Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 50 mg/m<sup>3</sup>

8.8

U in % of the ELV 50 mg/m<sup>3</sup>

20.0

U in % of the ELV 50 mg/m<sup>3</sup>

15.0



### Calculation of overall uncertainty according to EN 14181 and EN 15267-3

#### Measuring system

Manufacturer

Horiba GmbH

Name of measuring system

ENDA-5000

Serial number of the candidates

0900500 / 09105800

Measuring principle

NDIR

#### Test report

936/21212266/A

Test laboratory

TÜV Rheinland

Date of report

2011-10-18

#### Measured component

CO

Certification range

0 - 50 mg/m³

#### Evaluation of the cross sensitivity (CS)

(system with largest CS)

|                                       |       |       |
|---------------------------------------|-------|-------|
| Sum of positive CS at zero point      | 1.23  | mg/m³ |
| Sum of negative CS at zero point      | 0.00  | mg/m³ |
| Sum of positive CS at reference point | 1.30  | mg/m³ |
| Sum of negative CS at reference point | 0.00  | mg/m³ |
| Maximum sum of cross sensitivities    | 1.30  | mg/m³ |
| Uncertainty of cross sensitivity      | 0.751 | mg/m³ |

#### Calculation of the combined standard uncertainty

##### Tested parameter

Repeatability standard deviation at set point \*

|                  | u      | u²    |
|------------------|--------|-------|
| u <sub>r</sub>   | 0.650  | mg/m³ |
| u <sub>lof</sub> | -0.173 | mg/m³ |
| u <sub>d,z</sub> | -0.127 | mg/m³ |
| u <sub>d,s</sub> | 0.650  | mg/m³ |
| u <sub>t</sub>   | 0.643  | mg/m³ |
| u <sub>v</sub>   | 0.163  | mg/m³ |
| u <sub>i</sub>   | 0.751  | mg/m³ |
| u <sub>b</sub>   | -0.018 | mg/m³ |
| u <sub>rm</sub>  | 0.404  | mg/m³ |

Lack of fit

0.030 (mg/m³)²

Zero drift from field test

0.016 (mg/m³)²

Span drift from field test

0.423 (mg/m³)²

Influence of ambient temperature at span

0.413 (mg/m³)²

Influence of supply voltage

0.027 (mg/m³)²

Cross sensitivity (interference)

0.563 (mg/m³)²

Influence of sample gas flow

0.000 (mg/m³)²

Uncertainty of reference material at 70% of certification range

0.163 (mg/m³)²

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,j})^2}$$

$$u = u_c * k = u_c * 1.96$$

1.43 mg/m³

Total expanded uncertainty

2.81 mg/m³

#### Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 50 mg/m³ 5.6

Requirement of EN 15267-3

U in % of the ELV 50 mg/m³ 10.0



**Calculation of overall uncertainty according to EN 14181 and EN 15267-3**

**Measuring system**

Manufacturer Horiba GmbH  
 Name of measuring system ENDA-5000  
 Serial number of the candidates 0900500 / 09105800  
 Measuring principle NDIR

**Test report**

Test laboratory TÜV Rheinland  
 Date of report 2011-10-18

**Measured component**

Certification range CO<sub>2</sub>  
 0 - 20 Vol.-%

**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

|                                       |               |
|---------------------------------------|---------------|
| Sum of positive CS at zero point      | 0.00 Vol.-%   |
| Sum of negative CS at zero point      | 0.00 Vol.-%   |
| Sum of positive CS at reference point | 0.00 Vol.-%   |
| Sum of negative CS at reference point | -0.19 Vol.-%  |
| Maximum sum of cross sensitivities    | -0.19 Vol.-%  |
| Uncertainty of cross sensitivity      | -0.110 Vol.-% |

