International Standard 4219

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Air quality — Determination of gaseous sulphur compounds in ambient air — Sampling equipment

Qualité de l'air — Détermination des composés soufrés gazeux dans l'air ambiant — Appareillage d'échantillonnage

First edition — 1979-09-15

UDC 614.71 : 543.272.5 : 543.053 **Ref. No. ISO 4219-1979 (E)**

Descriptors : air pollution, air, chemical analysis, determination of content, sulphur dioxide.

Price based on 4 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4219 was developed by Technical Committee ISO/TC 146, *Air quality*, and was circulated to the member bodies in April 1977.

It has been approved by the member bodies of the following countries :

Australia	Germany, F. R.	South Africa, Rep. of
Austria	Hungary	Spain
Belgium	India	Sweden
Bulgaria	Iran	Switzerland
Canada	Japan	Turkey
Czechoslovakia	Mexico	USA
Denmark	Netherlands	USSR
Finland	Norway	Yugoslavia
France	Poland	

The member body of the following country expressed disapproval of the document on technical grounds :

United Kingdom

Printed in Switzerland

Air quality — Determination of gaseous sulphur compounds in ambient air — Sampling equipment

0 Introduction

The determination of gaseous sulphur compounds in ambient atmospheres requires as a first step the collection of a sample of air and the absorption of the constituents to be determined in a suitable liquid medium. The specific absorption media and some of the sampling conditions may vary according to the methods. This International Standard provides details of the equipment required thus obviating the necessity for specification in detail of the equipment in each of the separate International Standards concerned with methods of determination of gaseous sulphur compounds. The method of sampling is covered in ISO 4220 and 4221.

1 Scope

This International Standard specifies general requirements for the equipment for the sampling of ambient air in order to determine gaseous sulphur compounds, particularly sulphur dioxide.

2 Field of application

This International Standard is applicable to ambient air. It is applicable to the sampling of air for sulphur dioxide and other gaseous sulphur compounds as defined in clause 3.

It is primarily intended to be used in conjunction with the following International Standards :[1]

ISO 4220, *Air quality — Determination of a gaseous acid pollution index — Titrimetric method with indicator or potentiometric end-point detection.*

ISO 4221, Air quality — Determination of mass concentration of sulphur dioxide in ambient air — Thorin spectrophotometric method.

which specify supplementary details relating to the sampling equipment, the absorbing solution and the sampling procedure.

The sampling equipment specified may also be used for determinations other than gaseous sulphur compounds.

3 Definition

gaseous sulphur compounds : Sulpur dioxide, other gaseous sulphur compounds and water-soluble acidic gases determined according to the method of ISO 4220.

4 Principle

Drawing of ambient air through an absorber to trap the gaseous sulphur compounds being determined. Under certain circumstances, detailed in the relevant International Standard, filtration of the air to remove interfering particulates.

5 Equipment

Because gaseous sulphur compounds are very reactive, the use of the correct materials for all parts of the sampling equipment coming into contact with the air containing these compounds is essential.

Materials used shall not absorb any of the constituents to be determined and shall not react with them to produce a reaction product that might interfere with subsequent determination or to reduce the concentration of the constituents.

1) An International Standard specifying a tetrachloromercurate (TCM) pararosaniline spectrophotometric method for the determination of the mass concentration of sulphur dioxide in ambient air is in preparation.

The equipment shall consist essentially of the following components, each of which is separately described in 5.1 to 5.7 :

- air intake;
- connecting tubing;
- particulate filter and filter holder;
- absorber;
- protection filter;
- sampling pump;
- gas meter or air-flow regulator.

A schematic layout of a typical assembly system is shown in figure 1 :

5.1 Air intake

No particular design of air intake is required for this International Standard concerning determination of gaseous sulphur compounds only. If the air intake may be exposed to precipitation, an inverted funnel may be used as protection, as shown in figure 2.

If it is intended to carry out other determinations, e.g. concentration of black smoke with the same equipment (see clause 2), the air must be drawn in through an air intake of appropriate diameter.

5.2 Connecting tubing

5.2.1 Dimensions

The internal diameter of the tubing shall be 6 to 8 mm and the internal surface shall be smooth.

