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| **Issued By: AnneMarie McCartan** | **Approved By: Martin Fitzpatrick** |

1. **Purpose**

To ensure optimum NO/NO2/Nox data quality and capture by establishing a standard operating procedure for operating, calibrating and downloading data to comply with Council Directive 1999/30/EC.

1. **Scope**

All existing and future API M200A NO/NO2/NOx chemiluminescent Analysers located in Multipollutant sites under the control of the Air Quality Monitoring Unit.

1. **Responsibility**

# PEHO or designate

1. **Records/Related Documents**

EU Directive 1999/30/EC related to limit values for SO2, NO2 and oxides of nitrogen, particulate and lead in ambient air.

API NO/NO2/NOx Chemiluminescent Analyser M200A Instruction Manual

Appendix V: Guidance document for downloading data using Enview software.

Appendix I:Gas Cylinder Listings & Advisory Sheet

Multi-pollutant Site Visit Record.

NOx/NO/NO2 Internal Calibration Record

Equipment Maintenance & Repair Log

External Calibration & Maintenance records

Electronic Records (L:\Air Monitoring with relevant folders for all raw data).

Log of Civic Site/Coleraine St Downloads

Appendix III: Editing Nox/SO2/CO data

1. **Procedure**

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## No. Activity

1. **Introduction**

Nitrogen Dioxide (NO2) is one of a number of important oxides of nitrogen present in the atmosphere. Nitric Oxide (NO) and Nitrogen Dioxide (NO2) (together termed NOx) are the most abundant man-made oxides of nitrogen in urban areas; these are formed in all high temperature combustion processes although nitric oxide predominates. Nitric Oxide is not generally considered to be harmful to health at concentrations found in the ambient atmosphere.

Nitrogen Dioxide is formed by the oxidisation of nitric oxide by ozone and oxygen, and is the particular oxide of nitrogen that is considered to be a major pollutant.

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The production of meaningful data from the multipollutant site necessitates the calibration of the M200A NO/NO2/NOx chemiluminescent analyser using traceable standards.

1. **Equipment**

### M200A NO/NO2/NOx Chemiluminescent Analyser

### Code activated switch (if applicable)

Data Logger (if applicable)

Modem

Calibration Gases (Ref. S.3.1)

**2.1) Equipment Checks**

The officer carries out checks to ensure that all equipment is working correctly or takes corrective action should some equipment be found to be inoperable or faulty. If equipment is found to be inoperable or faulty, record on the Multi-Pollutant Site Visit Record and inform the officer with responsibility for that equipment.

* + 1. **API 200A NO/NO2/Nox analyser**

The API M200A N0xAnalyser has a 2 –line alphanumeric display and three status LED display lights on the front panel. The display is divided into four fields, Mode Field, Key Definition, Message and Concentration.

* If the FAULT light is flashing, two additional buttons will be identified in the Key Definition area of the display, namely MSG (Message) and CLR (Clear). Press the Message button and record the message given in the message area of the screen on the Internal calibration record sheet or on the multi-pollutant site visit record, then press the Clear button. Some warning messages indicate that the instrument output may drift. All test parameters should fall within the limits specified on the Internal calibration test sheet. If they do not, record on the multi-pollutant site visit record, consult with the operating manual and PEHO or contact the relevant service contractor to arrange a site visit.
* If the red FAULT light is off and a message display is visible, a fault has occurred, but has been automatically rectified. Record the message in the internal calibration record sheet and press Clear.

**NOTE: ALL FAULTS REQUIRING CONTACT WITH THE EQUIPMENT PROVIDERS MUST BE RECORDED ON THE EQUIPMENT MAINTENANCE & REPAIR LOG**

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* + 1. **Calibration Gas Bottles**

The officer must ensure that all calibration gases that are brought in from suppliers comply with the requirements as defined by the instrument. (See API manual).

All litre bottles should be turned on as required during the calibration with their regulators set to 30 psi.

Refer to Cylinder Listing & Advisory Sheet for guidance with respect to cylinder management contained Appendix I of in the Standard Operating Procedures Manual.

1. **Calibration**

**3.1 Frequency**

The officer ensures that the analyser is calibrated at the frequency scheduled below.

To ensure optimum data quality and capture, a two-tier system of calibration and analyser test procedures will be employed. The major components of this system are briefly described below:

**a) Monthly manual calibrations**

These will be performed by the officer every month, except during months when an external calibration is carried out (see below). Instrument drifts will be fully quantified by calibrating analysers monthly with documented and traceable calibration standards. Ref. 3.3. If there is a drift of >15% from the last calibration, repeat calibration until reading comes back to within 15%. The percentage drift from the previous months calibration should be recorded on the Internal Calibration Record.