**Calculation of the combined standard uncertainty**

**Tested parameter**

|  | u                              | u <sup>2</sup>              |
|--|--------------------------------|-----------------------------|
| Standard deviation from paired measurements under field conditions * | u <sub>D</sub> 0.094 Vol.-%    | 0.009 (Vol.-%) <sup>2</sup> |
| Lack of fit  | u <sub>lof</sub> -0.115 Vol.-% | 0.013 (Vol.-%) <sup>2</sup> |
| Zero drift from field test   | u <sub>d,z</sub> -0.072 Vol.-% | 0.005 (Vol.-%) <sup>2</sup> |
| Span drift from field test   | u <sub>d,s</sub> 0.311 Vol.-%  | 0.097 (Vol.-%) <sup>2</sup> |
| Influence of ambient temperature at span                             | u <sub>t</sub> 0.100 Vol.-%    | 0.010 (Vol.-%) <sup>2</sup> |
| Influence of supply voltage  | u <sub>v</sub> 0.067 Vol.-%    | 0.004 (Vol.-%) <sup>2</sup> |
| Cross sensitivity (interference)                                     | u <sub>i</sub> -0.110 Vol.-%   | 0.012 (Vol.-%) <sup>2</sup> |
| Influence of sample gas flow   | u <sub>p</sub> -0.005 Vol.-%   | 0.000 (Vol.-%) <sup>2</sup> |
| Uncertainty of reference material at 70% of certification range      | u <sub>rm</sub> 0.162 Vol.-%   | 0.026 (Vol.-%) <sup>2</sup> |

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,i})^2}$$

0.42 Vol.-%

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96$$

0.82 Vol.-%

**Relative total expanded uncertainty**

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 20 Vol.-%

4.1

U in % of the ELV 20 Vol.-%

10.0 \*\*

U in % of the ELV 20 Vol.-%

7.5

\*\* For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.

A value of 10.0 % was used for this.



**Calculation of overall uncertainty according to EN 14181 and EN 15267-3**

**Measuring system**

Manufacturer

Horiba GmbH

Name of measuring system

ENDA-5000

Serial number of the candidates

0900500 / 09105800

Measuring principle

Paramagnetismus

**Test report**

Test laboratory

936/21212266/A

Date of report

TÜV Rheinland

2011-10-18

**Measured component**

Certification range

O<sub>2</sub>

0 - 25 Vol.-%

**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point

0.00 Vol.-%

Sum of negative CS at zero point

0.00 Vol.-%

Sum of positive CS at reference point

0.00 Vol.-%

Sum of negative CS at reference point

-0.19 Vol.-%

Maximum sum of cross sensitivities

-0.19 Vol.-%

Uncertainty of cross sensitivity

-0.110 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

Standard deviation from paired measurements under field conditions \*

u<sub>D</sub>

0.191 Vol.-%

0.036 (Vol.-%)<sup>2</sup>

Lack of fit

u<sub>lof</sub>

0.040 Vol.-%

0.002 (Vol.-%)<sup>2</sup>

Zero drift from field test

u<sub>d,z</sub>

-0.173 Vol.-%

0.030 (Vol.-%)<sup>2</sup>

Span drift from field test

u<sub>d,s</sub>

0.162 Vol.-%

0.026 (Vol.-%)<sup>2</sup>

Influence of ambient temperature at span

u<sub>t</sub>

0.056 Vol.-%

0.003 (Vol.-%)<sup>2</sup>

Influence of supply voltage

u<sub>v</sub>

0.027 Vol.-%

0.001 (Vol.-%)<sup>2</sup>

Cross sensitivity (interference)

u<sub>i</sub>

-0.110 Vol.-%

0.012 (Vol.-%)<sup>2</sup>

Influence of sample gas flow

u<sub>b</sub>

0.039 Vol.-%

0.002 (Vol.-%)<sup>2</sup>

Uncertainty of reference material at 70% of certification range

u<sub>rm</sub>

0.202 Vol.-%

0.041 (Vol.-%)<sup>2</sup>

\* The larger value is used:

