

DIN EN 16909:2017-06 (E)

Ambient air - Measurement of elemental carbon (EC) and organic carbon (OC) collected on filters

Contents		Page
European foreword		5
Introduction		6
1	Scope	7
2	Normative references	7
3	Terms, definitions and abbreviations	7
3.1	Terms and definitions	7
3.2	Abbreviations and acronyms	8
4	Principle	9
5	Materials and instruments	9
5.1	Materials	9
5.1.1	Gases	9
5.1.2	Standard solution	9
5.1.3	Other materials	9
5.2	Instruments	9
5.2.1	Sampling instruments	9
5.2.2	Analytical instruments	9
6	Sampling	10
6.1	Filter material	10
6.2	Preheating of filter material and handling	10
6.3	Sampling duration and frequency	10
6.4	Field sampling and type of sampler	11
6.5	Site types	11
6.6	Filter environment during sampling	11
7	Transport and storage	11
7.1	Handling	11
7.2	Time and temperature limits	11
8	Analysis	11
8.1	General	11
8.2	Thermal protocol	12
9	Artefacts and interferences	13
9.1	General	13
9.2	Sampling	13
9.3	Transport and storage	13
9.4	Analysis	14
10	Quality assurance/quality control (QA/QC)	14
10.1	QA/QC for sampling parameters	14
10.2	Field blank determination	14
10.3	Laboratory blank determination	15
10.4	Calibration for TC	15
10.5	Long term stability and repeatability	15

10.6	Other-QA/QC checks	15
10.6.1	Use of quality control filters	15
10.6.2	Calibration gas injections	16
10.6.3	Calibration and checks on temperature sensors and optical systems	16
10.6.4	Stability of the laser signal	16
10.7	Applicable concentration range	16
11	Calculation of concentrations of EC and OC	17
12	Data recording	17
13	Determination of measurement uncertainty	18
Annex A (informative) Example of a logbook information		21
Annex B (informative) An example of a standard operating procedure for analysing EC and OC		22
B.1	General	22
B.2	Start-up	22
B.3	Cleaning the system	23
B.4	Running the instrument blank	23
B.5	Running an external calibration standard	23
B.6	Running an external long term calibration standard	24
B.7	Running a EC/OC control sample and routine samples	26
B.8	Shutdown of instrument	26
Annex C (informative) Methods for the assessment of carbonate carbon		28
Annex D (informative) Preparation of stock sucrose solutions and calibration standards		30
Annex E (informative) Example for the determination of measurement uncertainty		31
Annex F (informative) Statistical analysis of Organic Carbon (OC), Elemental Carbon (EC) and Total Carbon (TC) concentrations collected on filters from field validation exercise		34
F.1	General	34
F.2	Analysis methodology	34
F.2.1	General	34
F.2.2	Calculating between- and within-laboratory variability	35
F.2.2.1	Notation	35
F.2.2.2	Data processing	35
F.2.2.3	Outlier rejection	35
F.2.2.4	Data normalization	36
F.2.2.5	Analysis of variance	37
F.2.2.6	Calculation of standard deviations	37
F.2.3	Calculating between-sampler variability	38
F.2.3.1	Notation	38
F.2.3.2	Data processing	38
F.2.4	Combined standard uncertainty	39
F.3	Remarks	39
F.4	Results	39
F.4.1	Data set 1 - Between laboratory and internal laboratory variability	39
F.4.2	Data set 2 - Between sampler variability	41
F.4.3	Data set 3a - Site specific ranking	42
F.4.4	Data set 3B - Uncertainty over the measured concentration range	47
Annex G (informative) Good example for an instrument blank laser signal for EUSAAR2		54
Figure G.1 -- Good example for an instrument blank laser signal for EUSAAR2 including $\pm 3\%$ uncertainty limits		54
Bibliography		55