SKC

Operating Instructions

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UME^{X}200 Passive Sampler for Sulfur Dioxide and/or Nitrogen Dioxide Catalog No. 500-200

The SKC UME^X 200 Passive Sampler collects sulfur dioxide (SO_2) at a sampling rate of 15.1 ml/min and/or nitrogen dioxide (NO_2) at 12.83 ml/min. The UME^X 200 Passive Sampler contains a tape treated with triethanolamine (TEA). Each sampler incorporates a "blank/correction" section of tape in addition to the sample section of tape. Analysis is by solvent extraction and ion chromatography (IC) for identification of sulfur dioxide and/or nitrogen dioxide that may be present in the sample. Designed for single use, the SKC UME^X 200 Passive Sampler is packaged in an aluminized pouch for easy sample transport to a laboratory.

Performance Profile

Sampling Rate	
Sulfur Dioxide:	15.1 ml/min with a relative standard deviation of 16.7%
Nitrogen Dioxide:	12.83 ml/min with a relative standard deviation of 13.4%
Validated Concentration Range for SO_2 and/or NO_2:	0.4 to 8 ppm
Analysis Method for SO_2 and/or NO_2:	Solvent extraction and IC analysis
Lower Detection Limits for SO_2 and/or NO_2:	15 minutes: 2 ppm 8 hours: 0.1 ppm
Shelf-life:	18 months from date of manufacture at ambient temperature
Storage:	*Before use:* Ambient temperature *After use:* Analyze within 3 weeks. Can be stored at ambient temperature or at ≤39.2 F (4 C)
	Do not store with food.
Accuracy (SO_2 and/or NO_2):	± 30%
Temperature Effects:	No effect on sampling rate between 20 and 25 C
Humidity Effects:	No effect from 20 to 80% relative humidity (RH)
Wind Velocity Effects:	No effect from 0.05 to 1.0 m/s
Interferences:	None identified
Dimensions:	3.4 x 1.1 x .35 in (8.6 x 2.8 x .89 cm)
Weight:	0.38 oz (10.9 gm)
Slide Cover:	Yellow

Sampling Instructions

Cautions:
- **Do not store with food.**
- **Before sampling, check the expiration date on the label on the outside of the pouch. Do not use after the last day of the month indicated.**
- **SKC recommends using gloves when handling chemically treated media.**
- **UME^{X} samplers are designed for single use only. Do NOT reuse UME^{X} samplers.**

1. Open the pouch and remove the sampler. Do not discard the pouch; use it to send sampler to the laboratory. **Store the pouch away from potential sulfur dioxide and nitrogen dioxide sources.**

2. Enter date and location in the space provided on the back of the sampler.

3. Position the sampler on a worker's collar for personal sampling or in an appropriate location for area sampling.

4. Slide the sampler cover to the "on" position to begin sampling. Enter the sample start time in the space provided on the back of the sampler.

5. After sampling for the desired time, up to 8 hours, slide the sampler cover to the "off" position to stop sampling. Enter the sample stop time in the space provided on the back of the sampler.

6. Place the sampler in the original pouch immediately after sampling.

7. Seal the pouch. Send pertinent information and sample to an accredited laboratory for analysis.

Analysis Instructions for Sulfur Dioxide and/or Nitrogen Dioxide

Calibration Standards - Sulfate and/or Nitrite

Purchase commercially available sulfate and/or nitrite standards appropriate for your application. Prepare a range of sulfate and/or nitrite standards in de-ionized ultra-filtered (DIUF) water and prepare as outlined in Sample Preparation.
Note: Standards for sulfur dioxide require a 1:1 dilution with 0.15% hydrogen peroxide.

Sample Preparation for Sulfur Dioxide and/or Nitrogen Dioxide

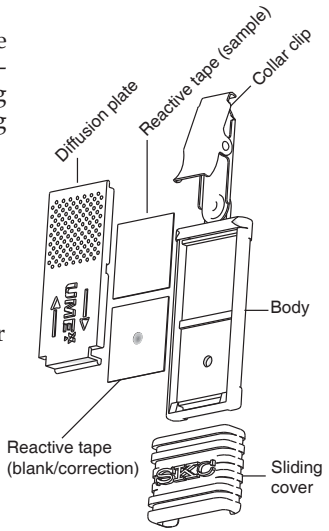
1. Remove the sampler from the pouch and the sliding cover from the sampler.

