

DIN EN 16966:2019-01 (E)

Workplace exposure - Measurement of exposure by inhalation of nano-objects and their aggregates and agglomerates - Metrics to be used such as number concentration, surface area concentration and mass concentration

Contents

	Page
European foreword	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	7
4 Symbols and abbreviations	12
5 Relevance of ISO definition for assessing health impacts of airborne NOAA	13
6 Particle metrics and their selection	13
6.1 Workplace aerosols consisting of NOAA	13
6.2 NOAA metrics	14
6.3 NOAA number metric, NOAA surface area metric and NOAA mass metric	14
6.4 Occupational exposure limits for NOAA	15
7 Exposure assessment strategy based on EN 17058	15
7.1 General	15
7.2 Basic assessment according to EN 17058	16
7.3 Comprehensive assessment according to EN 17058	16
7.4 Personal samplers versus static samplers/monitors	17
8 Determination of exposure	17
8.1 General	17
8.2 Introductory remarks regarding the measurement of particle metrics	18
8.2.1 General	18
8.2.2 Continuous measurement and display (using a monitor) or post-sampling analytical determination of a NOAA metric	19
8.2.3 Calculation/estimation of a NOAA metric based on the size-resolved NOAA distribution ..	20
8.2.4 Calculation of NOAA mass ensemble metric based on the size-resolved NOAA mass metric	20
8.3 Information of the measurement of particle metrics	20
Annex A (informative) Source domains of workplace exposure scenarios for engineered/ manufactured NOAA	21
Annex B (informative) Evolution of available instrumental technology since the publication of ISO/TR 27628 and ISO/TR 12885	22
Annex C (informative) Direct-reading instruments for measuring the NOAA ensemble number metric	23
C.1 General	23
C.2 Condensation particle counter	23
C.2.1 Principle of operation	23

C.2.2	Assumptions, limits and potential problems	23
C.2.3	Accuracy and comparability according to EN 16897	24
DIN EN 16966:2019-01 EN 16966:2018 (E) C.2.4 International standards on the use of CPC 24		
C.3	Diffusion chargers	24
C.3.1	General	24
C.3.2	Assumptions, limits and potential problems	24
C.3.3	Accuracy and comparability	25
Annex D (informative) Monitors for measuring the NOAA ensemble surface area metric 26		
D.1	General	26
D.2	Assumptions, limits and potential problems	26
D.3	Accuracy and comparability	28
Annex E (informative) Samplers for determining the NOAA mass (chemical element) metric by off-line analysis 29		
E.1	General	29
E.2	Ensemble of all sampled particles analysed	29
E.2.1	General	29
E.2.2	Assumptions, potential problems and comparability	30
E.3	Individual particles analysed	30
E.3.1	General	30
E.3.2	Assumptions, potential problems and comparability	30
Annex F (informative) Monitors for measuring the size-resolved NOAA number metric (number-weighted electric mobility equivalent diameter distribution) 31		
F.1	General	31
F.2	DMAS of various designs	31
F.2.1	General	31
F.2.2	Assumptions, potential problems and comparability	31
F.2.3	International Standards on the use of DMAS	32
Annex G (informative) Samplers for determining the size-resolved NOAA mass metric (mass-weighted diffusive equivalent diameter distribution) by off-line analysis 33		
G.1	General	33
G.2	Diffusion spectrometers	33
G.2.1	General	33
G.2.2	Assumptions and potential problems	33
Annex H (informative) Samplers for determining the size-resolved NOAA mass (chemical element/compound) metric (mass-weighted aerodynamic equivalent diameter distribution) by off-line analysis 34		
H.1	General	34
H.2	Cascade impactors	34
H.2.1	General	34
H.2.2	Assumptions and potential problems	34
DIN EN 16966:2019-01 EN 16966:2018 (E) Annex I (informative) Monitors for determining the size-resolved NOAA number metric (number-weighted aerodynamic equivalent diameter distribution) 35		
I.1	General	35
I.2	Assumptions and potential problems	35
Annex J (informative) Number-weighted minimum Feret diameter distribution of primary particles of aggregates and constituent parts of aggregates 36		

J.1	Distinction between a NOAA and a non-NOAA particle	36
J.2	Aggregates and agglomerates	36
J.3	Sample analysis in an electron microscope	36
J.3.1	General	36
J.3.2	Assumptions and potential problems	37
	Bibliography	38