



**International
Standard**

ISO 29464

**Cleaning of air and other gases —
Vocabulary**

Épuration de l'air et autres gaz — Vocabulaire

**Third edition
2024-07**

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 document 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 142, *Cleaning equipment for air and other gases*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 195, *Cleaning equipment for air and other gases*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 29464:2017), which has been technically revised.

The main changes are as follows:

- addition of [3.7](#) covering stand-alone electrically-powered air cleaners;
- addition of new terms and definitions in [3.5](#) and [3.6](#) due to the publication of new standards.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Cleaning of air and other gases — Vocabulary

1 Scope

This document defines terms related to the air filtration industry.

This document is applicable to particulate matter and gas phase air filters and air cleaners used for the general ventilation of inhabited enclosed spaces. It is also applicable to air inlet filters for static or seaborne rotary machines, cleanable filters, UV-C germicidal devices, and stand-alone electrically-powered air cleaners.

It is not applicable 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

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 Terms related to particle and gas-phase air cleaners

3.1.1

air cleaner

device for removing *contaminants* (3.1.12) from air in a ventilation system, building or other enclosed space

3.1.2

robotic air cleaner

air cleaner that operates and changes its physical location autonomously without user intervention

Note 1 to entry: The robotic air cleaner can consist of a part that houses the air cleaning function and can have a docking station and/or other accessories to assist its operation.

3.1.3

fresh-air air cleaner

air cleaner connected to the external environment, which provides pollutant-reduced outdoor air into an indoor space

Note 1 to entry: The fresh-air air cleaner can also include other auxiliary functions, such as heat exchange.

3.1.4

air velocity

rate of air movement

Note 1 to entry: It is expressed in m/s (fpm).

3.1.5

bypass

proportion of the *challenge air stream* (3.5.14) that passes around or through an *air cleaner* (3.1.1) without interacting with the air cleaner

3.1.6

calibrate

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

3.1.7

capture

removal of contaminants from an air stream

3.1.8

classification

allocation of air cleaners into groups and classes according to relevant aspects of their air cleaning performance

3.1.9

clean side

downstream side of an air cleaner element

3.1.10

combination product

air cleaner that includes a secondary function besides air cleaning within the same housing, such as humidifying, dehumidifying, heating, or air conditioning

3.1.11

concentration

quantity of one substance dispersed in a defined amount of another

3.1.12

contaminant

pollutant

substance (solid, liquid or gas) that negatively affects the intended use of a gas

3.1.13

contamination

pollution

presence of a substance that negatively affects the intended use of a gas

3.1.14

decontamination factor

ratio of the *contaminant* (3.1.12) concentration or particle number upstream of an air cleaner to the *contaminant concentration* (3.1.11) or particle number downstream of the air cleaner

Note 1 to entry: The decontamination factor can also be expressed as $1/(1 - \text{overall efficiency})$ or as $1/\text{penetration}$.

3.1.15

dirty side

upstream side of an air cleaner element

3.1.16

downstream

area or region into which air flows on leaving an air cleaner

3.1.17

removal efficiency

fraction or percentage of a challenge *contaminant* (3.1.12) that is removed by an air cleaner

3.1.18

average removal efficiency

value of removal efficiency which results from averaging the removal efficiencies determined over a number of discrete time intervals up to the end of an efficiency test

3.1.19

effluent

gas or liquid discharged from a given source into the external environment

Note 1 to entry: This is a general term describing any gas or liquid discharged from a given source; in this context, the discharged liquid or gas may contain associated gaseous, liquid and/or particulate *contaminants* (3.1.12).

3.1.20

face velocity

volumetric air flow rate divided by the *nominal air cleaner face area* (3.1.23)

Note 1 to entry: air cleaner face velocity is expressed in m/s (fpm).

3.1.21

filter

air filter

device for separating solid or liquid particles or gaseous *contaminant* (3.1.12) from an air stream passing through the device

Note 1 to entry: The device is generally formed of a layer or layers of porous, fibrous or granular material.

Note 2 to entry: Air being cleaned by a filter shall pass through the filter, whereas an *air cleaner* (3.1.1) can reduce air *contamination* (3.1.13) by any method.

3.1.22

filter face area

air cleaner face area

cross-sectional face area of the air cleaner through which air flows into the device

3.1.23

nominal filter face area

nominal air cleaner face area

cross-sectional face area of the air cleaner through which air flows into the device calculated using dimensions rounded up to the nearest integer

3.1.24

filter insert

replaceable part of a filter which contains the filter medium but which can only operate mounted inside a frame

3.1.25

filter medium

material used for separating contaminants from air and characterized by its porous structure

3.1.26

filter medium area

area of *filter medium* (3.1.25) contained in the filter

Note 1 to entry: For filters with pleats or folds, the filter medium area can be much larger than the *filter face area* (3.1.22).

3.1.27

effective filter medium area

area of the *filter medium* (3.1.25) contained in the filter through which air passes during operation

Note 1 to entry: This excludes areas covered by sealant, spacers, struts, etc.

Note 2 to entry: Effective filter medium area is expressed in m² (ft²).

3.1.28

medium velocity

volumetric air flow rate divided by the *effective filter medium area* (3.1.27) of the *filter* (3.1.21)

Note 1 to entry: Filter medium velocity is expressed in m/s (fpm).

Note 2 to entry: In devices where the filter medium surface area has been increased by use of pleats, folds or bags, the filter medium velocity may be much less than the filter *face velocity* (3.1.20).

3.1.29

flow rate

air flow rate

volume of air flowing through an air cleaner per unit time

3.1.30

design flow rate

design air flow rate

air flow rate specified by the manufacturer

3.1.31

user nominal air volume flow rate

volume air flow rate specified by the user, at which an air cleaner is used or tested in situ

Note 1 to entry: This flow rate may be different from the one specified by the manufacturer.