**b)** **Six Monthly calibrations**

These exercises, performed by external service contractors in conjunction with instrument servicing, will ensure that measurements from any station are completely representative and intercomparable. The calibration will also act as an independent audit of the system performance at each monitoring site. In this way, any site-specific problems that may have developed and remained undetected, will then be fully quantified.

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* 1. **Filter Changing**

The analyser sample inlet filters, which are situated behind the instrument front panel, require changing on a fortnightly basis approximately. Filter changing must be noted on the Internal Calibration record sheet. If calibration is not being undertaken at time of filter change, record on the Multi-pollutant site visit record. Refer to any API manual, section 8.2 for details on folding down the front panel and changing the analyser filter.

**Use Gelman Laboratory Zylon 37mm 5 μm PTFE Filters (P/N P4PH037)**

# **3.3 Calibration Procedure**

**Note: During calibration procedures “Stability” is defined as a variation of less than 0.1 ppb over a one minute period.**

* + 1. Internal operational parameters (these are detailed on the Internal Calibration record sheet) can be accessed by pressing the TEST button. Access this information and record the result displayed on the Internal Calibration record sheet. When all parameters on the checklist have been noted, press the TEST button once more. The current time will be displayed on the instrument display.

**Zero Calibration Check**

* + 1. Attach the sample line to the zero air.

3.3.1. Press “CAL” button. The M200A enters calibrate mode from sample mode. If you are asked for a password at this point enter 101.

3.3.2. This will allow the zero gas through the sample port. Set to a pressure of 30 PSI output. The instrument stability is used to indicate the stability of measurement of the analyser. The instruments stability must reach 0.1 ppb before the zero calibration check is complete.

* + 1. Take note of the last three Nox/NO readings on the Internal Calibration record allowing one minute between each reading.
    2. Press EXIT to return to the CAL menu.
    3. Turn off ZERO gas.

**Span Calibration Check**

* + 1. Attach the sample line to the calibration gas cylinder.

3.3.8. Press “CAL” button. If asked for a password at this point enter 101. The M200A enters calibrate mode from sample mode.

3.3.9. Allow the SPAN gas through the sample port. Set to a pressure of 30 PSI output. The instruments stability must reach 0.1 ppb before the span calibration check is complete.

3.3.10. Take note of the last three Nox/NO readings on the Internal Calibration record allowing one minute between each reading.

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3.3.12. Press EXIT to return to the CAL menu.

* + 1. Turn off SPAN gas.
    2. Switch the M200A from CAL MODE (out of service) to sample mode.
    3. Record the cylinder pressures of both the span gas cylinder and the zero air cylinder on the Internal Calibration record after each calibration.
    4. Ensure that all calibration data has been entered on the Internal Calibration record and sign and date record.

1. **Entering Expected Span Gas Concentrations Procedure (only applies when new calibration gas cylinder is used)**
   1. Press CAL-CONC. This key sequence causes the M200A to prompt for the expected Nox/NO concentration. Enter the Nox/NO span concentration value by pressing the key under each digit until the expected value is set. The concentrations are stated on the calibration certificate attached to the cylinder by the supplier.
   2. Press ENTR. This stores the Nox/NO span values.
   3. Press EXIT. This returns instrument to SAMPLE mode.
2. **Data Management/Validation**

The minimum data capture required is 90%, this does not include losses of data due to the regular calibration or the normal maintenance of the instrumentation.

The officer ensures that data is downloaded on a weekly basis using the Enview software and stored in the relevant sub-directory located in **L:\air monitoring.** Record downloaded filename on the Log of Civic Site/Coleraine St Download record.

(Refer to Guidance document for downloading data using Enview software contained in Appendix V of the Standard Operating Procedures Manual).

Each month’s raw data is validated by using the figures generated during internal and external calibrations. Validation is undertaken by editing the data using results generated during the Zero and Span calibration checks described in S3.3.

To ensure the accuracy and quality of the captured data the **Slope and Offset parameters** should be checked through the front panel, as it is important that they fall within certain limits with respect to themselves and to each other. The SLOPE value for Nox should be 1.0+/-.3. The SLOPE for NO should also be within this range. The NO and Nox slopes should be equal within +/-.1.

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If these values are not within this range record on the Multi-pollutant site visit record, consult with the PEHO and/or contact the relevant service contractor to arrange a site visit.

Test parameters post calibration check must be compared with the pre-calibration test parameters.

The validity of data must be assessed when a fault occurs which results in the analyser operating outside of its specifications (see s.2.1.2). The final decision regarding the validity and release of data lies with the PEHO.

A detailed editing and final reporting procedure is described in Appendix III: Editing Nox/SO2/CO data as generated by API M200A, M100A and M300 analysers.