

ISO 5409:2024-11 (E)

Stationary source emissions - Chemical absorption method for sampling and determining mercury species in flue gas

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Symbols and abbreviated terms	2
4.1	Symbols	2
4.2	Abbreviated terms	4
5	Principle	4
6	Reagents	5
6.1	Purity of reagents	5
6.2	Purity of water	5
6.3	Reagents	5
7	Apparatus	6
7.1	General	6
7.2	Nozzle	7
7.3	Probe liner	8
7.4	Probe	8
7.5	Transfer line	8
7.6	Filter	8
7.7	Cyclone separator	8
7.8	Filter housing	8
7.9	Filter heating box	8
7.10	Absorbing system	9
7.11	Pump	9
7.12	Thermometer	9
7.13	Manometer	9
7.14	Gas meter	9
7.15	Rotameter	9
7.16	Barometer	9
7.17	Ancillary equipment	9
7.18	Impinger	9
8	Sampling	10
8.1	Sampling location	10
8.2	Proper differential pressure gauge	10
8.3	Sampling volume	10
8.4	Preparation of the sampling train	10
8.5	Other measurements prior to sampling	10
8.5.1	Volumetric gas flow through duct at the sampling plane	10
8.5.2	Water vapour content	10
8.5.3	Oxygen content	11

9	Calibration and standardization	11
9.1	Calibration of probe nozzle	11
9.2	Calibration of pitot tube	11
9.3	Calibration of metering system	11
9.4	Calibration of thermometer	11
9.5	Leak check of the metering system	11
10	Measurement procedure	11
10.1	Sampling operation	11
10.2	Sample recovery	11
10.2.1	General	11
10.2.2	Recovery of ash sample	12
10.2.3	Recovery of absorber samples	12
10.2.4	Recovery of silica gel impinger	12
10.2.5	Storage of recovered samples	12
10.3	Sample preparation	12
10.3.1	Preparation of ash sample	12
10.3.2	Preparation of solution samples	13
10.4	Analytical procedures	13
10.4.1	Reagent blank	13
10.4.2	Analytical procedure for mercury in prepared solution	13
11	Quality assurance/quality control	14
11.1	General	14
11.2	QA/QC for the sampling	14
11.2.1	Absorbing system	14
11.2.2	Operation prior to sampling and during sampling	14
11.2.3	Field blank	14
11.2.4	Field spike	15
11.2.5	Leak test	15
11.2.6	Sampling in flue gas with high concentration of SO ₂	15
11.3	QA/QC for the analysis	15
11.3.1	Reagent blank	15
11.3.2	Separate mercury standard solutions	15
11.3.3	Parallel analysis	15
11.3.4	Independent QA/QC checks for ash samples	16
12	Expression of results	16
12.1	Dry gas volume	16
12.2	Content of water vapour	16
12.3	Mass concentration of Hg _P	17
12.4	Mass concentration of Hg ₂₊	18
12.5	Mass concentration of Hg ₀	18
12.6	Mass concentration of Hg _T	19
12.7	Mass concentration of mercury in the gas stream on a dry basis at STP and reference oxygen volume fraction	20
13	Performance characteristics	20
13.1	Instrumental limits of detection	20
13.2	Evaluation of the measurement uncertainty	20
14	Test report	20
Annex A (informative) Evaluation of limit of detection, limit of determination, precision and accuracy in laboratory tests		23
Annex B (informative) Results of evaluation of measurement uncertainties in field tests		29
Bibliography		37