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<p>DLI-QD-240 Measurement of ozone in the DLI Air Quality Monitoring Network</p>			<p>Page #: 1 of 6</p>

Prepared by: _____ Date: _____


Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

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Purpose

To describe the performance of measurements of ozone in the national air quality monitoring network of Cyprus.

Such measurements are performed e.g. for checking compliance with European Union target/treshold values for ozone:

- a target of 120 $\mu\text{g.m}^{-3}$ with a reference period of 8 hours
- an information treshold of 180 $\mu\text{g.m}^{-3}$ with a reference period of 1 hour
- an alert treshold of 240 $\mu\text{g.m}^{-3}$ with a reference period of 1 hour
- an AOT40 (for a definition see EU Directive 2002/03/EC & 2008/50/EC) of 18000 $\mu\text{g.m}^{-3}\text{h}$ with a reference period of 5 year for the protection of vegetation.

The procedures described are in conformity with the relevant clauses of EN 14625.

Principle


Ozone is measured continuously by UV photometry.

The concentrations of ozone are measured in units of ppb_v. For reporting these are converted to units of $\mu\text{g.m}^{-3}$ at standard temperature and pressure (20 °C, 101,325 kPa) using standard conversion factors.

The measurement range is 0-500 $\mu\text{g.m}^{-3}$.

Measurement results are fully traceable to internationally accepted standards. The expanded measurement uncertainties for, referred to the reference periods of the EU air quality target values, have been calculated in conformity with EN 14625 to be:

- 15 % for a one-hour period
- 15 % for an 8-hour period, both at the 95% confidence level.

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Staff involved

This SOP is intended for the staff of DLI and of the contracted maintenance company who perform (part of) the activities described.

Equipment

- Ozone monitor (Ecotech EC9810)
- Central sampling line
- Dynamic dilution system (Sabio 4010)
- Calibration gas mixture, NO in nitrogen certified every 6 months against a primary reference gas standard (Certification Body) (see DLI-SOP-102)
- Primary UV Photometer (MCZ UVB)
- Ozone transfer standard, TE 49iPS (Thermo Electron), certified every year against the primary UV photometer (see DLI-SOP-245)
- Calibrated flow meters, ranges 5-500 mL/min and 0.5-50 L/min (BIOS)
- Station data processor (Ecotech).

Housing

For field monitoring, monitors, dilution systems and reference gases are housed in special caravans, equipped with air conditioning units. For a description of the caravans see DLI-QD-101.

The primary UV Photometer and reference dilutor are kept in the Central Calibration Laboratory.

Acceptance and installation of equipment

The monitors purchased fulfill the minimum requirements given in EN 14625. After receipt, they undergo a brief performance test (see DLI-QD-102). The acceptance test includes a full calibration and linearity test.


After acceptance, the monitors are installed in the monitoring caravan in accordance with the manufacturers instructions and put into operation (see DLI-QD-102).

Procedure

General

The ozone monitor produces 1-minute average measurement results. These results are acquired by the station data processor and digitally transmitted to the central acquisition system.

In addition, monitor status parameters listed below are acquired and transmitted.

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Default ranges are indicated.

List of status parameters

In case of anomalies, the data are automatically flagged.

After each full hour of measuring, all non-flagged xx-minute results are averaged to hourly values and transmitted to the DLI internet website.

Data validation

Centrally acquired data are checked for anomalies using DLI-SOP-016. Validated data are transmitted to a database on a daily basis for further reporting (see DLI-SOP-017).

Calibration of monitors

Monitors are fully calibrated and tested for linearity

- Upon receipt (new)
- Every 3 months
- After corrective maintenance.

The calibrations upon receipt and after corrective maintenance are performed in the DLI Central Laboratory; the 3-monthly calibration is performed at the station.

