DIN EN 15267-4:2017-05 (E)

Air quality - Certification of automated m easuring systems - Part 4: Performance criteria and test procedures for automated measuring systems for periodic measurements of emissions from stationary sources

Contents

Page

European foreword 5

0 Introduction 6
0.1 General 6
0.2 Legal drivers 6
0.3 Periodic measurements 6
0.4 Relationship to EN 14181 6
0.5 Processes 7
0.6 Performance characteristics 7
0.7 Relationship to EN 15267-3 8

1 Scope 9

2 Normative references 9

3 Terms and definitions 9

4 Symbols and abbreviations 15
4.1 Symbols 15
4.2 Abbreviations 17

5 General requirements 17
5.1 Application of performance criteria 17
5.2 Ranges to be tested 17
5.2.1 Certification range 17
5.2.2 Supplementary ranges 18
5.2.3 Lower limit of ranges 18
5.2.4 Expression of performance criteria with respect to ranges 18
5.2.5 Ranges of optical insitu P-AMS with variable optical length 18
5.3 Performance testing of P-AMS based on certified AMS previously tested according to EN 15267-3 18
5.4 Equivalence with the SRM 18
5.5 Manufacturing consistency and changes to P-AMS design 19
5.6 Qualifications of test laboratories 19

6 Performance criteria common to all P-AMS for laboratory testing 19
6.1 P-AMS for testing 19
6.2 CE labelling 19
6.3 Output ranges and zero-point 19
6.4 Display of operational status signals 20
6.5 Degrees of protection provided by enclosures 20
6.6 Response time 20
6.7 Repeatability standard deviation at zero point 20
6.8 Repeatability standard deviation at span point 20
6.9 Lack of fit 20
6.10 Short-term zero and span drift 20
6.11 Set-up time after transport and influence of ambient temperature 20
6.12 Influence of voltage variations 21
6.13 Influence of vibration 21

6.14 Influence of sample gas flow for extractive P-AMS 21
6.15 Influence of sample gas pressure 21
6.16 Cross-sensitivity 21
6.17 Converter efficiency for P-AMS measuring NOx 21
6.18 Response factors for TOC measuring P-AMS 21
6.19 Influences on P-AMS with in-stack sampling chamber 22
6.20 Influences related to storage and transportation 22

7 Performance criteria common to all P-AMS for field testing 22
7.1 Response time 22
7.2 Short-term zero and span drift 23
7.3 Reproducibility 23

8 Performance criteria specific to measured components 23
8.1 General 23
8.2 Gas monitoring P-AMS 23
8.2.1 Performance criteria 23
8.2.2 P-AMS for total organic carbon 25
8.3 Particulate matter monitoring P-AMS 26

9 General test requirements 27

10 Test procedures for laboratory tests 28
10.1 P-AMS for testing 28
10.2 CE labelling 28
10.3 Output ranges and zero point 28
10.4 Display of operational status signals 29
10.5 Degrees of protection provided by enclosures 29
10.6 Response time 29
10.7 Repeatability standard deviation at zero point 31
10.8 Repeatability standard deviation at span point 31
10.9 Lack of fit 32
10.10 Short-term zero and span drift 33
10.11 Set-up time after transportation and influence of ambient temperature 33
10.12 Influence of voltage variations 34
10.13 Influence of vibration 35
10.14 Influence of sample gas pressure 36
10.15 Influence of the sample gas flow for extractive P-AMS 36
10.16 Cross-sensitivity 37
10.17 Converter efficiency for P-AMS measuring NOx 38
10.18 Response factors 39
10.19 Influences on P-AMS with in-stack sampling chamber 40
10.20 Influences related to storage and transportation 40

11 Requirements for the field test 41

12 Test procedures common to all P-AMS for field tests 41
12.1 Response time 41
12.2 Short-term zero and span drift 41
12.3 Reproducibility 42

13 Equivalence with the SRM 43

14 Measurement uncertainty 43

15 Test report 43

Annex A (normative) Minimum requirements for a test bench 44

Annex B (normative) Interferents 45

Annex C (normative) Test of linearity 46

C.1 Description of the test procedure 46
C.2 Establishment of the regression line 46
C.3 Calculation of the residuals of the average concentrations 47

Annex D (normative) Determination of the total uncertainty 48

D.1 Determination of uncertainty contributions 48
D.2 Elements required for the uncertainty determinations 48
D.3 Example of an uncertainty calculation for a CO measuring P-AMS 50
D.4 Determination of uncertainty contributions by use of sensitivity coefficients 52

Annex E (informative) Elements of performance testing report 53

Annex F (informative) European standard reference methods 56

Bibliography 57