ISO 19702:2024-12 (E)

Sampling and analysis of toxic gases and vapours in fire effluents using Fourier Transform Infrared (FTIR) spectroscopy

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **2**

3 Terms and definitions **2**

4 Principles **3**

5 Sampling **3**

5.1 General 3

5.2 Temperature of the sampling system 4

5.3 Filter systems 4

5.4 Sampling probes 6

5.4.1 General 6

5.4.2 Single-hole probes 7

5.4.3 Multi-hole probes 7

5.4.4 Probe positioning 7

5.5 Sampling line 8

5.6 Pump selection, position, and flow rate 9

5.7 Response time of the sampling system 10

5.8 Optical cell 10

6 The FTIR spectrophotometer **11**

6.1 Spectrophotometer environment 11

6.2 Detector 11

6.3 IR-source 11

6.4 Mirror alignment and cleanliness 11

6.5 Spectrophotometer compartment 11

6.6 Spectral range limits 12

6.7 Resolution 12

7 Calibration **12**

7.1 Background noise 12

7.2 Limits of detection and of quantification (L_D and L_Q) 12

7.3 Calibration methods 12

7.4 Acquiring and collecting calibration standards 13

8 Measurement procedure **13**

8.1 General 13

8.2 Daily setup, checks and controls 13

8.2.1 General 13

8.2.2 Control of calibration method 13

8.2.3 Spectrophotometer sensitivity measurements 14

8.2.4 Sampling system tests 14

8.2.5 Control of the sampling flow rate 14

8.3 Preparation for sampling and analysis 15

8.4 Initial procedures immediately before a test 15

8.5 Procedures during sampling from a test 15

8.6 Procedures after a test 16

8.7 Data reduction 16

9 Test report **16**

10 Precision and accuracy **17**

10.1 General 17

10.2 L_D and L_Q 17

10.3 Repeatability and reproducibility 17

Annex A (informative) **FTIR theory** **18**

Annex B (informative) **FTIR sampling systems** **20**

Annex C (informative) **Analysis of filter(s), the sampling line and probe for effluent retention** **24**

Annex D (normative) **Response time determination of the complete FTIR sampling system** **25**

Annex E (informative) **Considerations for FTIR optical cell selection** **27**

Annex F (normative) **Verification of FTIR optical cell performance** **29**

Annex G (informative) **Spectrophotometer** **31**

Annex H (normative) **Verification of spectrometer performance** **34**

Annex I (informative) **Reference gases** **37**

Annex J (informative) **Calibration methods** **42**

Annex K (informative) **Recording reference spectra and building a calibration set** **45**

Annex L (informative) **Repeatability and reproducibility** **55**

Annex M (informative) **Historical examples of equipment and parameters** **56**

Bibliography **67**