2. Use clean forceps to lift out the reactive tape from each section. Place each section in a sealed vial. This provides a sample and a blank/correction.

   Note: *The blank/correction section of tape has an indentation for easy identification.*

3. Sulfate and nitrite are desorbed from both the sample and the blank/correction tapes by inserting each in its own 4-ml glass vial containing 2 ml of de-ionized DIUF water and placing them on a vibrator/shaker for 20 minutes.

   a. **Sulfur Dioxide: <u>Immediately pipette exactly 1 ml</u>** of extract into a vial and dilute with 1 ml of 0.15% hydrogen peroxide. Shake well and transfer to autosampler vial for sulfur dioxide analysis.
   b. **Nitrogen Dioxide:** Immediately transfer the remaining 1 ml of extract to autosampler vial for analysis of nitrogen dioxide.



Sulfur Dioxide Sample Analysis

1. The sample extracts are analyzed for sulfate by ion chromatography with conductivity detection.

2. A 20 microliter portion of the extract is injected onto a Dionex 4 x 250 mm AS14A column and with an 8.0/1.0 mM sodium carbonate/sodium bicarbonate eluent.

3. Calculate the sulfate results by comparing against a standard calibration curve.

4. Convert the results from sulfate to sulfur dioxide using the following formula:

   Concentration µg/ml sulfur dioxide = Concentration µg/ml sulfate x (64.1/96.1)

   Where 64.1 is the molecular weight of sulfur dioxide and
   Where 96.1 is the molecular weight of sulfate

5. Total mass of sulfur dioxide is calculated below:

   Concentration sulfur dioxide (µg/ml) x Desorption volume (2 ml)

6. The sulfur dioxide of the blank/correction tape must always be subtracted from the sample tape when calculating air concentrations.

7. Calculate the air concentration in ppm using the following equations:

$$\text{Volume of air (liters)} = \frac{\text{Time (minutes)} \times \text{Sampling rate (15.1 ml/min)}}{1000}$$

$$\text{Concentration (ppm)} = \frac{\text{Mass (mg)} \times 24450}{\text{Air volume (L)} \times \text{Molecular weight (64.1)}}$$

Nitrogen Dioxide Sample Analysis

1. The sample extracts are analyzed for nitrite by ion chromatography with conductivity detection.

2. A 20 microliter portion of the extract is injected onto a Dionex 4 x 250-mm AS14A column and with an 8.0/1.0 mM sodium carbonate/sodium bicarbonate eluent.

3. Calculate the nitrite results by comparing against a standard calibration curve.

4. Convert the results from nitrite to nitrogen dioxide using the following formula:

   Concentration µg/ml nitrogen dioxide = Concentration µg/ml nitrite

5. Total mass of nitrogen dioxide is calculated below:

   Concentration nitrogen dioxide (µg/ml) x Desorption volume (2 ml)

6. The nitrogen dioxide of the blank/correction tape must always be subtracted from the sample tape when calculating air concentrations.

7. Calculate the air concentration in ppm using the following equations:

$$\text{Volume of air (liters)} = \frac{\text{Time (minutes)} \times \text{Sampling rate (12.8 ml/min)}}{1000}$$

$$\text{Concentration (ppm)} = \frac{\text{Mass (mg)} \times 24450}{\text{Air volume (L)} \times \text{Molecular weight (46.01)}}$$

UME^{x} Passive Samplers#	Catalog No.
UME^{x} 200*†, for sulfur dioxide and/or nitrogen dioxide	**500-200**
UME^{x} 100*†‡, for formaldehyde and other aldehydes	**500-100**
UME^{x} 400*†‡, for amines	**500-400**

* *Limited shelf-life* † *Do not store with food.* ‡ *Storage at ≤39.2 F (4 C) required*

 # UME^{x} passive samplers are designed for single use only. Do NOT reuse UME^{x} samplers.