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max,i})^2}$$

0.39 Vol.-%

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96$$

0.77 Vol.-%

**Relative total expanded uncertainty**

Requirement of 2000/76/EC and 2001/80/EC

U in % of the range 25 Vol.-%

3.1

Requirement of EN 15267-3

U in % of the range 25 Vol.-%

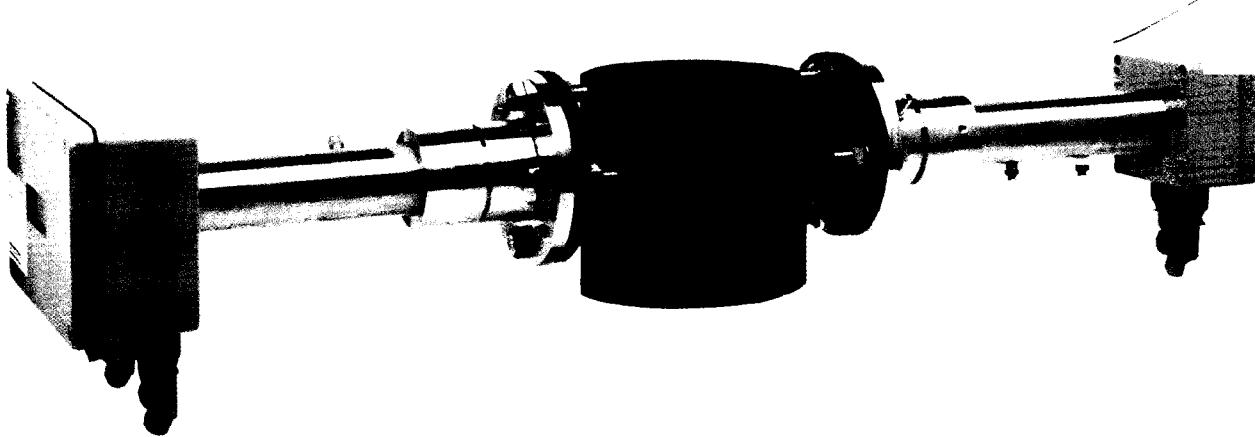
10.0 \*\*

7.5

\*\* For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.

A value of 10.0 % was used for this.

# LaserGas™ II SP



**NEO Monitors LaserGas™** is using Tuneable Laser Absorption Spectroscopy (TLAS) i.e a non-contact optical measurement method employing solid-state laser sources. The sensor remains unaffected by contaminants corrosives air does not require regular maintenance. The absence of extractive conditioning systems further improves availability of the measurements and eliminates errors related to sample handling. The monitor is mounted directly onto flanges, which include purge gas connections and a tilting mechanism for easy alignment. Continuous purge flow prevents dust and other contamination from settling on the optical windows. Once power and data lines are connected, measurements are performed in real-time.

| Features  | Applications  | Customer benefits   |
|---|---|---|
| <ul style="list-style-type: none"><li>• Response time down to 1 second</li><li>• No gas sampling: In-situ measurement</li><li>• No interference from background gases</li><li>• Applicable for many process conditions:<ul style="list-style-type: none"><li>- high/low temperature</li><li>- high dust</li><li>- corrosive gases</li></ul></li><li>• Line measurement, integral concentration over the full stack diameter</li><li>• ATEX and CSA certified</li><li>• TÜV, MCERTS, GOST approved technology</li><li>• Integrated span check option available</li><li>• Suitable for harsh environment</li><li>• No zero drift</li><li>• Stable calibration</li><li>• Long OPLs</li></ul> | <p>LaserGas™ II SP is designed for reliable and fast measurement of all kinds of gases in any environment, most typically:</p> <ul style="list-style-type: none"><li>• Chemical industry</li><li>• Petrochemical industry</li><li>• Metal industry</li><li>• Power plants</li><li>• Waste incinerators</li><li>• Cement industry</li><li>• Automotive industry</li><li>• Scrubber technology</li><li>• Glass industry</li><li>• PVC production</li><li>• Pulp and paper</li><li>• and more</li></ul> <p><i>Begyde<br/>...anade!</i></p> | <ul style="list-style-type: none"><li>• In-situ monitoring</li><li>• Highly reliable real time analyzer</li><li>• Low maintenance cost</li><li>• Reduce emission to the environment</li><li>• Easy to install and operate</li><li>• Reduce daily operation costs</li><li>• Optimize process</li><li>• Well proven measurement technique</li></ul> |

