

AQUILA : *Network of Air Quality Reference Laboratories*



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- Background (legislation, role of NRL's)
- AQUILA objectives in relation to “Zero Gases”
- What are the needs?

General background

Role and tasks of National Reference Laboratories

- *Verifying and supporting the correct implementation of AQDs, by:*
- Implementing a quality system in the laboratory
 - Approving measurement systems (instruments, laboratories, networks)
 - Ensuring the traceability of the measurements at national level, by providing/certifying reference materials to networks
 - Organizing intercomparisons/round robin tests at national level
 - Participating in EC QA/QC programmes
 - Exchanging information through the organisation of training sessions, workshops, conferences and guidance documents
- ⇒ AQUILA is a formally-constituted network open to all of the NRL's across Europe
- ⇒ **“AQUILA's role and the tasks of a NRL”** has been approved by DG ENV's "Air Quality Committee" in 2009 (*)

(*) <http://ec.europa.eu/environment/air/quality/legislation/assessment.htm>

AQUILA: objectives related to “zero gases”

➤ to promote the harmonisation / comparability / accuracy of air-quality measurements required by these Directives across Europe, to facilitate scientific & technical improvements, and to exchange expertise

These objectives are achieved by:

↪ emitting scientific & technical advice on issues related to measurements and their strategy of implementation,

↪ participating in european standardisation activities, providing technical advice to these, and collating practical experiences on current standards,

↪ coordinating (*where needed*) work on QA/QC activities, method development, and **providing steer on method validation**

↪ providing a forum for the **exchange of scientific & technical information**, and **good measurement practices**,

↪ developing (*where necessary*) and providing steer on, common research projects, pilot studies etc...

AQUILA possible inputs on “Zero Gases”

- review & comments on EN ambient-air standards (implementation of current texts & influence on forthcoming ones – revision / creation)
 - Focal point for gathering feedback directly from the users in different countries (gas suppliers, gas monitors, conditions of use...):
 - ↳ how to improve validity & comparability of results,
 - ↳ Interface between end-user and manufacturers.
 - Promotion of use of accurate nationally traceable calibration standards & CRM's (i.e. intercomparison exercises)
- ⇒ Growing needs for accurate “calibration tools” and for “validated new devices” in line with needs (quality level? overall uncertainty for the measurement chain? Affordable costs?...)

What are the (*stated / implied*) needs?

➤ from the end-users' perspective:

1) 2 levels of specification for purity of zero gas

• for interferences testing

• for other tests (i.e. field)

Concentration for interferences testing

Concentration for other tests

Impurity	for SO ₂	for NO/NO ₂	for O ₃	for CO
CO ₂		≤ 4 ppm		≤ 4 ppm
O ₃		≤ 2,0 ppb	≤ 1 ppb	
H ₂ S	≤ 0,1 ppm			
NH ₃	≤ 2,0 ppb	≤ 1,0 ppb		
NO	≤ 1,0 ppb	≤ 1,0 ppb		≤ 1 ppb
NO ₂	≤ 1,0 ppb	≤ 1,0 ppb		
N ₂ O				≤ 0,5 ppb
m-xylene	≤ 1,0 ppb		≤ 1 ppb (xylenes)	
Toluene			≤ 1 ppb	
H ₂ O vapour	≤ 150 ppm	≤ 150 ppm	≤ 150 ppm	≤ 150 ppm
SO ₂	≤ 1,0 ppb			
CO				≤ 0,1 ppm

Impurity	for SO ₂	for NO/NO ₂	for O ₃	for CO
CO ₂		≤ 400 ppm		≤ 400 ppm
O ₃		≤ 2,0 ppb	≤ 1 ppb	
H ₂ S	≤ 0,1 ppm			
NH ₃	≤ 10 ppb	≤ 10 ppb		
NO	≤ 1,0 ppb	≤ 1,0 ppb		≤ 1 ppb
NO ₂	≤ 1,0 ppb	≤ 1,0 ppb		
N ₂ O				≤ 0,5 ppb
m-xylene	≤ 1,0 ppb		≤ 1 ppb (xylenes)	
Toluene			≤ 1 ppb	
H ₂ O vapour	≤ 150 ppm	≤ 150 ppm		≤ 150 ppm
SO ₂	≤ 1,0 ppb			
CO				≤ 0,1 ppm

Questions: technically feasible? At what cost? Under which packaging? And C₆H₆ (14662-3)?...

What are the (*stated / implied*) needs?

➤ from the end-users' perspective:

2) Comparability with technical specifications of manufacturers (gas / ZG generators)?

• cylinder

• ZA generator

specifications (air cylinder)
CO ₂ < 100 ppb
CO < 100 ppb
total C _n H _m < 50 ppb
SO ₂ < 10 ppb
H ₂ O < 500 ppb
NO _x < 10 ppb
O ₂ = 20,9 M%
N ₂ = 79,1 M%

specifications (N ₂ cylinder)
CO ₂ < 100 ppb
CO < 100 ppb
total C _n H _m < 100 ppb
O ₂ < 100 ppb
H ₂ O < 500 ppb
H ₂ < 100 ppb

output concentrations (maximum)
SO ₂ < 0,5 ppb
NO < 0,5 ppb
NO ₂ < 0,5 ppb
O ₃ < 0,5 ppb
CO < 0,025 ppm
Hydrocarbons < 0,02 ppm

output concentrations (maximum)
SO ₂ < 0,025 ppb
NO < 0,025 ppb
NO ₂ < 0,025 ppb
O ₃ < 0,3 ppb
CO < 10 ppb
Hydrocarbons < 0,25 ppb

• Question: and N₂ generators?

What are the (*stated / implied*) needs?

➤ from the end-users' perspective:

3) Adequation between Zero Gas specifications / capabilities of manufacturers / Detection limits of Ambient Air gas monitors?

Cf. check of gas stability in EN standards

Pollutant	Detection Limit (*)	
	Brand 1	Brand 2
SO₂	0,33 ppb	0,07 ppb
NO	2,12 ppb	0,69 ppb
O₃	1,32 ppb	0,33 ppb
CO	0,66 ppm	0,16 ppm

(*): values from type-approval reports, worst case scenario

What are the (*stated / implied*) needs?

- ↪ need for a common language between users and manufacturers
- common definition for
 - “Zero Gas” (*Zero Gas Purity ?*),
 - “Detection Limit / Lower Detectable Limit” (*importance of analytical principle ?*)
 - ...
- ↪ requirement for traceability at every level in the calibration chain (weight of uncertainty at zero, with lower & lower levels)
- ↪ Don't forget pragmatism & ease of implementation for measurement technique defined as reference method in AQD

Accurate traceable calibration standards (zero & span) are “*an absolute prerequisite*” for fulfilling requirements of EU Directives (and associated EN reference methods),

Summary

- Requirements of AQ Directives and related EN standards will impact more heavily on the Member States in the future (in current scope – outdoor, emissions – and certainly more in the near future – indoor)
- measurement of trace & ultratrace species (existing / new) will probably be a major challenge for the future in AQ assessment (outdoor / indoor)

This will increase the importance of expertise (such as AQUILA's) and of research projects (such as MACPoll) and place more demands on them to provide technical & scientific support across EU and associated countries, in collaboration with manufacturers (gas & monitors).

Thank you for your attention !