

**Air quality - Atmospheric measurements near ground  
with Differential Optical Absorption Spectroscopy  
(DOAS) - Ambient air and diffuse emission  
measurements**

## EESTI STANDARDI EESSÕNA

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English Version

**Air quality - Atmospheric measurements near ground with active  
Differential Optical Absorption Spectroscopy (DOAS) - Ambient  
air and diffuse emission measurements**

Qualité de l'air - Mesurages atmosphériques à proximité du  
sol par Spectroscopie d'Absorption Optique Différentielle  
(DOAS) - Mesurages de l'air ambiant et des émissions  
diffuses

Luftqualität - Messungen in der bodennahen Atmosphäre  
mit der aktiven Differentiellen Optischen  
Absorptionsspektroskopie (DOAS) - Immissionsmessungen  
und Messungen von diffusen Emissionen

This European Standard was approved by CEN on 15 May 2013.

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## Foreword

This document (EN 16253:2013) has been prepared by Technical Committee CEN/TC 264 "Air quality", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

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## Introduction

Differential Optical Absorption Spectroscopy (DOAS) has been successfully progressed, starting in the late 1970s, from a laboratory based method to a versatile remote sensing technique for atmospheric trace gases. In the DOAS measuring process, the absorption of radiation in the ultraviolet, visible or infrared spectral range by gaseous constituents is measured along an open monitoring path between a radiation source and a spectrometer, and the integral concentration over the monitoring path is determined.

DOAS systems support direct multi-constituent measurements. They provide alternative measuring techniques in that they can handle a large number of measuring tasks which cannot be adequately addressed by in situ techniques based on point measurements. Examples of such tasks include the monitoring of diffuse emissions from area sources such as urban settlements [1], traffic routes, sewage treatment plants and industrially or agriculturally used surface areas; the minimisation of production losses through a detection of leaks in equipment zones or pipeline systems; or ambient air monitoring in any of the above-mentioned applications.

With an appropriate measuring set-up, the local air pollution can usually be assessed very quickly. Measurements can be taken effectively even in areas which are difficult or impossible to access, or where the direct presence of personnel or equipment would be hazardous. The measurement in the open atmosphere eliminates potential losses by sample handling. An overview on the DOAS measurement technique can be found in [2].

## 1 Scope

This European Standard describes the operation of *active* DOAS measuring systems with continuous radiation source, the calibration procedures and applications in determining gaseous constituents (e.g. NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, BTX, Hg) in ambient air or in diffuse emissions.

## 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 2.1

#### **active DOAS**

DOAS with artificial radiation source

### 2.2

#### **background spectrum**

spectrum taken by the DOAS system with the light beam blocked or the lamp switched off

Note 1 to entry: The background spectrum results mainly from scattered sunlight.

### 2.3

#### **complete spectral modelling**

process of using synthetic spectra to match with observed experimental spectra

### 2.4

#### **dark spectrum**

spectrum which identifies the thermal effects of the detector when no radiation is admitted to the detector

### 2.5

#### **electronic offset spectrum**

spectrum which identifies the electronic effects of the detector when no radiation is admitted to the detector

### 2.6

#### **instrument line shape**

ILS

mathematical function which describes the effect of the instrument's response on a monochromatic line

### 2.7

#### **intensity**

radiant power per unit solid angle (non-collimated beam) or per unit area (collimated beam)

### 2.8

#### **lamp spectrum**

spectrum which is achieved by admitting direct light from the lamp to the spectrometer

### 2.9

#### **monitoring path**

actual path in space over which the pollutant concentration is measured and averaged

### 2.10

#### **open-path measurement**

measurement which is performed in the open atmosphere

### 2.11

#### **path length**

distance that the radiation travels in the open atmosphere