# LaserGas™ II SP

## Technical Data

|                                 |   |                                   |   |
|---------------------------------|---|-----------------------------------|---|
| <b>Specifications</b>           |   |                                   |   |
| Optical path length:            | Typically 0.5-20m   | Input transmitter unit:           | 18 – 36 VDC, max. 20W   |
| Response time:                  | 1 – 2 sec   | 4 – 20 mA output:                 | 500 Ohm max. isolated   |
| Accuracy:                       | Application dependent   | Relay output:                     | 1 A at 30 V DC/AC   |
| Repeatability:                  | 1% of range<br>(gas & application specific)                   |                                   |   |
| <b>Environmental conditions</b> |   |                                   |   |
| Operating temperature:          | -20 °C to +55 °C<br>(special version up to +65 °C on request) | <b>Installation and Operation</b> | Flange dimension alignment: DN50/PN10 or ANSI 2"/150lbs (other dimensions on request) |
| Storage temperature:            | -20 °C to +55 °C  | Alignment tolerances:             | Flanges parallel within 1.5°  |
| Protection classification:      | IP66  | Purge flow:                       | Dry and oil-free pressurised air or nitrogen<br>10 - 50 l/min (application dependent) |
| <b>Inputs / Outputs</b>         |   |                                   |   |
| Analog output (3):              | 4 – 20 mA current loop (concentration, transmission)          | <b>Maintenance</b>                | Recommended every 6 – 12 months   |
| Digital output:                 | TCP/IP, MODBUS, Optional fibre optic                          | Calibration:                      | Check recommended every 12 months   |
| Relay output (3):               | High gas, Maintenance Warning and Fault                       | Validation:                       | In-situ span check with optional internal cell (application dependent)                |
| Analog input (2):               | 4 – 20 mA process temperature and pressure reading            |                                   |   |
| <b>Ratings</b>                  |   |                                   |   |
| Input power supply unit:        | 100 – 240 VAC, 50/60 Hz, 0.36 – 0.26 A                        | <b>Safety</b>                     | Class 1 according to IEC 60825-1  |
| Output power supply unit:       | 24 VDC, 900 – 1000 mA   | CE:                               | Certified.  |
|                                 |   | EMC:                              | Conformant with directive 2014/30/EU  |
|                                 |   |                                   |   |

| Gas                  | Detection limit (ppm) | Max temp (°C) | Max pressure (bar abs) |
|----------------------|-----------------------|---------------|------------------------|
| NH <sub>3</sub>      | 0,15                  | 600           | 2                      |
| HCl                  | 0,05                  | 600           | 2                      |
| HF                   | 0,015                 | 400           | 2                      |
| H <sub>2</sub> S     | 3                     | 300           | 2                      |
| O <sub>2</sub>       | 100                   | 1500          | 20                     |
| % H <sub>2</sub> O   | 50                    | 1500          | 2*                     |
| ppm H <sub>2</sub> O | 0,1                   | 400           | 2                      |
| % CO                 | 30                    | 1500          | 2*                     |
| % CO <sub>2</sub>    | 30                    | 1200          | 2*                     |
| ppm CO               | 0,3                   | 1500          | 2                      |
| ppm CO <sub>2</sub>  | 0,2                   | 300           | 2                      |
| NO                   | 10                    | 300           | 2                      |
| N <sub>2</sub> O     | 1                     | 200           | 2                      |
| CH <sub>4</sub>      | 0,2                   | 1000          | 3                      |
| NO <sub>2</sub>      | 2                     | 200           | 1,5                    |
| HCN                  | 0,3                   | 300           | 2                      |

\* NEO Monitors reserve the right to change specifications without prior notice

**NOTE:** Detection limits are specified as the 95% confidence interval for 1m optical path and gas temperature / pressure = 25 °C / 1 bar abs. Measured in N<sub>2</sub>.