3.1.32

test flow rate

rate of air flow used for testing

Note 1 to entry: The flow rate is usually expressed in volumetric units [m³/h (cfm)].

Note 2 to entry: Test flow rate may differ from the manufacturer's specified flow through the air cleaner.

3.1.33

rated flow

flow rate through an air cleaner, either as stated by the manufacturer for defined conditions of use or as agreed between the interested parties for a particular installation

Note 1 to entry: The manufacturer's rated flow may differ from the *test air flow rate* (3.1.32).

3.1.34

gas

substance whose vapour pressure is greater than the *ambient pressure* (3.5.53) at ambient temperature

3.1.35

header frame

integral rigid frame of an air cleaner with a flange extending beyond the dimensions of the frame walls, enabling it to be fastened and sealed against the *holding frame* (3.1.36)

3.1.36

holding frame

rigid structural frame, part of an air handling system into which an air cleaner is fastened and sealed

3.1.37

housing

device used to hold an air cleaner

3.1.38

hood

inlet device for an air extraction system

3.1.39

integrity test

in situ test procedure for quantifying the unfiltered leakage of the system

3.1.40

leak

point in a filter at which the local penetration exceeds a given value

3.1.41

**penetration
breakthrough**

ratio of contaminant concentration downstream of an air cleaner to the upstream (challenge) *concentration* ([3.1.11](#))

Note 1 to entry: Sometimes expressed as a percentage.

Note 2 to entry: Penetration (P) is related to removal efficiency (E) by the expression: $E = (1 - P) \times 100 \%$.

Note 3 to entry: Penetration is related to the *decontamination factor* (DF) ([3.1.14](#)) by the expression: $DF = 1/\text{penetration}$.

3.1.42

reference device

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

Note 1 to entry: Reference particle filters are laboratory tested for *removal efficiency by particle size* ([3.2.141](#)) and/or resistance to air flow.

3.1.43

resistance to air flow

differential pressure

pressure differential

pressure drop

difference in absolute (static) pressure between two points in an air flow system

Note 1 to entry: Resistance to air flow is expressed in Pa (inches of water).

3.1.44

test air

air being used for testing purposes

3.1.45

test device

device under test

DUT

air cleaner that is being subjected to performance testing

3.1.46

upstream

area or region from which air flows as it enters an air cleaner

3.1.47

washer

dust separator ([3.2.152](#)), *droplet separator* ([3.2.151](#)) or *gas purifier* ([3.5.41](#)) that depends on a liquid acting as a collecting medium for its operation

3.2 Terms related to particulate matter filters (including general ventilation, EPA, HEPA and ULPA filters)

3.2.1

aerosol

solid and/or liquid particles suspended in a gas

Note 1 to entry: Based on European Union and US Environmental Protection Agency information, atmospheric aerosol is divided into four size categories: the ultrafine range $x < 0,1 \mu\text{m}$, the fine range $0,1 \mu\text{m} \leq x \leq 2,5 \mu\text{m}$, the coarse range $2,5 \mu\text{m} < x \leq 10 \mu\text{m}$, and the large coarse range $x > 10 \mu\text{m}$, whereby x is the aerodynamic diameter of the particle.

3.2.2

liquid phase aerosol

liquid particles suspended in a gas

3.2.3

monodisperse aerosol

aerosol, the width of whose distribution function, described by the geometric standard deviation σ_g , is less than $1,15 \mu\text{m}$

3.2.4

aerosol neutralisation

action of bringing the aerosol to a Boltzmann charge equilibrium distribution with bipolar ions

Note 1 to entry: Neutralization should not be confused with discharging.

3.2.5

aerosol photometer

instrument that measures the intensity of light scattered by an aerosol sample

3.2.6

polydisperse aerosol

aerosol, the width of whose distribution function, described by the geometric standard deviation σ_g , exceeds $1,5 \mu\text{m}$

3.2.7

quasi-monodisperse aerosol

aerosol, the width of whose distribution function, described by the geometric standard deviation σ_g , is between $1,15 \mu\text{m}$ and $1,5 \mu\text{m}$

3.2.8

reference aerosol

defined approved aerosol for test measurement within a specific size range

3.2.9

solid phase aerosol

solid particles suspended in a gas

3.2.10

test aerosol

aerosol used for determining the particle removal efficiency performance of the device being tested or for calibrating particle measurement devices

3.2.11

agglomerate

collection of solid particles adhering to each other

3.2.12

agglomeration

action leading to the formation of *agglomerates* ([3.2.11](#))

3.2.13

agglutination

action of joining, by *impact* (3.2.85), solid particles coated with a thin adhesive layer or of trapping solid particles by impact on a surface coated with adhesive

3.2.14

aggregate

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

3.2.15

arrestance

gravimetric arrestance

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

Note 1 to entry: This measure is expressed as a mass percentage.

3.2.16

average arrestance

average gravimetric arrestance

ratio of the total mass of a standard test dust retained by the filter to the total mass of dust fed up to final test pressure differential

3.2.17

initial arrestance

initial gravimetric arrestance

ratio of the mass of a standard test dust retained by the filter to the mass of dust fed after the first increment of dust load

Note 1 to entry: This measure is expressed as a mass percentage.

Note 2 to entry: For example, in ISO 29461-1 or ISO 16890-3 procedure.

3.2.18

ash

solid residue of effectively complete combustion

3.2.19

fly ash

ash entrained by combustion gases

3.2.20

bioaerosol

particles of biological origin suspended in a gaseous medium

Note 1 to entry: Bioaerosol particles include viruses, bacteria, fungi, pollen, plant debris, fragments of these and their derivatives such as endotoxins, glucans, allergens and mycotoxins.

