

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Serinus 40 NOx Analyser

manufactured by:

ABB S.p.A.

Via L. Lama 33
20099 Sesto S. Giovanni (MI)
Italy

has been assessed by Sira Certification Service
and for the conditions stated on this certificate complies with:

**MCERTS Performance Standards for Continuous Ambient Air Quality
Monitoring Systems, Version 6, dated December 2008,**

Certification Ranges :

| | |
|-----------------|---------------|
| NO | 0 to 1000 ppb |
| NO ₂ | 0 to 260 ppb |

Project No: 16A22352
Certificate No: Sira MC100174/03
Initial Certification: 25 February 2010
This Certificate Issued: 15 May 2013
Renewal Date: 24 February 2015

R Cooper | Eng MInst MC

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service

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Registered Office: Rake Lane, Eccleston, Chester, UK CH4 9JN*

Approved Site Application

Any potential user should ensure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency Monitoring Technical Guidance Notes available at www.mcerts.net

All tests have been conducted in accordance with BS EN 14211. On the basis of these tests this certificate is valid when the instrument is used for urban air quality monitoring and similar applications.

The field trial was conducted on an urban background site for 3 months.

Basis of Certification

This certification is based on the following Test Report(s) and on Sira's assessment and ongoing surveillance of the product and the manufacturing process:

Sira Report 674/0362 dated 17th February 2010

Product Certified

The Serinus 40 NOx analyser measuring system consists of the following parts:

- Converter
- Ozone generator
- Sample valve manifold
- Reaction cell
- Photomultiplier tube

This certificate applies to all instruments fitted with software version 1.23.0000 (serial number 08-0762 onwards).

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: 0°C to +30°C

Note: If the instrument is supplied with an enclosure then the ambient temperature shall be monitored inside the enclosure to ensure that it stays within the above ambient temperature range.

| Test | Results expressed as % of measured value | | | | Other results | MCERTS specification Note: nmol/mol = ppb |
|--|--|------|----|----|-----------------|--|
| | <0.5 | <1 | <2 | <5 | | |
| Repeatability at zero | | | | | 0.150 nmol/mol | <1 nmol/mol |
| Repeatability at hourly limit value | | | | | 0.385 nmol/mol | <3 nmol/mol |
| Residual lack of fit at zero | | | | | -0.562 nmol/mol | <5 nmol/mol |
| Lack of fit (largest residual from the linear regression line) | | 1.18 | | | | <4% |
| Sensitivity coefficient to sample gas pressure | | | | | 1.354 nmol/mol | <8 nmol/mol/kPa |
| Sensitivity coefficient to sample gas temperature | | | | | 0.077 nmol/mol | <3 nmol/mol/K |
| Sensitivity coefficient to surrounding air temperature | | | | | 1.709 nmol/mol | <3 nmol/mol/K |
| Sensitivity coefficient to electrical supply voltage | | | | | 0.002 nmol/mol | <0.3 nmol/mol/V |
| Convertor efficiency | | | | | 98.67% | >98% |
| Interference by H ₂ O (at concentration of 19 nmol/mol) | | | | | 2.827 nmol/mol | <5 nmol/mol |
| Interference by NH ₃ (concentration of 200 nmol/mol) | | | | | -3.995 nmol/mol | <5 nmol/mol |
| Interference by CO ₂ (at concentration of 500 µmol/mol) | | | | | -3.017 nmol/mol | <5 nmol/mol |
| Interference by O ₃ (at concentration of 200 nmol/mol) | | | | | Not tested | <2 nmol/mol |

| Test | Results expressed as % of measured value | Other results | MCERTS specification |
|------|--|---------------|----------------------|
|------|--|---------------|----------------------|

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| | <0.5 | <1 | <2 | <5 | | Note: nmol/mol = ppb |
|--|------|----|----|--------------|-----------------|---------------------------------------|
| Averaging effect NO NO ₂ | | | | 2.78 4.12 | | <7% |
| Short term zero drift (over 12h) | | | | | -0.228 nmol/mol | <2 nmol/mol |
| Short term span drift (over 12h) | | | | | -2.161 nmol/mol | <6 nmol/mol |
| Response time (rise) NO NO ₂ | | | | | 33.0s 46.7s | 180 s |
| Response time (fall) NO NO ₂ | | | | | 35.7s 44.0s | 180 s |
| Difference between rise and fall time NO NO ₂ | | | | | 2.8s 3.4s | <10s |
| Reproducibility under field conditions | | | | 4.26 | | <5% averaged over three month period |
| Long term zero drift | | | | | 0.122 nmol/mol | <5 nmol/mol |
| Long term span drift | | | | 3.65 | | <5% of the max of certification range |
| Period of unattended operation | | | | | 22 days | 3 months not less than 2 weeks |
| Availability (data capture) | | | | | 92.62% | >90% |
| Total expanded uncertainty | | | | | 14.74% | <15% |

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Description:

The measurement of nitric oxide (NO) and nitrogen dioxide (NO₂) is based on classical chemiluminescence; when NO and excess ozone mix, they react emitting light in a broad frequency band with a peak at about 1200 nm. The intensity of the light emitted is linearly proportional to the nitric oxide concentration and is measured by a photomultiplier tube.

Ambient air is drawn into the analyser and is split into two. One channel is drawn directly into the sample valve manifold for measurement of NO gas, whilst the other channel, for measuring NO_x, is drawn through a heated molybdenum converter where NO₂ is converted to NO. Beyond the sample valve manifold the NO molecules (from either channel) are drawn into the reaction cell where they then react with ozone.

Ozone is internally generated with dried air drawn from the "BGnd Air" port. The reaction with ozone in the cell emits light which is detected by a photomultiplier tube housed in a sealed thermo-electrically cooled assembly. After the reaction, sample is exhausted out of the cell and the analyzer through the "Exhaust" port.

The analyzer software automatically corrects for gas temperature and pressure changes and is referenced to 0°C, 20°C or 25°C at 1 atmosphere. The analyser can store 8 years of one minute data of up to twelve analyser parameters.

General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. 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 system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of Sira Certificates'. The design of the product certified is defined in the Sira Design Schedule for certificate No. Sira MC100167/02
2. If certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.
3. The Certification Marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of Sira Certificates'.
4. This document remains the property of Sira and shall be returned when requested by the company.

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