Other gases available on request.

Dual Gas: NH<sub>3</sub>+H<sub>2</sub>O, HCl+H<sub>2</sub>O, CO+CO<sub>2</sub>, CO+H<sub>2</sub>O, CO+CH<sub>4</sub>, O<sub>2</sub>+temp, CO+temp.

\*Higher pressure available on request for certain gases.

Please contact us for details.

TÜV and MCERTS, GOST approval available for some gases.

### Your local distributor:



**EO Monitors as** • A subsidiary of Norsk Elektro Optikk  
19 Skedsmokorset, Norway • Phone +47 67 97 47 00 • [www.neomonitors.com](http://www.neomonitors.com)

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000028732\_02

**Certified AMS:** LaserGas II for HCl and H<sub>2</sub>O

**Manufacturer:** NEO Monitors AS  
Solheimveien 62A  
1473 Lørenskog  
Norway

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

This is to certify that the AMS has been tested and certified  
according to the standards

EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2008)  
and EN 14181 (2004)

Certification is awarded in respect of the conditions stated in this certificate  
(This certificate contains 8 pages.)



Suitability Tested  
EN 15267  
QAL1 Certified  
Regular  
Surveillance  
  
[www.tuv.com](http://www.tuv.com)  
ID 0000028732

Publication in the German Federal Gazette  
(BAnz.) of 2 March 2012

This certificate will expire on:  
25 January 2021

German Federal Environment Agency  
Dessau, 21 January 2016

TÜV Rheinland Energie und Umwelt GmbH  
Cologne, 20 January 2016

i. A. Dr. Marcel Langner

  
ppa. Dr. Peter Wilbrii

[www.umwelt-tuv.de](http://www.umwelt-tuv.de) / [www.eco-tuv.com](http://www.eco-tuv.com)  
teu@umwelt-tuv.de  
+49 221 806-5200

TÜV Rheinland Energie  
Am Grauen Stein  
51105 Cologne

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.

**Certificate:**  
0000028732\_02/ 21 January 2016

 **TÜVRheinland®**  
Precisely Right.

**Test report:** 936/21212540/B of 09 September 2011  
**Initial certification:** 26 January 2011  
**Certification:** renewal (previous certificate 0000028732\_01 of  
16 March 2012 valid until 25 January 2016)  
**Expiry date:** 25 January 2021  
**Publication:** BAuz. 02. March 2012, No. 36, page 920, chapter

**Approved application**

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13. BImSchV), at waste incineration plants according to Directive 2010/75/EU, chapter IV (17. B<sup>+</sup> SchV) and other plants requiring official approval. The measured ranges have been selected considering the wide application range of the AMS.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and twelve months field test at a municipal waste incinerator.

The AMS is approved for an ambient temperature range of -20 °C to +50 °C.

The notification of suitability of the AMS, performance testing, and the uncertainty calculation have been effected on the basis of the regulations valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure that this AMS is suitable for monitoring the limit value relevant to the application.

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

**Basis of the certification**

This certification is based on:

- test report 936/21212540/B dated 09 September 2011 of  
TÜV Rheinland Energie und Umwelt GmbH
- suitability announced by the German Environmental Agency (UBA) as the relevant body
- the ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz. 02 March 2012, No. 36, p. 920 chapter I,  
number 4.6, Announcement by UBA from 23 February 2012:

**AMS name:**LaserGas II for HCl and H<sub>2</sub>O**Manufacturer:**

NEO Monitors AS, Lørenskog, Norway

**Field of application:**

For measurements at plants requiring official approval and plants according to 27 BlmSchV.