Note 2 to entry: The size of a bioaerosol particle can be larger if it is encased within a liquid drop, for example a virus in sputum

3.2.21

burst pressure

value of differential pressure across a filter, above which damage/destruction of the *filter medium* (3.1.25) or the structure occurs

3.2.22

calibration particle

mono-disperse spherical particle with a known mean particle size

EXAMPLE Polystyrene latex (PSL) particle traceable to an international standard of length where the standard uncertainty of the mean particle size is equal to or less than $\pm 2,5\%$.

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

3.2.23

dust holding capacity

DHC

dust loading capacity

test dust capacity

TDC

total mass of loading dust captured by an air-cleaning device up to the final test resistance to air flow

3.2.24

cleaning

removal of a deposit of solid and/or liquid particles

3.2.25

clogging

deposition, progressive or otherwise, of solid or liquid particles on or within a *filter medium* (3.1.25), causing the flow to be obstructed

3.2.26

coagulation losses

particle losses due to collision and adhesion of particles

Note 1 to entry: Coagulation affects the measured particle parameters as follows: the *particle number concentration* (3.2.113) decreases, the *particle mass concentration* (3.1.11) remains the same and the *mean particle size* (3.2.117) increases.

3.2.27

coalescence

action by which liquid particles in *suspension* (3.2.155) unite to form larger particles

3.2.28

coefficient of variation

CV

standard deviation of a group of measurements divided by the mean

3.2.29

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 1 to entry: The coincidence error leads to a measured number *concentration* (3.1.11) which is too low and a value for the *particle diameter* (3.2.106) which is too high.

3.2.30

correlation ratio

measure of bias between the upstream and downstream sampling systems

Note 1 to entry: This is expressed as the downstream particle concentration divided by the upstream particle concentration measured without filter in place.

3.2.31

counting efficiency

ratio of detected number *concentration* (3.1.11) of particles to the actual number concentration of particles in a given size or range of sizes

Note 1 to entry: This is usually expressed as a percentage.

Note 2 to entry: The counting efficiency depends on the *particle size* (3.2.117) and decreases progressively in the proximity of the lower detection limit of the particle counter.

3.2.32

counting rate

number of counting events per unit time

3.2.33

cyclone

dust separator (3.2.152) or *droplet separator* (3.2.151) utilizing essentially the centrifugal force derived from the motion of the gas

3.2.34

DiEthylHexylSebacate

DEHS

liquid used for generating the DEHS *test aerosol* (3.2.10)

3.2.35

equivalent diameter

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

3.2.36

median diameter

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

3.2.37

count median diameter

number median diameter

CMD

50th percentile of the number distribution of an aerosol

Note 1 to entry: 50 % of the particles are smaller than the count median diameter and 50 % are larger than the count median diameter.

3.2.38

diluter

dilution system

system for reducing the sampled *concentration* (3.1.11) to avoid coincidence error in the particle counter

3.2.39

dispersion

operation as a result of which solid particles or liquid particles are distributed in a gas

Note 1 to entry: 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”. For example, dioctyl phthalate (DOP) liquid or liquids with similar physical properties, are dispersed in air to generate a *test aerosol* (3.2.10).

3.2.40

dioctyl phthalate

challenge contaminant used to determine particle removal performance of HEPA filters

Note 1 to entry: Also known by the acronym DOP.

3.2.41

droplet

liquid particle of small mass, capable of remaining in *suspension* (3.2.155) in a gas

Note 1 to entry: In some turbulent systems, for example clouds, its diameter can reach 200 µm.

3.2.42

dust

airborne solid particles which settle by gravity in calm conditions

3.2.43

dust control

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

Note 1 to entry: By extension, also the activities involved in the construction and commissioning of a *dust separator* ([3.2.152](#)).

3.2.44

dust feeder

device which is used to distribute test dust to the filter

3.2.45

loading dust

synthetic test dust

synthetic dust formulated specifically for determination of the test dust capacity and arrestance of *air filters* ([3.1.21](#))

Note 1 to entry: A number of loading dusts are in use; some of them are defined in ISO 15957.

3.2.46

collection efficiency

ratio of the quantity of particles retained by a *separator* ([3.2.150](#)) to the quantity entering it with regard to *filters* ([3.1.21](#)), *dust separators* ([3.2.152](#)) and *droplet separators* ([3.2.151](#))

Note 1 to entry: This measure is normally expressed as a percentage.

3.2.47

elutriation

method of separating a mixture of particles according to their settling velocities within a gas

3.2.48

superficial face area

cross-sectional area of the *filter element* ([3.2.59](#)) through which the air flow passes

3.2.49

brush filter

air filter ([3.1.21](#)) in which the medium consists of a screen of intermeshing brushes

3.2.50

cartridge filter

compact filter often of cylindrical design

3.2.51

cellular filter

replaceable *filter insert* ([3.1.24](#)) which is or can be installed in a multiple bank or wall structure

Note 1 to entry: Examples of these are *HEPA filters* ([3.2.66](#)), rigid bags and panels.

3.2.52

ceramic filter

filter with a medium consisting of ceramic fibres or porous ceramic

3.2.53

charged filter

electret filter

filter with an electrostatically charged medium

3.2.54

filter class

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

3.2.55

cleanable filter

filter designed to permit the removal of collected dust by application of an appropriate technique

3.2.56

coarse filter

filtration device with particle *removal efficiency* (3.1.17) < 50 % in the ePM₁₀ particle range

3.2.57

disposable filter

filter which is not intended to be cleaned or regenerated for reuse

3.2.58

efficient particulate air filter

EPA filter

filter with performance complying with requirements of filter classes ISO 15 E to ISO 25 E as specified in ISO 29463-1

Note 1 to entry: EPA filters cannot be and will not be leak tested.

