DIN EN ISO 21083-1:2019-09 (E)

Test method to measure the efficiency of air filtration media against spherical nanomaterials - Part 1: Size range from 20 nm to 500 nm (ISO 21083-1:2018)

Contents

Page

European foreword ... 4

Foreword ... 5

Introduction ... 6

1 Scope ... 7

2 Normative references ... 7

3 Terms, definitions, symbols and abbreviated terms ... 7
3.1 Terms and definitions ... 7
3.2 Symbols and abbreviated terms ... 8

4 Principle ... 9

5 Test materials ... 10
5.1 General ... 10
5.2 Liquid phase aerosol ... 10
5.2.1 DEHS test aerosol ... 10
5.2.2 Liquid phase aerosol generation ... 11

6 Test setup ... 12
6.1 General ... 12
6.2 Specification of setup ... 14
6.2.1 Aerosol generation system ... 14
6.2.2 Tubing ... 14
6.2.3 Dryer ... 14
6.2.4 DEMC ... 15
6.2.5 Equilibrium charge distribution and neutralization of aerosol particles ... 17
6.2.6 Neutralization of aerosol particles ... 17
6.2.7 Make-up air line ... 18
6.2.8 Test filter medium mounting assembly ... 19
6.2.9 CPC ... 20
6.2.10 Final filter ... 22
6.3 Detailed setup for test using DEHS particles ... 22
6.4 Determination of the filter medium velocity ... 23

7 Qualification of the test rig and apparatus ... 23
7.1 CPC tests ... 23
7.1.1 CPC — Air flow rate stability test ... 23
7.1.2 CPC — Zero test ... 24
7.1.3 CPC — Overload test ... 24
7.1.4 Counting accuracy calibration ... 24
7.2 DEMC tests ... 27
7.3 Qualification of aerosol neutralization ... 27
7.3.1 General ... 27
7.3.2 Qualification of neutralization by checking the multiple charge fraction on the particles passing through the neutralizer ... 27
7.3.3 Qualification of the aerosol neutralizer using corona discharge balanced output ... 27
7.3.4 Qualification of neutralization according to ISO/TS 19713-1 ... 28

7.4 System leak checks 28
7.4.1 Air leakage tests 28
7.4.2 Visual detection by cold smoke 28
7.4.3 Pressurization of the test system 28
7.4.4 Use of high efficiency filter media 28
7.5 Uniformity of the test aerosol concentration 28

8 Test procedure 29
8.1 Determination of the correlation ratio/zero efficiency test 29
8.2 Protocol of filtration efficiency measurement 30
8.2.1 Preparatory checks 30
8.2.2 Equipment preparation 30
8.2.3 Aerosol generator 30
8.2.4 Aerosol generator — Neutralizer 31
8.2.5 Filter medium neutralization 32
8.2.6 Filter medium neutralization according to ISO 29461-1 32
8.2.7 Air flow measurement 34
8.2.8 Measurement of the pressure drop 35
8.2.9 Zero count test 35
8.2.10 Air leakage test 35
8.2.11 Loading effect test 35
8.2.12 Reported values 35
8.2.13 Measurement of filtration efficiency — DEHS particles 35
8.3 Test evaluation 37
8.4 Measurement protocol for one sample — Summary 37
8.4.1 Using one CPC to measure the upstream and downstream particle concentrations 37
8.4.2 Using two CPCs to measure the upstream and downstream particle concentrations 38

9 Maintenance items 39

10 Measurement uncertainties 40

11 Reporting results 41
11.1 General 41
11.2 Required reporting elements 41
11.2.1 General 41
11.2.2 Report summary 41
11.2.3 Report Details 42

Annex A (informative) Instruments specifications 46

Annex B (informative) Statistical analysis for precision of an experiment (according to ISO 5725-2) 50
B.1 General 50
B.2 Nomenclature 51
B.3 Procedure 51
B.3.1 General 51
B.3.2 Scrutiny of test results for consistency and outliers 52
B.3.3 Calculation of the general mean and variance 54

Annex C (informative) Safe use of IPA 55

Annex D (informative) Safe handling of radioactive devices 56

Bibliography 57