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Cleaning equipment for air and other gases — Terminology

Séparateurs aérauliques — Terminologie

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 29464 was prepared by Technical Committee ISO/TC 142, *Cleaning equipment for air and other gases*.

This first edition of ISO 29464 cancels and replaces ISO 3649:1980, which has been technically revised.

Cleaning equipment for air and other gases — Terminology

1 Scope

This International Standard establishes a terminology for the air filtration industry and comprises terms and definitions together with, in some cases, symbols and units.

This International Standard is applicable to both particulate and gas phase air filters and cleaners used for the general ventilation of inhabited enclosed spaces. Air inlet filters for static or seaborne rotary machines are included.

It does not apply to cabin filters for road vehicles or air inlet filters for mobile internal combustion engines, for which separate arrangements exist. Dust separators for the purpose of air pollution control are also excluded.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 29463-1, *High-efficiency filters and filter media for removing particles in air — Part 1: Classification, performance testing and marking*

3 Terms and definitions

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

3.1 Particulate filters

3.1.1
aerosol
system of solid or liquid particles suspended in gas

NOTE In general, one divides the atmospheric aerosol into three size categories: the ultrafine range $x \leq 0,1$ µm, the fine range 0,1 µm $< x \leq 1$ µm and the coarse range $x > 1$ µm, whereby x is the particle diameter.

3.1.2
monodisperse aerosol
aerosol, the width of whose distribution function, described by the geometric standard deviation σg, is less than 1,15 µm

3.1.3
polydisperse aerosol
aerosol, the width of whose distribution function, described by the geometric standard deviation σg, exceeds 1,5 µm

3.1.4
quasi-monodisperse aerosol
aerosol, the width of whose distribution function, described by the geometric standard deviation σg, lies between 1,15 µm and 1,5 µm

3.1.5
test aerosol
aerosol used for determining filter performance and for calibrating particle measurement devices

3.1.6
agglomerate
collection of solid particles adhering to each other

3.1.7
agglomeration
action leading to the formation of agglomerates

3.1.8
agglutination
action of joining, by impact, solid particles coated with a thin adhesive layer or of trapping solid particles by impact on a surface coated with adhesive

3.1.9
aggregate
relatively stable assembly of dry particles, formed under the influence of physical forces

3.1.10
filter media area
A_{fm}
area of media contained in the filter

3.1.11
effective filter media area
area of the media contained in the filter (without adhesive spaces or ligament) and passed by air during operation

3.1.12
exposed filter area
A_{exp}
area of filter medium in a filter effective for particle capture

3.1.13
nominal filter face area
A_{nff}
frontal face area of the filter including the header frame which determines the nominal filter face velocity

3.1.14
arrestance
A
measure of the ability of a filter to remove a standard test dust from the air passing through it, under given operating conditions

NOTE This measure is expressed as a weight percentage.

3.1.15
average arrestance
A_m
ratio of the total amount of loading dust retained by the filter to the total amount of dust fed up to final test pressure differential

3.1.16
initial arrestance
value of arrestance determined after the first loading cycle in a filter test

NOTE 1 For example, in EN 14799 procedure for the first 30 g of test dust.

NOTE 2 This measure is expressed as a weight percentage.

3.1.17
ash
solid residue of effectively complete combustion

3.1.18
fly ash
ash entrained by combustion gases

3.1.19
dust holding capacity
DHC
C_d
amount of loading dust retained by the filter up to final pressure differential

3.1.20
capture
extraction of particles, liquid particles or gases, close to their sources for purposes of collection or sampling

3.1.21
classification
allocation of filters into groups and classes according to relevant aspects of their filtration performance

3.1.22
cleaning (after clogging)
removal of the deposit of solid or liquid particles which has produced clogging

3.1.23
clogging
deposition, progressive or otherwise, of solid or liquid particles on or within a filter medium, causing the flow to be obstructed

3.1.24
coalescence
action by which liquid particles in suspension unite to form larger particles

3.1.25
concentration
content
quantity of a solid, liquid or gaseous material expressed as a proportion of another material in which it is contained in the form of a mixture, a suspension or a solution

3.1.26
correlation ratio of sampling points
downstream particle concentration divided by the upstream particle concentration (measured without filter)

3.1.27
particle counter
device for detecting and counting numbers of discrete airborne particles present in a sample of air

3.1.28
condensation particle counter
CPC
type of **optical particle counter** (3.1.29) in which very fine airborne particles are enlarged by condensation to a size which may readily be counted by other particle counting methods

NOTE 1 It can provide data on particle numbers but not the original size distribution.