Note 2 to entry: The European Committee for Standardization CEN has not adopted ISO 29463-1. EPA filters are covered in Europe by the European standard EN 1822-1. EN 1822-1:2019, Table A.1 gives a side-by-side comparison of EN 1822-1 and ISO 29463-1.

3.2.59

filter element

structure made of the filtering material, its supports and its interfaces with the filter housing

3.2.60

fabric filter

filter medium (3.1.25) manufactured either from woven or non-woven textile or a combination of both

Note 1 to entry: The term is most often applied to dust collectors. In these devices the filtering is effectively carried out by a bed of deposited dust, the textile providing a supporting substrate.

3.2.61

fibrous filter

filter comprising a medium made up of fibres

Note 1 to entry: The efficiency of these filters is derived from the presence of very fine fibres which are supported by coarser fibres in a relatively open structure.

Note 2 to entry: Fibrous filters are usually disposable.

3.2.62

final filter

air filter (3.1.21) used to collect the loading dust passing through or *shedding* (3.2.116) from the filter under test

3.2.63

fine filter

filtration device with particle removal efficiency ≥ 50 % in the PM₁₀ particle range

3.2.64

filter group designation

designation of a *group of filters* (3.2.65) fulfilling certain requirements in the filter classification

Note 1 to entry: ISO 16890-1 defines four groups of filters. Group designations are "ISO coarse", "ISO ePM10", "ISO ePM2,5" and "ISO ePM1".

3.2.65

group of filters

comprises filters of more than one adjacent class within a performance spectrum

3.2.66

high efficiency particulate air filter

HEPA filter

filter with performance complying with requirements of *filter classes* ISO 35 H to ISO 45 H as specified in ISO 29463-1

3.2.67

filter installation

filtration devices and systems such as a single filter or a *group of filters* ([3.2.65](#)) mounted together with the same inlet and outlet of air

3.2.68

metal filter

filter with a medium consisting of metal mesh(es), fibres or porous metal

3.2.69

filter pack

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

3.2.70

panel filter

shallow parallel-faced *filter element* ([3.2.59](#)) or cell

3.2.71

particle air filter

filter designed to remove suspended particles from air flowing through it

3.2.72

pocket filter

bag filter

filter in which the medium is formed into pockets or bags

3.2.73

reference filter

dry media-type filter that has been laboratory tested for removal efficiency by particle size

3.2.74

renewable media filter

filter in which the medium can be replaced

3.2.75

roll filter

filter incorporating a means for advancing new medium to replace used medium

3.2.76

self-cleaning filter

filter having an inbuilt mechanism for removing collected *contaminants* ([3.1.12](#))

3.2.77

filter type

designation of the structure and test regime of a filter

3.2.78

ultra low penetration air filter

ULPA filter

filter with performance complying with the requirements of filter classes ISO 50 U – ISO 75 U as specified in ISO 29463-1

Note 1 to entry: The European Committee for Standardization CEN has not adopted ISO 29463-1. ULPA filters are covered in Europe by the European standard EN 1822-1. EN 1822-1:2019, Table A.1 gives a side-by-side comparison of EN 1822-1 and ISO 29463-1.

3.2.79

sampling volume flow rate

fraction of the total flow stream required by the instrument used for determining the characteristics of the air

3.2.80

service flow

gas flow rate through a *separator* (3.2.150) under given service conditions

3.2.81

folded pack

pack of the *filter medium* (3.1.25) formed by uniform individual folds

3.2.82

fume

solid aerosol generated by condensation, generally after evaporation from melted substances such as metals and often accompanied by chemical reactions such as oxidation

Note 1 to entry: In popular usage, gaseous effluent, often unpleasant and malodorous, which can arise from chemical processes.

3.2.83

general ventilation

process of moving air from outside the space, recirculated air, or a combination of these into or about a space or removing air from the space

3.2.84

grit

airborne solid particles in the atmosphere or flues

Note 1 to entry: In the UK, defined to be of size greater than 75 μm .

3.2.85

impact

collision of two particles with each other, or of a particle with a solid or liquid surface

3.2.86

impaction

inertial impingement

inertial separation due to mass and velocity of a particle causing divergence from the air flow stream lines onto individual filter fibres

3.2.87

isoaxial sampling

sampling in which the flow in the sampler inlet is moving in the same direction as the flow being sampled

3.2.88

isokinetic sampling

technique for air sampling such that the probe inlet *air velocity* (3.1.4) is the same as the velocity of the air surrounding the sampling point

3.2.89

KCl

solid potassium chloride particles generated from an aqueous solution and used as *test aerosol* (3.2.10)

3.2.90

measuring procedure with fixed sampling probes

determination of the *overall efficiency* (3.2.137) using fixed sampling probes upstream and *downstream* (3.1.16) of the filter being tested

3.2.91

minimum fractional test efficiency

fractional removal efficiency measured according to ISO 16890-2 after applying the conditioning method defined in ISO 16890-4

3.2.92

mist

suspension ([3.2.155](#)) of droplets in a gas

3.2.93

particle

small discrete mass of solid or liquid matter

3.2.94

particle bounce

behaviour of particles that impinge on the filter medium without being retained

Note 1 to entry: Particle bounce is a different process from particle re-entrainment.

3.2.95

particle concentration method

method that can determine the total concentration of particles in the aerosol either by multiple particle counting or chemical concentrations

Note 1 to entry: No particle size classification can be determined by this method.

3.2.96

particle counter

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

3.2.97

allowable measurable concentration of the particle counter

fifty percent of the maximum measurable concentration as stated by the manufacturer of the *particle counter* ([3.2.96](#))

3.2.98

particle counter border zone error

particle sizing error that occurs when particles pass through the optical border of the sensing zone and receive less illumination

Note 1 to entry: The border zone error is device and particle size dependent and has a direct effect on the size resolution.

