

**Workplace exposure - Measurement of the dustiness of  
bulk materials - Part 1: Requirements and choice of test  
methods**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 15051-1:2013 sisaldab Euroopa standardi EN 15051-1:2013 inglisekeelset teksti.	This Estonian standard EVS-EN 15051-1:2013 consists of the English text of the European standard EN 15051-1:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
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ICS 13.040.30

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English Version

## Workplace exposure - Measurement of the dustiness of bulk materials - Part 1: Requirements and choice of test methods

Exposition sur les lieux de travail - Mesure du pouvoir de resuspension des matériaux pulvérulents en vrac - Partie 1:  
Exigences et choix des méthodes d'essai

Exposition am Arbeitsplatz - Messung des Staubungsverhaltens von Schüttgütern - Teil 1:  
Anforderungen und Auswahl der Prüfverfahren

This European Standard was approved by CEN on 28 September 2013.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 15051-1:2013) has been prepared by Technical Committee CEN/TC 137 "Assessment of workplace exposure to chemical and biological agents", 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of an identical text or by endorsement, at the latest by May 2014, and conflicting national standards shall be withdrawn at the latest by May 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document, together with EN 15051-2:2013 and EN 15051-3:2013, supersedes EN 15051:2006.

The major technical changes between this European Standard and the previous edition are as follows:

- a) EN 15051:2006 has been split in three parts (see below);
- b) the test methods given are no longer referred to as reference test methods;
- c) the test of equivalence between an alternative (candidate) test method and any of the test methods now given in EN 15051-2 and EN 15051-3 have been deleted.

EN 15051 *Workplace exposure – Measurement of the dustiness of bulk materials* consists of the following parts:

- *Part 1: Requirements and choice of test methods;*
- *Part 2: Rotating drum method;*
- *Part 3: Continuous drop method.*

EN 15051-2 and EN 15051-3 give details of two test apparatus and test methods for the reproducible production of dust from a bulk material under standard conditions, and the measurement of the inhalable, thoracic and respirable fractions of this dust, with reference to the existing European Standards, where relevant (see Clause 6).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

The control of dust emissions during the handling and transportation of bulk materials is an important consideration in the design and operation of many industrial processes. Excessive airborne dust levels in workplaces are undesirable for several reasons:

- they can cause adverse health effects to the workers;
- their control can involve the use of costly ventilation and filtration systems;
- they can contaminate machinery and products;
- they can be costly in terms of product losses;

It is therefore advantageous for occupational hygienists and process engineers to have relevant information about the propensity of bulk materials to produce airborne dust (the “dustiness” of the bulk material) so that risks can be evaluated, controlled and minimized.

No single method of dustiness testing is likely to represent and reproduce the various types of processing and handling used in industry. Therefore a number of dustiness testing methods are in use in different industries. Different methods use different test apparatus and measuring principles, and express results in different ways. Methods that do not separate the dust cloud produced into the three health-related size fractions - inhalable, thoracic and respirable dust - can serve the needs of manufacturing industry for process and batch control, but give limited information on the health hazard due to the dustiness of the bulk material.

Dustiness is a relative term and the measurement obtained will depend on the test apparatus used, the condition and properties of the tested bulk material and various environmental variables. The test and the variables therefore need to be closely specified to ensure reproducibility. Recognising the above, it was concluded that there was a need for standardized methods to measure the dustiness of bulk materials, based on the biologically relevant aerosol fractions defined in EN 481.

This European Standard, together with EN 15051-2 and EN 15051-3, establishes test methods that classify the dustiness, in terms of health-related fractions, of solid bulk materials. The dustiness classification is intended to provide users (e.g. manufacturers, producers, occupational hygienists and workers) with information on the potential for dust emissions when the bulk material is handled or processed in workplaces. It provides the manufacturers of bulk materials with information that can help to improve their products. It allows the users of the bulk materials to assess the effects of pre-treatments, and also to select less dusty products, if available. Although this European Standard does not discuss the analysis of dust released from bulk materials (except in terms of health-related fractions), the test method produces samples with the potential for chemical analysis of the contents.

If methods to evaluate dustiness for bulk materials handled in other ways are deemed of importance, CEN/TC 137 could be approached for adopting a new work item, e.g. more specific industrial handling procedures.

The level of the dustiness generally depends on material-specific and process-specific parameters. The most important material-specific parameters are

- the particle size distribution of the bulk material,
- its bulk density,
- its moisture content (“bulk material moisture content”),
- its chemical composition,

- physical characteristics like electrostatic charge distribution.

Process-specific parameters are mainly determined by the type of handling and are essentially determined by

- the type and level of energy that leads to dust release, and
- the duration of the energy effect.

This European Standard was originally developed based on the results of the European project SMT4-CT96-2074 Development of a Method for Dustiness Testing (see [1]). This project investigated the dustiness of 12 bulk materials, with the intention to test as wide a range of bulk materials as possible, i.e. magnitude of dustiness, industrial sectors, chemical composition and particle size distribution. In this revised version, important comments from industrial users of the standard (e.g. Industrial Minerals Association), a number of research papers (for example, [2] and [3]) and the potential influence of the expanding database of dustiness results have been taken into account.

## 1 Scope

This European Standard specifies the environmental conditions, the sample handling and analytical procedures and the method of calculating and presenting the results. Reasons are given for the need for more than one method and advice is given on the choice of method to be used.

