

DIN EN 17199-5:2020-02 (E)

Workplace exposure - Measurement of dustiness of bulk materials that contain or release respirable NOAA or other respirable particles - Part 5: Vortex shaker method

Contents	Page
European foreword	4
Introduction	5
1 Scope	6
2 Normative references	7
3 Terms and definitions	7
4 Symbols and abbreviations	8
5 Principle	8
6 Equipment	10
6.1 General	10
6.2 Test apparatus	12
6.2.1 Vortex shaker apparatus	12
6.2.2 Cylindrical container	12
6.2.3 Humidification system of incoming and dilution air	15
6.2.4 Sampling line for the measurement of the respirable dustiness mass fraction	15
6.2.5 Sampling line for other measurements	17
6.2.6 Conductive flexible tubing, carbon impregnated	19
6.2.7 Respirable cyclone, made of stainless steel	19
6.2.8 Air sampling cassette	19
6.2.9 Condensation particle counter (CPC), with alcohol as working fluid	20
6.2.10 Time- and size-resolving aerosol instrument	20
6.2.11 Aerosol sampler for analytical electron microscopy analysis	20
6.2.12 Analytical balance, capable of weighing to a resolution of 10 µg	21
6.2.13 Microbalance, capable of weighing to a resolution of 1 µg	21
6.2.14 Filters for gravimetric analysis	21
6.2.15 Micro-centrifuge tubes	21
7 Requirements	21
7.1 General	21
7.2 Engineering control measures	21
7.3 Conditioning of the test material	21
7.3.1 General	21
7.3.2 Specified conditions	22
7.3.3 As-received conditions	22
7.4 Conditioning of the test equipment	22
8 Preparation	22
8.1 Test sample	22
8.2 Moisture content of the test material	23
8.3 Bulk density of the test material	23
8.4 Preparation of test apparatus	23
8.5 Aerosol instruments and aerosol samplers	23
9 Test procedure	23

10	Evaluation of data	26
10.1	Respirable dustiness mass fraction	26
10.2	Number-based dustiness index, number-based emission rate and modal aerodynamic equivalent diameters of the particle size distribution	26
10.2.1	General	26
10.2.2	Number-based dustiness index	27
10.2.3	Number-based emission rate	27
10.2.4	Modal aerodynamic equivalent diameters of the number-based particle size distribution	27
10.3	Morphological and chemical characterization of the particles	28
11	Test report	29
Annex A (informative) Pictures illustrating some of the equipment of the method		30
Annex B (informative) Examples of TEM images obtained with the vortex shaker method		35
Annex C (informative) Motivation for development of the vortex shaker method		36
Bibliography		37