Note 2 to entry: Due to the border zone error, the *particle size* ([3.2.117](#)) is underestimated.

Note 3 to entry: The larger the particle to be measured, the bigger the border zone error.

3.2.99

particle counter calibration curve

graph depicting the relationship between scattered light intensity and particle size

Note 1 to entry: For the clear particle size and quantity determination, an unambiguous, monotonically increasing calibration curve offers advantages. This enables narrower size intervals to be chosen.

3.2.100

condensation particle counter

CPC

type of *optical particle counter* ([3.2.101](#)) in which very fine airborne particles are enlarged by condensation to a size which can readily be counted by other particle counting methods

Note 1 to entry: It can provide data on *particle numbers* ([3.2.112](#)) but not the original size distribution.

3.2.101

optical particle counter

OPC

instrument that counts the number of particles and measures their size using the light scattering method or the light extinction method

3.2.102

particle counter sizing accuracy

measure of the ability of an instrument to correctly determine the size of a reference particle of known size

Note 1 to entry: Sizes are usually stated in μm .

3.2.103

particle counter sizing resolution

measure of the ability of an instrument to precisely differentiate particles of different sizes

3.2.104

particle counter sampling flow rate

particle counter sampling air flow

volumetric flow rate through the instrument

Note 1 to entry: Any error in the volumetric flow rate will affect the reported *particle number concentration* ([3.2.113](#)).

3.2.105

particle counting and sizing method

particle counting method which allows both the determination of the number of particles and also the classification of the particles according to size

EXAMPLE By using an *optical particle counter* ([3.2.101](#)).

3.2.106

particle diameter

geometric diameter (equivalent spherical, optical or aerodynamic, depending on context) of the particles of an aerosol

Note 1 to entry: Particle diameter is often referred to simply as "particle size".

3.2.107

count mean particle diameter

number mean particle diameter

geometric average of the lower and upper limit of the size range

3.2.108

mean diameter

mean particle diameter

geometric mean of the upper and lower border diameters in a size range

3.2.109

particle flow distribution

distribution of the particle flow over a plane at right angles to the direction of flow

3.2.110

particle flow rate

number of particles that are measured or that flow past a specified cross-section per unit time

3.2.111

particle lower size limit

smallest *particle diameter* ([3.2.106](#)) with a counting efficiency of $0,5 \pm 0,15$ (50 % \pm 15 %)

3.2.112

particle number

number of particles present in a defined group

3.2.113

particle number concentration

number of particles per unit of volume of air

3.2.114

particle production rate

number of particles produced per unit time by an aerosol generator

3.2.115

particle re-entrainment

re-entrainment

release to the air flow of particles previously captured on the filter medium

3.2.116

particle shedding

shedding

release to the air flow of particles due to *particle bounce* (3.2.94) and re-entrainment effects and to the release of fibres or *particulate matter* (3.2.123) from the filter or filtering material

Note 1 to entry: Shedding typically refers to particles that are measured downstream of the filter when there is nothing injected upstream of the filter.

3.2.117

particle size

geometric diameter (equivalent spherical, optical or aerodynamic, depending on context) of the particles of an aerosol

3.2.118

particle size analysis

technique used to measure the size distribution of an assembly of particles

3.2.119

particle size distribution

presentation, in the form of tables of numbers or of graphs, of the experimental results obtained using a method or an apparatus capable of measuring the equivalent diameter of particles in a sample or capable of giving the proportion of particles for which the equivalent diameter lies between defined limits

3.2.120

most penetrating particle size

MPPS

particle size (3.2.117) at which the minimum of the particle size efficiency curve occurs under test conditions

Note 1 to entry: This MPPS is dependent on the *filter medium* (3.1.25) and the test conditions.

3.2.121

particle size range

defined particle counter channel

3.2.122

particle upper size limit

largest *particle diameter* (3.2.106) with a counting efficiency of $0,5 \pm 0,15$ (50 % \pm 15 %)

3.2.123

particulate matter

PM

solid and/or liquid particles

3.2.124

particulate matter removal efficiency

ePM_x

removal efficiency (3.1.17) of an air cleaning device in reducing the mass concentration of particles with an optical diameter between 0,3 μm and $x \mu\text{m}$

3.2.125

particulate matter

PM₁₀

particulate matter (3.2.123) which passes through a size-selective inlet with a 50 % efficiency cutoff at 10 µm aerodynamic diameter

3.2.126

particulate matter

PM_{2,5}

particulate matter (3.2.123) which passes through a size-selective inlet with a 50 % efficiency cutoff at 2,5 µm aerodynamic diameter

3.2.127

particulate matter

PM₁

particulate matter (3.2.123) which passes through a size-selective inlet with a 50 % efficiency cutoff at 1 µm aerodynamic diameter

3.2.128

porous layer

permeable layer of solid material in any form having interstices of small size, generally known as “pores”

3.2.129

precipitation

operation in which particles are separated from a gas stream in which they are suspended

Note 1 to entry: For example, by the action of an electrical field or a thermal gradient.

3.2.130

electrostatic precipitator

device in which particles become electrostatically charged and are precipitated on the collecting surface

Note 1 to entry: Also referred to as electrostatic collector, electrical separator or electrostatic separator.

3.2.131

purification

total or partial removal of unwanted constituents from a gaseous medium

3.2.132

removal efficiency accountability test

in situ test procedure meeting a requirement for an accurate system overall removal efficiency determination at *MPPS* (3.2.120)

3.2.133

conditioned removal efficiency

removal efficiency of the conditioned filter medium operating at an average medium velocity corresponding to the *test flow rate* (3.1.32) in the filter

Note 1 to entry: The conditioning procedure varies depending on the standard being used.

