BSI Standards Publication

Workplace exposure — Measurement of the dustiness of bulk materials

Part 2: Rotating drum method

bsi.

National foreword

This British Standard is the UK implementation of EN 15051-2:2025. It supersedes BS EN 15051-2:2013+A1:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EH/2/2, Work place atmospheres.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Exposition am Arbeitsplatz - Messung des Staubungsverhaltens von Schüttgütern - Teil 2: Verfahren mit rotierender Trommel

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European foreword

This document (EN 15051-2:2025) 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of an identical text or by endorsement, at the latest by June 2026, and conflicting national standards shall be withdrawn at the latest by June 2026.

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

This document supersedes EN 15051-2:2013+A1:2016.

EN 15051-2:2025 includes the following significant technical changes with respect to EN 15051-2:2013+A1:2016:

— the introduction was revised to better explain the purpose of dustiness testing;

— 4.2.2: Inclusion of conditioning specifications for standard testing and inter-comparison in addition to as received testing;

— 4.3: Change in the tolerance of relative humidity (RH): Previously, RH was specified at (50 ± 10) % RH; now, it is specified at (50 ± 5) %;

— 4.8: Introduction of an in-house or test powder of relatively high dustiness for quality purpose and to ensure reproducibility in testing;

— 5.7: Change in the minimum of repeat tests to be carried out from three to five and specify procedure for reporting results based on the relative standard deviation.

— 5.10: Limit of detection (LOD) and limit of quantification (LOQ) has been added for the determination and reporting of LOD and LOQ of the weighing of the filters, and the 80 ppi and 20 ppi foams;

— Clause 6: In Table 1, the respirable dustiness mass fraction ($w_{R,A}$) upper limit for the very low dustiness category has been changed from < 10 mg/m^3 to < 20 mg/kg. As a result, the low category has been revised from (10 to 60) mg/m^3 to (20 to 60) mg/m^3;

— Annex A: Flow rate and leak check, which is normative, has been added. It provides a procedure to check, evaluate and report the flow rate and potential leaks through the rotating drum;

— Annex B (informative) for the quality control of metal foams has been added;

— Annex C (informative) provides a test to identify outliers amongst values obtained from repeat tests;

— Annex D (informative) provides an example of a procedure to evaluate the LOD and LOQ for gravimetric filters and foams.

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.*

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

Introduction

This document gives details of the design and operation of the rotating drum test method that categorizes the dustiness of solid bulk materials, in terms of health-related mass fractions.

The dustiness values of a specific method can be used for comparing and ranking powders and are useful for the purpose of safety by design and risk assessment. A dustiness categorization is presented 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. It is envisaged that different branches of industry might develop their own categorization schemes using experimentally determined dustiness values of the bulk materials of interest.

However, dustiness test methods measure dust at emission source and do not consider the transportation of the airborne particles within a workplace environment to the breathing zone of a worker. Concentrations of respirable or inhalable dust in the workplace air, resulting from the processing and handling of bulk materials, will depend on a wide variety of factors (e.g. environmental factors, quantity used, engineering controls, transport of particles from source to worker's breathing zone, type of activities). Therefore, dustiness values do not provide workplace exposure concentrations.

Although this document does not discuss in detail the analysis of dust released from bulk materials (except in terms of gravimetric analysis), the test method produces samples with the potential for chemical analysis of the contents. However, it is important to understand that for a mixture, the mass percentage of a substance in the bulk material will be different (lower or higher) to the mass percentage of the same substance in the dust collected by the foams and the filter using the rotating drum.

The EN 15051 standard was originally developed in 2006 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 2013, the standard was revised based on 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. In this revised document, the performance and characteristics of the metal foams for the sampling of the respirable fraction and important comments from industrial users of the standard have been taken into account.

For the measurement of dustiness of bulk materials that possibly contain or release nano-objects and their agglomerates and aggregates (NOAA) using the rotating drum, EN 17199-1 and EN 17199-2 apply [6, 7].

1 Scope

This document specifies the rotating drum test apparatus and associated test method for the reproducible production of dust from a bulk material under standard conditions, and the measurement of the inhalable, thoracic and respirable dustiness mass fractions, with reference to existing European standards, where relevant (see Clause 6).

This method is suitable for general bulk material handling processes, including all those processes where the bulk material is dropped, or can be dropped. It differs from the continuous drop method presented in EN 15051-3:2025 [4]. In EN 15051-2:2025 the same bulk material is repeatedly dropped, whilst in EN 15051-3:2025, the bulk material is dropped only once, but continuously.

Furthermore, this document specifies the environmental conditions, the sample handling and analytical procedures, and the method of calculating and presenting the results. A categorization scheme for dustiness is specified, to provide a standardized way to express and communicate the results to users of the bulk materials.

This document is applicable to powdered, granular or pelletized bulk materials. A standard sample volume is used.

This document does not apply to test the dust released when solid bulk materials are mechanically reduced (e.g. cut, crushed).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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 15051-1:2025, *Workplace exposure — Measurement of the dustiness of bulk materials — Part 1: Requirements and choice of test methods*

ISO 15767, *Workplace atmospheres — Controlling and characterizing uncertainty in weighing collected aerosols*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 1540, EN 15051-1:2025 and the following apply. ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

3.1
aerosol sample
aerosol particles collected onto the collection substrate or sampling cassette

[SOURCE: ISO 15767:2009, 2.1]