**Measuring ranges during the suitability test:**

| Component        | Certification range | Supplementary measurement ranges | Unit                |
|------------------|---------------------|----------------------------------|---------------------|
| HCl              | 0 - 15              | 0 - 90                           | mg/m <sup>3</sup> * |
| H <sub>2</sub> O | 0 - 40              | 0 - 30                           | Vol.-%*             |

\* at 1 m measurement path

**Software version:**

GM6.1d5

**Restrictions:**

None

**Notes:**

1. The measurement device includes an internal cell for the automatic span check of HCl.
2. The maintenance interval is six months.
3. The AMS has been tested at an active measurement path of 0.513 m in the laboratory test.
4. The AMS has been tested at an active measurement path of 1 m in the field test.
5. Supplementary test (maintenance interval extension) to the announcement of the Umweltbundesamt from 10 January 2011 (BAnz. p. 294, chapter I No. 3.2).

**Test report:**TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Report No.: 936/21212540/B dated 9 September 2011

**Certificate:**  
0000028732\_02/21 January 2016

Publication in the German Federal Gazette: BAuz AT 20.07.2012 B11, chapter IV, notification 7,  
Announcement by UBA from 06 July 2012:

**7 Notification as regards Federal Environmental Agency notice of 2 March 2012  
(BAuz. p. 920, chapter I, No. 4.6)**

The current software version for the LaserGas II measuring system for HCl and H<sub>2</sub>O manufactured by NEO Monitors AS is:

6.1f1

Statement of TÜV Rheinland Energie und Umwelt GmbH of 20 March 2012

Publication in the German Federal Gazette: BAuz AT 23.07.2013 B4, chapter V, notification 7,  
Announcement by UBA from 03 July 2013:

**7 Notification as regards Federal Environmental Agency notices of 23 February 2012  
(BAuz. p. 920, chapter I no. 4.6) and of 6 July 2012 (BAuz AT 20.07.2012 B11,  
chapter IV, 7th notification)**

The LaserGas II measuring system monitoring HCl and H<sub>2</sub>O manufactured by NEO Monitor AS may also be placed inside the explosion proof enclosure versions Ex-n or Ex-p.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 27 March 2013

Publication in the German Federal Gazette: BAuz AT 05.08.2014 B11, chapter IV, notification 10,  
Announcement by UBA from 17 July 2014:

**10 Notification as regards Federal Environmental Agency notices of 23 February 2012  
(BAuz. p. 920, chapter I, no. 4.6) and of 3 July 2013 (BAuz AT 23.07.2013 B4,  
chapter V, 7th notification)**

The software for the LaserGas II measuring system for monitoring H<sub>2</sub>O and HCl manufactured by NEO monitors AS, Lørenskog, Norway is now designated as GM 6.1f1-6.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 2 April 2014

Publication in the German Federal Gazette: BAuz AT 26.08.2015 B4, chapter V, notification 18,  
Announcement by UBA from 22 July 2015:

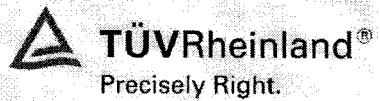
**18 Notification as regards Federal Environmental Agency notices of 23 February 2012  
(BAuz. p. 920, chapter I no. 4.6) and of 17 July 2014 (BAuz AT 05.08.2014 B11, chapter  
IV 10th notification)**

The LaserGas II measuring system for H<sub>2</sub>O and HCl manufactured by NEO Monitors AS can also be used with a detector of type G12181-020K by Hamamatsu.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 19 March 2015



Certificate:  
0000028732\_02/ 21 January 2016



### Certified product

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

The LaserGas II is an optical instrument based on transmitting infrared laser light from a transmitter unit of one side of the stack to a receiver unit on the diametrically opposite side of the stack. The measuring technique is based on measuring the absorption of light by the gas molecules present in the stack.

The measuring principle is called infrared single-line absorption spectroscopy and is based on the fact that most gases absorb light at certain wavelengths. The absorption is a direct function of the gas concentration in the stack.