3.2.134

dust loaded removal efficiency

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

3.2.135

fractional removal efficiency

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

Note 1 to entry: The efficiency plotted as a function of particle size gives the particle size efficiency spectrum.

3.2.136

initial removal efficiency

initial particle removal efficiency

removal efficiency of the air cleaning device measured at the start of a performance test while operating at the *test flow rate* (3.1.32)

Note 1 to entry: Expressed in % for each selected size of particle.

3.2.137

integral removal efficiency

overall removal efficiency

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

3.2.138

local filter removal efficiency

removal efficiency at a specific point of a *filter element* (3.2.59) under given operating conditions

3.2.139

minimum filter removal efficiency

minimum value of the filter removal efficiency curve under given operating conditions

3.2.140

particle size removal efficiency

removal efficiency for a specific particle diameter

Note 1 to entry: The removal efficiency plotted as a function of the *particle diameter* (3.2.106) gives the fractional efficiency curve.

3.2.141

removal efficiency by particle size

removal efficiency

ratio of the number of particles retained by the filter to the number of particles measured upstream of the filter for a given particle-size range

3.2.142

final resistance to air flow

resistance to air flow up to which the filtration performance is measured for *classification* (3.1.8) or other purposes

Note 1 to entry: Final resistance to air flow is expressed in Pa (inches of water).

3.2.143

initial resistance to air flow

resistance to air flow of the clean filter operating at its *test air flow rate* (3.1.32)

Note 1 to entry: Initial resistance to air flow is expressed in Pa (inches of water).

3.2.144

mean resistance to air flow

arithmetical mean value of the measured number of resistances to air flow

3.2.145

recommended final resistance to air flow

maximum operating resistance to air flow of the filter as recommended by the manufacturer

Note 1 to entry: Recommended final resistance to air flow is expressed in Pa (inches of water).

3.2.146

sampling air flow

volumetric flow rate through the sampling instrument

3.2.147

sampling duration

time during which the particles in the sampling volume flow are counted (upstream or *downstream* ([3.1.16](#)))

3.2.148

scan test

test procedure by which local efficiency or penetration values are determined by sampling filtered air at the downstream filter face according to a specified grid pattern

3.2.149

sedimentation

separation of particles from the gas in which they are suspended, by the action of gravity

3.2.150

separator

apparatus for separating solid or liquid particles or gases from a gaseous stream in which they are suspended or mixed

Note 1 to entry: A separator (also known as an inertial separator or a collector) takes larger *contaminants* ([3.1.12](#)) out of the air stream, often to prevent them from reaching filters downstream.

3.2.151

droplet separator

apparatus for separating suspended liquid particles from a gas stream

3.2.152

dust separator

apparatus for separating suspended solid particles from a gas stream

3.2.153

smoke

solid or liquid aerosol resulting from combustion of organic materials including fossil fuels, wood and cigarettes

3.2.154

soot

deposits of agglomerated carbonaceous particles formed by incomplete combustion

3.2.155

suspension

two-phase system in which one phase, the disperse phase, is distributed throughout the other, known as the continuous phase

3.2.156

system removal efficiency

removal efficiency ([3.1.17](#)) of an air cleaning system where upstream and downstream particle count measurements may be across several filter banks or other system components

3.2.157

total particle count method

particle counting method in which the total number of particles in a certain sample volume is determined without classification according to size

EXAMPLE 1 By using a *condensation particle counter* ([3.2.100](#)), see ISO 29463-5.

EXAMPLE 2 By using a condensation nucleus counter, see ISO 29463-4.

3.2.158

transmission

ratio of the quantity of particles leaving a *filter* ([3.1.21](#)), *dust separator* ([3.2.152](#)) or *droplet separator* ([3.2.151](#)), to the quantity entering it

3.2.159

undersize

percentage of particles smaller than a specified *particle size* (3.2.117) in a *particle size distribution* (3.2.119)

Note 1 to entry: Undersize measurement can be *particle number* (3.2.112) or concentration.

3.2.160

user nominal filter medium velocity

air volume flow rate specified by the user divided by the effective filter medium area specified by the filter manufacturer

3.2.161

zero count rate

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

3.3 Terms related to air intake particle filters for rotary machines

3.3.1

depth loading filter

filter in which particles penetrate into the *filter medium* (3.1.25) and are collected on the fibres in the depth of the filter medium

3.3.2

pulse jet filter

cleanable air filter, that typically is cleaned with air jet pulses to provide a longer service life

3.3.3

static filter

air filter (3.1.21) that will be removed (exchanged) after it has reached its final test resistance to air flow and that is not cleaned with jet pulses or other means in order to fully or partially, retrieve its initial performance (pressure drop and efficiency)

3.3.4

surface loading filter

filter in which the dust is collected on the surface of the *filter medium* (3.1.25)

3.3.5

two-fluid nozzle

nozzle capable of spraying fine mists by mixing liquid and air

3.3.6

saturated air

air that contains the maximum amount of water vapour it can hold at its temperature and pressure

3.3.7

test duration

time to reach a certain *resistance to air flow* (3.1.43) or other termination conditions to end the test

3.3.8

water fog

water droplets and mist generated by water spray device

3.3.9

water fog mass concentration

mass of liquid water droplets per unit volume of air

3.4 Terms related to cleanable particle filter degradation

3.4.1

aged flat filter sheet

flat filter sheet exposed under simulated hot and *corrosive gas* (3.4.7) conditions for a preset period of time to evaluate the change of filtration properties

3.4.2

air permeability

gas volume flow rate per unit filtration area at resistance to air flow of 124,5 Pa

