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Test dusts for evaluating air cleaning equipment

Poussières d'essai pour l'évaluation des équipements d'épuration d'air

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 142, *Cleaning equipment for air and other gases*.

Introduction

Filters are subjected to evaluation of their initial performance and dust-loaded performance in laboratory tests using specified test dusts. The results are to reflect the performance of the filter as installed in a building. However, since the properties of atmospheric aerosols vary to a large extent regionally, seasonally, and according to weather conditions, test data obtained with a given test dust seldom accurately predict the filter performance as actually used. In addition to this, the test results with a given test dust might not be in agreement with those obtained by other laboratories because the filter performance is affected by many factors such as particle size distribution, particle agglomeration, and electrical charge. Despite these problems in testing filter performance, the test data are used for the classification of filters, estimation of energy consumption, Life Cycle Cost (LCC), and Life Cycle Assessment (LCA).

The test dust used for evaluating initial performance and loaded performance of filters can have a different specification from the dust used to achieve filter loading.

This International Standard does not control the specification, manufacturing, or use of test dusts. It describes the properties of test dusts which can be used to load filters, and the requirements for test dust generation that will ensure that useful laboratory test results are obtained in order to mimic the actual use as much as possible.

Test dusts for evaluating air cleaning equipment

1 Scope

This International Standard defines the properties of load test dusts used for heating, ventilation, and air conditioning (HVAC) air filters as well as air cleaning equipment in laboratories. Test dusts used for evaluation of efficiency performance are not included.

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 updated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12103-1, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*

ISO/TS 21220, *Particulate air filters for general ventilation — Determination of filtration performance*

3 Terms and definitions

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

3.1
dust feeder
device which is used to distribute test dust to the filter

3.2
median diameter
diameter of the particle for which the cumulated volume fraction is equal to 50 % on a cumulated volume particle size distribution curve

3.3
undersize
percentage in volume of particles smaller than a specified particle size in a particle size distribution

3.4
particulate matter
PM
size fraction of the natural aerosol (liquid and solid particles) suspended in ambient air, with the symbol PM*x* where *x* defines the size range of the aerodynamic diameter

Note 1 to entry: The following particle size fractions are used in this International Standard.

Fraction	Category	Size range µm
PM10	Thoracic fraction	≤10
PM2,5	Respirable fraction	≤2,5

Note 2 to entry: The collection efficiency of the correct equipment at the considered diameter is equal to 50 %.

4 Test dusts designation

Load test dusts belong to one of four categories, according to the composition, the particle median diameter, and the particle density as shown in Table 1.

Table 1 — Load test dusts

Categories	Composition	Median diameter µm	Density g/cm^3
L1	Mixture of: — Arizona desert sand 72 %[a] — Carbon 23 % — Milled Cotton linters 5 %	 Conforms to ISO 12103-1, A2 Not defined Not defined	 Conforms to ISO 12103-1, A2 Not defined Not defined
L2	Arizona desert sand[a]	Conforms to ISO 12103-1, A2	Conforms to ISO 12103-1, A2
L3	KANTO loam (sintered)	1,7–2,5	2,9–3,1 (for reference)
L4	Mixture of: — Arizona desert sand[a] 93,5 % — Milled cotton linters 6,5 %	 Conforms to ISO 12103-1, A2 Not defined	 Conforms to ISO 12103-1, A2 Not defined

L1 test dust is the same as the commercially available dust used for ANSI/ASHRAE Standard 52.2 testing. The details conform to the description of the standard.

L2 test dust is the same as ISO 12103-1, A2 Arizona test dust. The details conform to the description of the standard.

L3 test dust is the same as SAP14-12 Test Powders 3-3. The details conform to the description of the standard (SAP: Standard of Association of Powder Process Industry and Engineering, Japan).

L4 test dust is the same as ANSI/AHRI 680. The details conform to the description of the standard.

[a] See ISO 12103-1.

5 Chemical composition

The chemical composition of each test dust shall meet the requirements of Table 2.

Table 2 — Chemical composition (mass fraction, %)

L1	L2	L3		L4
ISO 12103-1, A2 72 %	Conforms to ISO 12103-1, A2	SiO_2	34 to 40	ISO 12103-1, A2 93,5 %
		Al_2O_3	26 to 32	
		Fe_2O_3	17 to 23	
Carbon black 23 %		CaO	0 to 3	Milled cotton linters 6,5 %
		MgO	0 to 7	
Milled cotton linters 5 %		TiO_2	0 to 4	
		Loss on ignition	0 to 4	

6 Particle size distribution

The particle size distributions of L1, L2, and L4 test dust conform to ISO 12103-1, A2 for the Arizona desert sand component of the mixture. The carbon black and cotton linters conform to ANSI/ASHRAE Standard 52.2 testing.

The particle size distribution of L3 test dust shall meet the requirements of Table 3.

Table 3 — Particle size distribution of L3 test dust

Undersize, volume fraction (%)	Particle size, µm	
	Minimum	Maximum
10	0,89	1,3
20	1,2	1,7
30	1,4	2,0
40	1,5	2,3
50	1,7	2,5
60	1,8	2,7
70	2,0	2,9
80	2,4	3,5
90	2,9	4,2

7 Particle size analysis procedure

7.1 L1 test dust

The particle size analysis procedure conforms to ISO 12103-1, A2 for the Arizona desert sand component of the mixture. There is no particle size analysis procedure for the carbon black and cotton linters components.

7.2 L2 test dust

The particle size analysis procedure conforms to ISO 12103-1, A2.

7.3 L3 test dust

The particle size analysis procedure conforms to SAP14-12 Test Powders 3. Laser diffraction scattering is used for the measurement. For the measuring device and the measurement conditions, the specification approved by the test dust supplier, APPIE (Association of Powder Process Industry and Engineering, Japan) is used.

7.4 L4 test dust

The particle size analysis procedure conforms to ISO 12103-1, A2 for the Arizona desert sand component of the mixture. There is no particle size analysis procedure for the cotton linters component.

8 Production methods

8.1 L1 test dust

This test dust is produced by mixing the three components listed in Table 1. The detailed procedure conforms to ANSI/ASHRAE Standard 52.2.

8.2 L2 test dust

This test dust is collected from a selected area of Arizona desert, jet-milled and classified to the specified particle size.

8.3 L3 test dust

KANTO loam is sintered for two hours, jet-milled and classified to the specified particle size.