NOTE 2 The ISO committee dealing with CPC is TC 24/SC 4.

3.1.29
optical particle counter
OPC
particle counter which functions by illuminating airborne particles in a sample flow of air, converting the scattered light impulses to electrical impulse data capable of analysis to provide data on particle population and size distribution

NOTE See ISO 21501-4.

3.1.30
border zone error
with an optical limitation of the measuring volume or by means of the Gaussian distribution of the light intensity in the laser beam, the particles passing the border of the sensing zone are less illuminated than the ones passing the centre of the sensing zone

NOTE 1 The border zone error is device- and particle-size-dependent and has a direct effect on the size resolution.

NOTE 2 Due to the border zone error, the particle size is underestimated.

NOTE 3 The larger the particle to be measured, the larger the border zone error.

3.1.31
sizing accuracy
$\varepsilon(x)$
$\varepsilon(x)$ determined by the function:

$$\varepsilon(x) = \frac{x_{\text{measured}} - x_{\text{reference}}}{x_{\text{reference}}} \cdot 100$$

3.1.32
sizing resolution
$R(x)$
indicates which particle sizes can be differentiated by a particle measuring instrument

NOTE The sizing accuracy can be evaluated for any particle size as follows:

$$R(x) = \frac{\sqrt{\sigma^2{}_{\text{measured}}(x) - \sigma^2{}_{\text{reference}}(x)}}{x_{\text{reference}}} \cdot 100, \ \sigma = \text{geometric standard deviation}$$

3.1.33
lower size limit
smallest particle diameter with a counting efficiency of 0,5 ± 0,15 (50 % ± 15 %)

3.1.34
upper size limit
largest particle diameter with a counting efficiency of 0,5 ± 0,15 (50 % ± 15 %)

3.1.35
sampling flow rate
volumetric flow rate through the instrument

NOTE Any error in the volume flow will affect the reported particle number concentration.

3.1.36
calibration curve
graph depicting the relationship between scattered light intensity and particle size

NOTE For the clear particle size and quantity determination, an unambiguous, monotonically increasing calibration curve offers advantages. This enables narrower size intervals to be chosen.

3.1.37
calibrate
to compare readings from the instrument to be calibrated with those from a reference device

3.1.38
calibration particle
mono-disperse spherical particle with a known mean particle size, e.g. polystyrene latex (PSL) particle, that is traceable to an international standard of length, and where the standard uncertainty of the mean particle size is equal to or less than ± 2,5 %

NOTE The refractive index of (PSL) calibration particles is close to 1,59 at a wavelength of 589 nm (sodium D line).

[ISO 21501-3:2007, definition 2.1]

3.1.39
reference device
primary device possessing accurately known parameters used as a standard for calibrating secondary devices

3.1.40
coagulation losses
particle losses due to collision and adhesion of particles

NOTE Coagulation affects the measured particle parameters as follows: the particle number concentration decreases, the particle mass concentration remains the same and the particle size increases.

3.1.41
counting rate
N
number of counting events per unit time

3.1.42
zero count rate
N_z
number of counts registered per unit time by the particle counter when air, which is free of particles, is passed through the measuring volume

3.1.43
cyclone
dust separator or droplet separator utilizing essentially the centrifugal force derived from the motion of the gas

3.1.44
DEHS
DiEthylHexylSebacate
liquid used for generating the DEHS test aerosol

3.1.45
equivalent diameter
diameter of a spherical particle which will give behaviour equivalent to that of the particle being examined

3.1.46
count median diameter of aerosol
number median diameter of aerosol
CMD
d_m
50th percentile of the number distribution of the aerosol

NOTE 50 % of the particles are smaller than the count median diameter and 50 % are larger than the count median diameter.

3.1.47
count mean particle diameter
number mean particle diameter
d_{pm}
geometric average of the lower and upper limit of the size range

3.1.48
dispersion
operation as a result of which solid particles or liquid particles are distributed in a fluid

NOTE Also applied to a two-phase system in which one phase, known as the “disperse phase”, is distributed throughout the other, known as the “continuous medium”, e.g. DOP (Dioctyl phthalate) liquid, or liquids with similar physical properties, are dispersed in air to generate a test aerosol.