3.4.3

average gas concentration

mean concentration of *test gases* (3.4.29) during the *exposure* (3.6.4)

3.4.4

batch type exposure chamber

chamber in which filter sheets are exposed to stationary *test gas* (3.4.29) mixture

3.4.5

chemical degradation

degradation (3.4.8) of chemical properties of filter media by the interaction with *test gas* (3.4.29)

3.4.6

continuous-flow-method

method of exposing a filter sheet in a continuous flow of *test gas* (3.4.29) mixture

3.4.7

corrosive gas

chemical which reacts with *filter medium* (3.1.25) and change its chemical and physical properties

3.4.8

degradation

change in physical and chemical performance of a *filter medium* (3.1.25) caused by interaction with *corrosive gases* (3.4.7)

3.4.9

elongation

incremental change in length of test specimen determined by tensile test

3.4.10

elongation at maximum load

incremental change in length of test specimen at maximum load determined by tensile test

3.4.11

elongation ratio

ratio of *elongation* (3.4.9) of test specimen to its initial *length between holders* (3.4.16)

Note 1 to entry: It can be expressed as a percentage.

3.4.12

elongation ratio at maximum load

ratio of *elongation* (3.4.9) of test specimen at maximum load in tensile test to its initial *length between holders* (3.4.16)

3.4.13

exposure chamber

chamber to expose test filter sheet to *corrosive gases* (3.4.7)

3.4.14

flow-through type replacement

method to replace test gas in the *batch type exposure chamber* (3.4.4) by introducing *test gas* (3.4.29) continuously to the chamber

3.4.15

initial load

load applied to the test specimen at the start of tensile test

3.4.16

length between holders

length between the jaws of the top and bottom holding chucks as positioned at the start of the tensile test

3.4.17

load

tensile strength (3.4.28) of test specimen observed in the tensile test

3.4.18

non-continuous-flow-method

method of exposing a filter sheet in a stationary *test gas* (3.4.29) mixture

3.4.19

nonwoven fabric

filter medium (3.1.25) manufactured using fabric made from long fibres bonded together with each other by chemical, mechanical, heat or solvent treatment

3.4.20

number of replacement

number of *test gas* (3.4.29) replacement for whole heating space volume of the test chamber

3.4.21

pulse cleaning

process for removing collected particulate matter from a filter element by injecting compressed air in short bursts from the clean side of the filter element

3.4.22

replacement of gas

exchange gas to maintain *test gas* (3.4.29) concentration within certain concentration range

3.4.23

retainer

cage

device supporting the filter element as it performs dust collection

3.4.24

retention of tensile strength

ratio of *tensile strength* (3.4.28) of the test specimen subjected to thermal and/or acid gas exposure to that of the test specimen without the *exposure* (3.6.4)

3.4.25

snap ring

metallic ring-shaped spring mounted at the open end of the filter element

3.4.26

strip method

method of implementing tensile test with holding whole width of the test specimen with a holding device

3.4.27

tensile speed

speed to pull a test specimen in tensile test

3.4.28

tensile strength

value of the maximum *load* (3.4.17) divided by the width of test specimen

3.4.29

test gas

gas which can cause changes in physical properties of filter media to be used for tensile test

3.4.30

thermal exposure

exposure (3.6.4) of filter medium to an elevated temperature to accelerate the change in its physical properties

3.4.31

vacuum replacement

method to replace *test gas* (3.4.29) in the *batch type exposure chamber* (3.4.4) by the use of vacuum

3.4.32

woven fabric

filter medium (3.1.25) manufactured using a fabric formed by weaving

3.5 Terms related to gas phase air cleaners (GPAC)

3.5.1

absorption

transport and dissolution of one substance into another to form a mixture having the characteristics of a solution

3.5.2

active site

position on an *adsorbent* (3.5.4) surface with the potential to trap an *adsorbate* (3.5.3) molecule

3.5.3

adsorbate

molecular compound in gaseous or vapour phase that can be retained by an *adsorbent* (3.5.4) medium

3.5.4

adsorbent

solid material having the ability to retain gases or vapours on its surface by physical or chemical processes

3.5.5

regenerable adsorbent

adsorbent (3.5.4) material which, after saturation, can be treated to recover its adsorption properties thereby enabling its reuse

3.5.6

ageing of adsorbent

chemical or physical process which reduces the effectiveness (efficiency and/or capacity) of an *adsorbent* (3.5.4)

Note 1 to entry: Ageing reduces the number of *active sites* (3.5.2).

3.5.7

adsorption

process in which the molecules of a gas or vapour adhere by physical or chemical processes to the exposed surface of solid substances, both the outer surface and inner pore surface, with which they come into contact

3.5.8

activated alumina

aluminium oxide, usually in the form of granules, treated to enhance its surface area and consequent ability to adsorb gases

3.5.9

bed depth

depth of the *adsorbent* (3.5.4) medium through which the gas being processed passes

Note 1 to entry: See 3.1.34.

3.5.10

biofilter

bioreactor treating waste gas with the aid of biofilm attached to the packing media whose moisture is maintained by a prepositive humidifier or intermittent water feeding to the filter bed

3.5.11

breakthrough time

time to reach a specified penetration (x)

Note 1 to entry: Relevant breakthrough times can be defined as penetrations of 5 %, 50 % and 95 % (tb5, tb50, tb95)

Note 2 to entry: Breakthrough time is sometimes referred to as breakthrough point.

3.5.12

breakthrough versus time curve

plot of *contaminant* (3.1.12) penetration versus time for a particular *challenge concentration* (3.5.16) and air flow

3.5.13

adsorbate capacity

amount (mass or moles) of a selected *adsorbate* (3.5.3) that can be contained in the GPAC medium or device under given test conditions and end point (termination time)

Note 1 to entry: Capacity can also be negative during *desorption* (3.5.22).