The tested system LaserGas II comprises the following parts:

- Transmitter with purge gas device and evaluation system
- Receiver unit with purge gas device and internal reference cuvette
- Data cable of 5 m length for connecting the sender and receiver unit
- Voltage supply
- Heated measuring path (active measuring path length: 0.513 m)
- System software, Version GM6.1 f 1-6

### 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.

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 its expiration is also accessible on the internet: [qal1.de](http://qal1.de).

Certification of LaserGas II for HCl and H<sub>2</sub>O 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. 0000028732: 09 February 2011  
Validity of the certificate until: 25 January 2016  
Test report: 936/21212540/A of 06 October 2010,  
TÜV Rheinland Energie und Umwelt GmbH, Cologne,  
Publication: BAuz. 26 January 2011, no. 14, p. 295, chapter I no. 3.2,  
Announcement by UBA from 10 January 2011

**Supplementary testing according to EN 15267:**

Certificate No. 0000028732\_01: 16 March 2012  
Validity of certificate until: 25 January 2016  
Test report: 936/21212540/B of 09 September 2011,  
TÜV Rheinland Energie und Umwelt GmbH, Cologne,  
Publication: BAuz. 02 March 2012, no. 36, p. 920, chapter I, no. 4.6,  
Announcement by UBA from 23 February 2012

**Notifications according to EN 15267:**

Statement of TÜV Rheinland Energie und Umwelt GmbH, of 20 March 2012,  
Publication: BAuz AT 20.07.2012 B11, chapter IV notification 7,  
Announcement by UBA on 06 July 2012, (software changes)

Statement of TÜV Rheinland Energie und Umwelt GmbH, of 27 March 2013,  
Publication: BAuz AT 23.07.2013 B4, chapter V notification 7,  
Announcement by UBA on 03 July 2013, (explosion protection extension)

Statement of TÜV Rheinland Energie und Umwelt GmbH, of 2 April 2014,  
Publication: BAuz AT 05.08.2014 B11, chapter V notification 10,  
Announcement by UBA on 17 July 2014, (software changes)

Statement of TÜV Rheinland Energie und Umwelt GmbH, of 19 March 2015,  
Publication: BAuz AT 26.08.2015 B4, chapter V notification 18 (hardware option)  
Announcement by UBA on 22 July 2015

**Renewal of the certificate:**

Certificate No.: 0000028732\_02: 21 January 2016  
Validity of the certificate: 25 January 2021