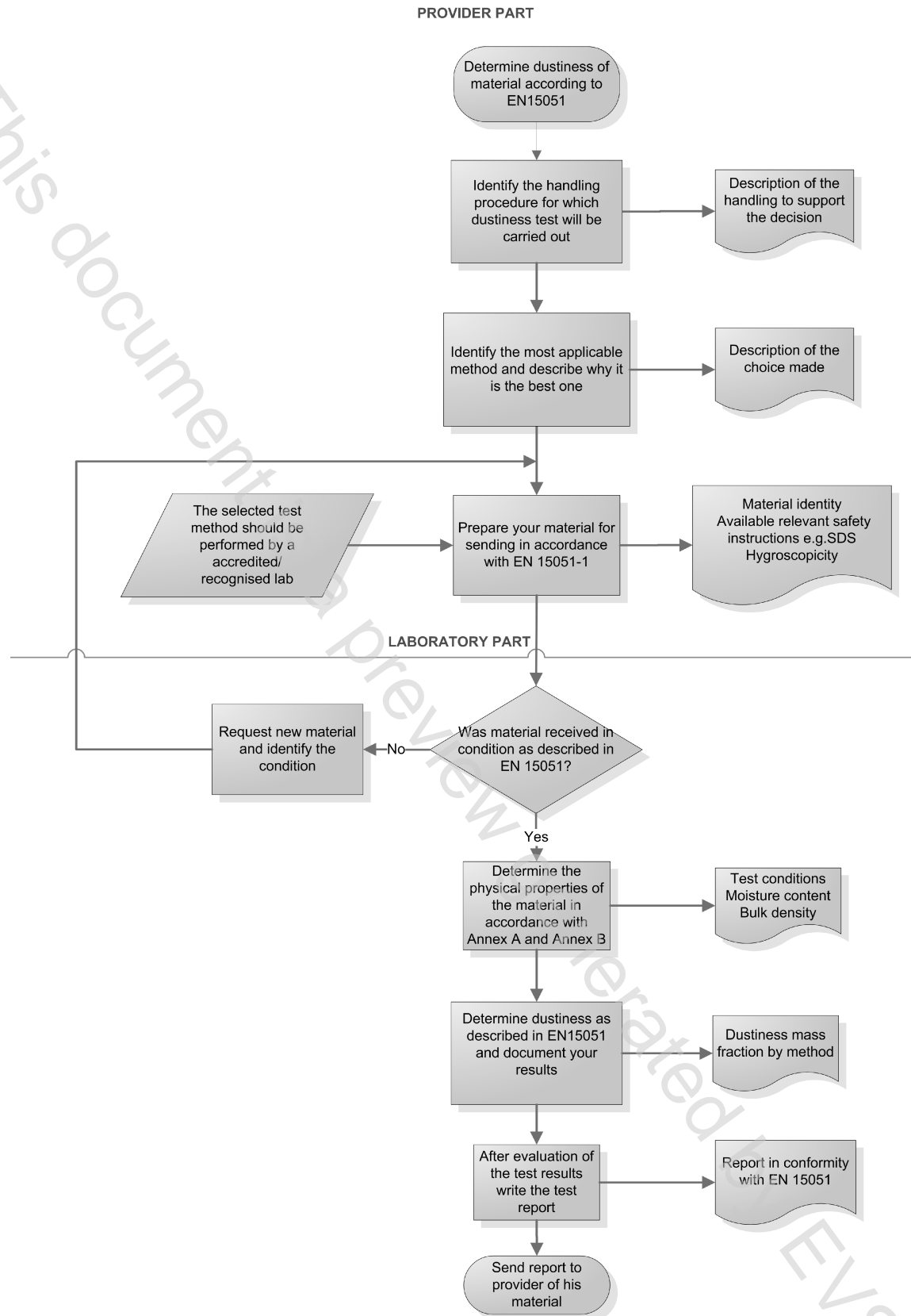
This European Standard establishes a classification scheme for dustiness to provide a standardised way to express and communicate the results to users of the bulk materials. Details of the scheme for each method are given in EN 15051-2 and EN 15051-3.

This European Standard is applicable to powdered, granular or pelletized bulk materials.

This European Standard is not applicable to test the dust released during mechanical reduction of solid bulk materials (e.g. cut, crushed) or to test application procedures for the bulk materials.

Figure 1 gives a flow chart to provide the user of this European Standard a route through the necessary stages that need to be taken to obtain values of the dustiness of a given bulk material.





**Figure 1 — Flow chart to show how EN 15051 is used to measure the dustiness of a bulk material**

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1540, *Workplace exposure - Terminology*

EN 15051-2, *Workplace exposure - Measurement of the dustiness of bulk materials - Part 2: Rotating drum method*

EN 15051-3, *Workplace exposure - Measurement of the dustiness of bulk materials - Part 3: Continuous drop method*

## 3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 1540 and the following apply.

**NOTE** In particular, the following terms of EN 1540 are used in this document: airborne dust, collected sample, dustiness, inhalable fraction, respirable fraction, thoracic fraction and health related fractions.

**3.1**  
**inhalable dustiness mass fraction**  
 $w_{I,t}$   
ratio of the inhalable dust produced by the dustiness test procedure, to the test mass for the respective test method  $t$

Note 1 to entry: The different test methods are described in EN 15051-2 and EN 15051-3, and  $t$  has the value A and B for the two methods respectively.

**3.2**  
**respirable dustiness mass fraction**  
 $w_{R,t}$   
ratio of the respirable dust produced by the dustiness test procedure to the test mass for the respective test method  $t$

Note 1 to entry: The different test methods are described in EN 15051-2 and EN 15051-3, and  $t$  has the value A and B for the two methods respectively.

**3.3**  
**thoracic dustiness mass fraction**  
 $w_{T,t}$   
ratio of the thoracic dust produced by the dustiness test procedure to the initial mass for the respective test method  $t$

Note 1 to entry: The different test methods are described in EN 15051-2 and EN 15051-3, and  $t$  has the value A and B for the two methods respectively.

## 4 Principle

A dustiness tester consists of the following elements:

- dust generation section;
- dust transfer section;
- sampling section;