For this purpose, calibration gas mixtures are produced from certified concentrated calibration gas mixture at various levels (see DLI-F-QD-210.1), using the dynamic dilutor. A calibration function and residuals are calculated in accordance with Annex B of EN 14625. The calibration function is used to calculate the ozone response factor to be used for further calculations.

The full procedure for the performance of the calibration and linearity tests is given in DLI-SOP-241.


Calculation of results

Monitor results are expressed in units of ppb_v. For reporting, these are converted into units of µg.m⁻³ at standard temperature and pressure (20 °C, 101,325 kPa) as follows:

$$\text{Ozone } (\mu\text{g.m}^{-3}, \text{STP}) = \text{ozone (ppb}_v) \cdot 2,00.$$

Reporting

Reporting is described in DLI-SOP-017 <Data Reporting>.

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Quality control

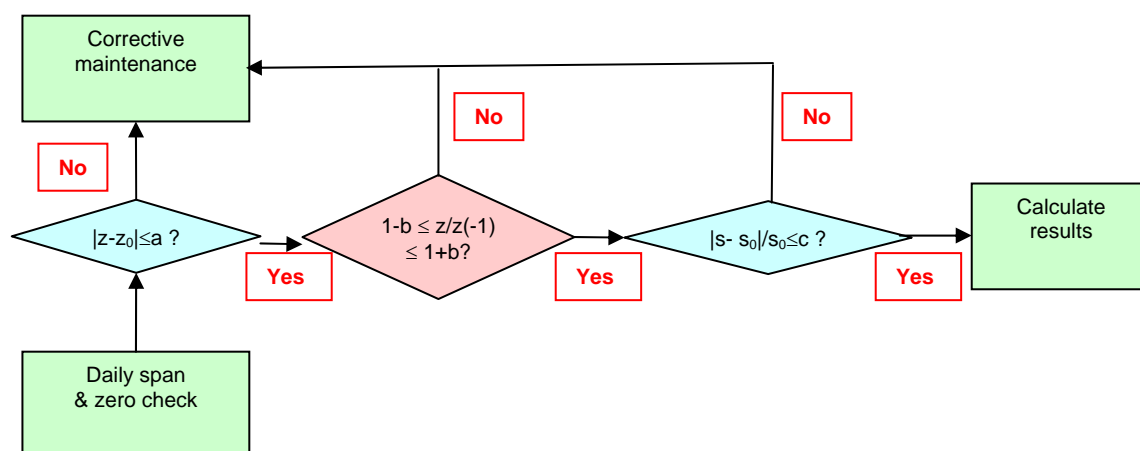
Zero and span checks

Zero and span checks are performed automatically every 24 hours by the dynamic dilution system using the GPT unit of the dilutor.

The decision scheme associated with the results of the checks is given below.


Values for a, b and c are:

- $a = 5 \text{ ppb}_v$
- $b = 0,025$
- $c = 0,05$



z_0 = zero directly after installation
 z = measured zero
 s_0 = span directly after installation
 s = measured span

$z(-1)$ = previous zero
 r = response factor
 $r(-1)$ = previous response factor

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Calibration and linearity tests

Calibrations and linearity tests are performed by comparison with the certified transfer standard (see DLI-SOP-241).

Maintenance

Preventive maintenance

Information about the maintenance schedule and the performance of the maintenance can be found in DLI-QD-103, DLI-SOP-101, DLI-SOP-106 and DLI-SOP-243.

Corrective maintenance

See DLI-SOP-244.

Relevant documentation

DLI-QD-101; DLI-QD-102; DLI-SOP-101; DLI-SOP-102; DLI-SOP-104; DLI-SOP-016; DLI-SOP-017; DLI-SOP-241, DLI-SOP-243, 244 & 245.

Reference Procedures

Ecotech EC9810 manual
Sabio 4010 manual

References

CYS-EN 14625: 2005. Ambient Air Quality – Measurement method for the determination of the concentration of ozone by UV photometry.

Revision History

Revision 0