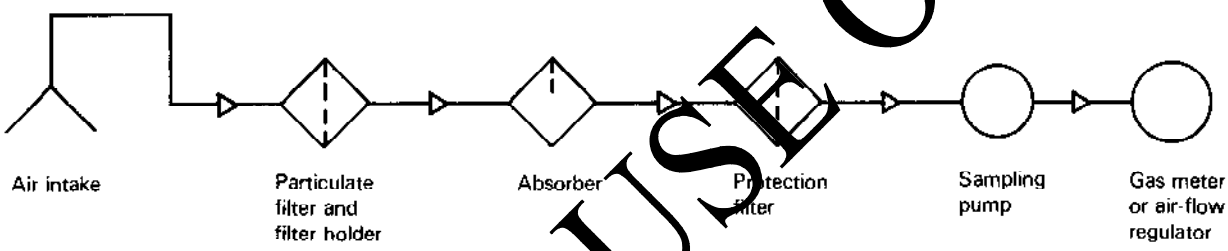

Figure 1 — Block diagram of sampling equipment

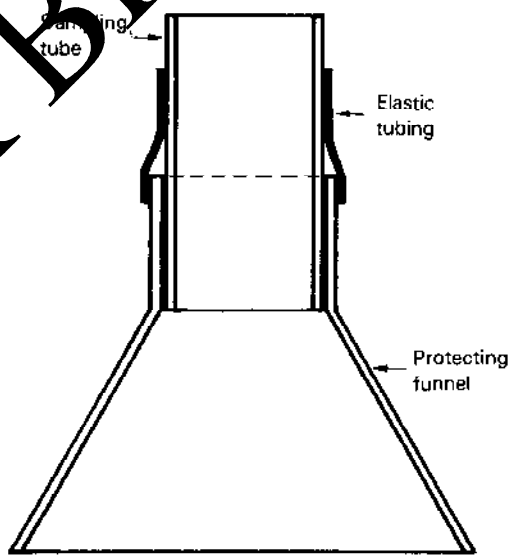

Figure 2 — Air intake with protecting funnel

5.2.2 Material

In addition to the general requirements for materials, plastics materials used shall be protected from actinic activity and preferably should be covered with a material having a low thermal conductivity. All tubing shall be airtight. Regular cleaning of the tubing is recommended. The following materials, in order of preference according to descending effectiveness, may be used :

a) Polytetrafluorethylene (PTFE). Although chemically inert, PTFE is not flexible and difficulty may be experienced in making connections. Connections with PTFE can be made successfully using connectors which are available in PTFE. In addition, in view of the inflexibility of PTFE, there is no need to use PTFE downstream of the sample absorber. Rubber vacuum hose should be the preferred material since it is flexible, makes good seals and will not affect the sample because the components of interest have already been removed.

b) Glass. Glass is fragile. It is suggested that connections to components be made using butt joints with flexible PVC tubing.

c) Polypropylene (polyethylene).

Agents used for cleaning tubing shall be sulphur free.

5.3 Particulate filter

The assembly shall be airtight in use; hence, an appropriate clamping device shall be used together with an annular seal. Air shall be drawn upwards through the filter.

5.3.1 Filter material

The material of the filter shall be chemically inert with respect to sulphur compounds, and shall not be hygroscopic.

The filter shall possess high efficiency (99 %) for particles above 0,3 µm.

If the filter is being used simply to remove particulate matter (which interferes with some methods of analysis), a suitable filter is a pad of polystyrene fibres[1]. This filter has excellent efficiency and low pressure drop, and the material is inert. Other kinds of inert filter can also be used.

The use of glass fibre filter material is not recommended as it is too reactive (see first paragraph).

NOTE — Under conditions of high humidity, the particulate filter may become damp and thus absorb some sulphur compounds from the air passing through it. These conditions should be noted in the test report. The heating of the filter under such conditions is not recommended due to the possibility of side reactions. However, under some climatic conditions, it is found necessary to warm the filter above the dew point.

1) For example, Microsorban.

5.3.2 Filter holder

The filter holder shall be made from inert material, for an example an inert form of PVC.

5.4 Absorber

The design of the absorption bottle, in which the absorption solution is contained, is dependent on the particular analysis to be employed and on the sampling flow rate. The relevant International Standards shall be consulted.

5.5 Protection filter

If a liquid absorbent is employed, it may be necessary to insert a trap between the absorption bottle and the gas meter (or the air-flow regulator) to protect the latter from absorbing solution droplets and/or harmful gases. The design of the trap is not critical, provided that air is not allowed to enter the system through leakage (it will normally be under slight suction).

5.6 Gas meter or air-flow regulator

In order to calculate the relevant concentration, the volume of air sampled must be known. The volume is best measured by an integrating method, for example by using a dry-gas meter. This shall be able to record the volume of sampled air to a sufficient accuracy at the flow rate used. A flow-regulating system based on the use of a critical orifice may alternatively be used. The flow shall then be checked at the beginning and end of the sampling period at the air intake with a device such as a variable-area flow meter to ensure that the flow rate has not changed because of partial plugging of the orifice.

Calibration of these meters or orifices may be carried out by comparison with a laboratory wet-gas meter which has itself been subjected to primary calibration within the preceding 2 years.

5.7 Sampling pump

The most suitable device for sampling is a constant-flow air pump.

The type of pump should preferably be chosen for the intended air flow rate as it is not good practice to control a pump flow rate by voltage variations.

Unless the pump is placed after the gas meter, it shall be leak proof.

6 Installation

Install the equipment in an environment in which it is not exposed to extreme temperatures or to direct sunlight for long periods.

Arrange the air intake (5.1) so that it is at least 1 m from all obstacles, including sampling equipment, and more than 3 m

above the nearest large area of horizontal surface. The tubing or funnel shall point vertically downwards.

Take care to avoid placing the air intake anywhere near local sources of pollution, such as a low-level chimney or an exhaust vent.

NOTE — The choice of a site which is representative of the relevant concentration in a given geographical area, and the number of sites required for adequate coverage of a given area, will be the subject of other International Standards.

Arrange the connecting tubing (5.2) in such a way that there are no loops in which water may collect and no radii less than 50 mm. The latter condition is particularly important if a black smoke index is being determined with the same equipment.

The total length of tubing between air intake and absorber (5.4) shall be as short as possible and in any case shall be less than 6 m.

Check that all connections between the components of the equipment are airtight.

This page intentionally left blank

This page intentionally left blank