3.1.49
downstream
area or region into which fluid flows on leaving the filter

3.1.50
droplet
liquid particle of small mass, capable of remaining in suspension in a gas

NOTE In some turbulent systems, for example clouds, its diameter can reach 200 µm.

3.1.51
dust
airborne solid particles which settle by gravity in calm conditions

3.1.52
test dust capacity
TDC
amount of loading dust held by the filter at final test pressure differential

3.1.53
dust control
whole of the processes for the separation of solid particles from a gas stream in which they are suspended

NOTE By extension this also includes the activities involved in the construction and commissioning of a dust separator.

3.1.54
loading dust
synthetic dust formulated specifically for determination of the test dust capacity and arrestance of air filters

NOTE A number of loading dusts are currently used, e.g. ISO fine test dust, ASHRAE dust and JIS-11.

3.1.55
efficiency
E
fraction of contaminant entering the filter which is retained

3.1.56
average efficiency
E_{av}
value of efficiency which results from averaging the efficiencies determined over a number of discrete intervals up to the final pressure differential

3.1.57
collection efficiency
ratio of the quantity of particles retained by a separator to the quantity entering it with regard to filters, dust separators and droplet separators

NOTE It is generally expressed as a percentage.

3.1.58
conditioned efficiency
efficiency of the conditioned filter media operating at an average media velocity corresponding to the test air flow rate in the filter

3.1.59
counting efficiency
E_c
ratio, expressed as a percentage, of detected number concentration of particles divided by the actual number concentration of particles in a given size or range of sizes

3.1.60
dust loaded efficiency
efficiency of the filter operating at test flow rate and after dust loadings up to final test pressure differential

3.1.61
fractional efficiency
ability of an air cleaning device to remove particles of a specific size or size range

NOTE The efficiency plotted as a function of particle size gives the particle size efficiency spectrum.

3.1.62
initial efficiency
E_i
efficiency of the air cleaning device operating at the test air flow rate

NOTE Expressed in % for each selected size of particle.

3.1.63
integral efficiency
efficiency, averaged over the whole superficial face area of a filter under given operating conditions

3.1.64
local filter efficiency
E_{local}
efficiency at a specific point of a filter element under given operating conditions

3.1.65
minimum filter efficiency
E_{min}
minimum value of the filter efficiency curve under given operating conditions

3.1.66
effluent
fluid discharged from a given source into the external environment

NOTE This is a general term describing any fluid discharged from a given source. In this context the discharged fluid may be liquid or gaseous and may contain associated liquid and/or particulate contaminants.

3.1.67
filter element
filtering material in a preformed shape being a part of a complete filter

3.1.68
elutriation
method of separating a mixture of particles according to their settling velocities within a fluid

3.1.69
coincidence error
error which occurs because at a given time more than one particle is contained in the measurement volume of a particle counter

NOTE The coincidence error leads to a measured number concentration which is too low and a value for the particle diameter which is too high.

3.1.70
air filter
apparatus for separating solid or liquid particles or gaseous contaminants from a gas stream

NOTE The apparatus is generally formed of a layer or layers of porous, fibrous or granular material.

3.1.71
brush filter
air filter in which the medium consists of a screen of intermeshing brushes

3.1.72
cartridge filter
compact filter often of cylindrical design

3.1.73
cellular filter
replaceable filter insert which is or may be installed in a multiple bank or wall structure

NOTE Examples of these are HEPA filters, rigid bags and panels.

3.1.74
ceramic filter
filter with a medium consisting of ceramic fibres or sintered porous ceramic

3.1.75
charged filter
filter in which the medium is electrostatically charged or polarized

3.1.76
filter class
range of filtration performances clearly defined by lower and upper limit values

3.1.77
cleanable filter
filter designed to enable the removal of collected dust by application of an appropriate technique

NOTE The removal of collected dust is usually partial.

3.1.78
disposable filter
filter which is not intended to be cleaned or regenerated for re-use

3.1.79
effective filtering area
area of filter medium in the filter which collects dust

3.1.80
electret filter
filter with an electrostatically charged medium