**Calculation of overall uncertainty according to EN 14181 and EN 15267-3**

**Measuring system**

Manufacturer

Name of measuring system

Serial number of the candidates

Measuring principle

NEO Monitors

LaserGas II

4266 / 4267

Single-line spectroscopy

**Test report**

Test laboratory

Date of report

936/21212540/A

TÜV Rheinland

2010-10-06

936/21212540/B

TÜV Rheinland

2011-09-09

**Measured component**

Certification range

HCl

0 - 15 mg/m<sup>3</sup>

**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point

0.00 mg/m<sup>3</sup>

Sum of negative CS at zero point

0.00 mg/m<sup>3</sup>

Sum of positive CS at reference point

0.00 mg/m<sup>3</sup>

Sum of negative CS at reference point

0.00 mg/m<sup>3</sup>

Maximum sum of cross sensitivities

0.00 mg/m<sup>3</sup>

Uncertainty of cross sensitivity

0.000 mg/m<sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

Standard deviation from paired measurements under field conditions \*

|                        | <i>u</i>                 | <i>u</i> <sup>2</sup>                   |
|------------------------|--------------------------|---|
| <i>u<sub>D</sub></i>   | 0.242 mg/m <sup>3</sup>  | 0.059 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>lof</sub></i> | 0.081 mg/m <sup>3</sup>  | 0.007 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>d,z</sub></i> | 0.095 mg/m <sup>3</sup>  | 0.009 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>d,s</sub></i> | -0.147 mg/m <sup>3</sup> | 0.022 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>t</sub></i>   | 0.100 mg/m <sup>3</sup>  | 0.010 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>v</sub></i>   | 0.025 mg/m <sup>3</sup>  | 0.001 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>i</sub></i>   | 0.000 mg/m <sup>3</sup>  | 0.000 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>p</sub></i>   | 0.116 mg/m <sup>3</sup>  | 0.013 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>rm</sub></i>  | 0.121 mg/m <sup>3</sup>  | 0.015 (mg/m <sup>3</sup> ) <sup>2</sup> |
| <i>u<sub>mb</sub></i>  | -0.146 mg/m <sup>3</sup> | 0.021 (mg/m <sup>3</sup> ) <sup>2</sup> |

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (*u<sub>c</sub>*)

$$u_c = \sqrt{\sum (u_{max,j})^2}$$

0.39 mg/m<sup>3</sup>

Total expanded uncertainty

0.77 mg/m<sup>3</sup>

**Relative total expanded uncertainty**

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

*U* in % of the ELV 10 mg/m<sup>3</sup>

7.7

*U* in % of the ELV 10 mg/m<sup>3</sup>

40.0

*U* in % of the ELV 10 mg/m<sup>3</sup>

30.0



**Calculation of overall uncertainty according to EN 14181 and EN 15267-3**

**Measuring system**

Manufacturer

Name of measuring system

Serial number of the candidates

Measuring principle

NEO Monitors

LaserGas II

4266 / 4267

Single-line spectroscopy

**Test report**

Test laboratory

Date of report

936/21212540/A

936/21212540/B

TÜV Rheinland

TÜV Rheinland

2010-10-06

2011-09-09

**Measured component**

Certification range

H<sub>2</sub>O

0 - 40 Vol.-%

**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point

0.00 Vol.-%

Sum of negative CS at zero point

0.00 Vol.-%

Sum of positive CS at reference point

0.00 Vol.-%

Sum of negative CS at reference point

0.00 Vol.-%

Maximum sum of cross sensitivities

0.00 Vol.-%

Uncertainty of cross sensitivity

0.000 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

Standard deviation from paired measurements under field conditions \*

|                  | <b>u</b>      | <b>u<sup>2</sup></b>        |
|------------------|---------------|-----------------------------|
| u <sub>D</sub>   | 0.622 Vol.-%  | 0.387 (Vol.-%) <sup>2</sup> |
| u <sub>lof</sub> | -0.058 Vol.-% | 0.003 (Vol.-%) <sup>2</sup> |
| u <sub>d,z</sub> | 0.185 Vol.-%  | 0.034 (Vol.-%) <sup>2</sup> |
| u <sub>d,s</sub> | -0.323 Vol.-% | 0.104 (Vol.-%) <sup>2</sup> |
| u <sub>t</sub>   | 0.115 Vol.-%  | 0.013 (Vol.-%) <sup>2</sup> |
| u <sub>v</sub>   | 0.189 Vol.-%  | 0.036 (Vol.-%) <sup>2</sup> |
| u <sub>i</sub>   | 0.000 Vol.-%  | 0.000 (Vol.-%) <sup>2</sup> |
| u <sub>p</sub>   | 0.077 Vol.-%  | 0.006 (Vol.-%) <sup>2</sup> |
| u <sub>m</sub>   | 0.323 Vol.-%  | 0.105 (Vol.-%) <sup>2</sup> |
| u <sub>mb</sub>  | -0.182 Vol.-% | 0.033 (Vol.-%) <sup>2</sup> |

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.85 \text{ Vol.-%}$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.66 \text{ Vol.-%}$$

**Relative total expanded uncertainty**

U in % of the range 40 Vol.-% **4.2**

Requirement of 2000/76/EC and 2001/80/EC

U in % of the range 40 Vol.-% **10.0 \*\***

Requirement of EN 15267-3

U in % of the range 40 Vol.-% **7.5**

\*\* For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.

A level of 10% was applied.

Заличаването е на основание чл. 4 от Регламент (ЕС) 2016/679