3.5.14

challenge air stream

test *contaminant(s)* (3.1.12) of interest diluted to the specified concentration(s) of the test prior to filtration

3.5.15

challenge compound

chemical compound that is being used as the *contaminant* (3.1.12) of interest for any given test

3.5.16

challenge concentration

concentration of the test *contaminant(s)* (3.1.12) of interest in the air stream prior to filtration (*challenge air stream* (3.5.14))

3.5.17

channelling

disproportionate or uneven flow of gas through passages of lower resistance due to inconsistencies in the design or production of a GPACD, particularly in packed granular beds

3.5.18

activated charcoal

activated carbon

carbon, usually in the form of granules, treated to enhance its surface area and consequent ability to adsorb gases through a highly developed pore structure

Note 1 to entry: It is usually produced from coal, carbonized coconut shell or other organic materials.

3.5.19

chemisorption

chemical adsorption

trapping of gaseous or vapour contaminants on an *adsorbent* (3.5.4) involving chemical reaction on the adsorbent surface

3.5.20

close valve time

time when the challenge gas(es) are initially turned off or when switching from upstream to downstream monitoring

3.5.21

decay time

time required for the gas contaminant monitoring instrument to record a reduction from an initial value greater than 95 % of the *challenge concentration* (3.5.16) to a final value of less than 5 % of the challenge concentration at the downstream sampling point for a specific test, challenge gas and gas flow, after stopping the injection of the *contaminant* (3.1.12) with no GPAC media or device present

3.5.22

desorption

process in which *adsorbate* (3.5.3) molecules leave the surface of the *adsorbent* (3.5.4) and re-enter the air stream

Note 1 to entry: Desorption is the opposite of adsorption.

3.5.23

initial dose

mass per *GPACD face area* (3.5.35) that reaches a *GPACD* (3.5.34) calculated from air flow in (volume per time), time, pollution *concentration* (3.1.11) (mass per volume) and GPACD face area during the test phase for determination of the *initial removal efficiency* (3.5.60)

3.5.24

normalised dose

mass per *GPACD face area* (3.5.35) that reaches a *GPACD* (3.5.34) calculated from air flow in (volume per time), time, pollution *concentration* (3.1.11) (mass per volume) and GPACD face area

3.5.25

heavy duty

HD

duty level (specific dose) of a contaminant that corresponds to a *removal efficiency* (3.5.55) versus dose performance for a *GPACD* (3.5.34) that is used in challenging environments (e.g. heavily polluted environments)

3.5.26

light duty

LD

duty level (specific dose) of a contaminant that corresponds to a *removal efficiency* (3.5.55) versus dose performance for a *GPACD* (3.5.34) that is used as an entry level solution, for low *concentrations* (3.1.11) or intermittent contamination episodes

3.5.27

medium duty

MD

duty level (specific dose) of a contaminant that corresponds to a *removal efficiency* (3.5.55) versus dose performance for a *GPACD* (3.5.34) that is used for medium *concentrations* (3.1.11) of contamination

3.5.28

very light duty

vLD

duty level corresponding to a *removal efficiency* (3.5.55) versus dose performance for a *GPACD* (3.5.34) that reaches less than 50 % efficiency at the *LD* dose

3.5.29

carbon filter

filter in which the filtering medium is, or includes, *activated charcoal* (3.5.18) and which is used for the separation of gaseous substances from the passing air

3.5.30

sorption filter

filter that removes gases or vapour contaminants from a gas stream using adsorption or absorptive processes

3.5.31

filtration

separation of *contaminants* (3.1.12) from a gas stream in which they are suspended through retention of the contaminants (by extension, also the whole of the activities involved in the construction and commissioning of a *filter installation* (3.2.67))

3.5.32

flow rate sampling point

location where the air flow rate is sufficiently stable to permit a reliable flow measurement

3.5.33

test volume flow rate

volumetric air flow rate used for testing

3.5.34

gas phase air cleaning device

GPACD

assembly of a fixed size enabling the removal of specific gas- or vapour-phase contaminants

Note 1 to entry: It is normally box shaped or fits into a box of dimensions between 290 mm × 290 mm × 290 mm up to approximately 610 mm × 610 mm × 610 mm or 2 ft × 2 ft × 2 ft.

3.5.35

GPACD face area

nominal cross-sectional area of the *GPACD* (3.5.34)

Note 1 to entry: For the purpose of standardizing measurements, the nominal area is calculated using 610 mm × 610 mm for a full-size filter, 610 mm × 305 mm for a half-size filter and 305 mm × 305 mm for a quarter-size filter.

3.5.36

GPAC medium or device face area

cross-sectional area of the GPAC medium or device also including a header frame or other support structures if so equipped when viewed from the direction of air flow using exact dimensions

3.5.37

gas phase air cleaning medium

GPACM

solid medium or medium configuration used for filtering a *contaminant* (3.1.12)

EXAMPLE A porous film or fibrous layer; a bead shaped, granular or pelletized adsorbent (or chemisorbent); a support structure of fabric, foam or monoliths containing *adsorbent* (3.5.4) in the form of small-sized particles, granules, spheres or powder; a woven or *nonwoven fabric* (3.4.19) completely made from an adsorbent material.

3.5.38

GPACM-FL

adsorbent (3.5.4) in the form of flat sheet that is flexible, thin and nominally two-dimensional

EXAMPLE Woven or *nonwoven fabrics* (3.4.19), wet laid papers, smooth pads, felts, etc. normally handled as roll goods.

3.5.39

GPACM-LF

adsorbent (3.5.4) in the form of particles of different shape and size intended for loose fill applications for example

3.5.40

GPACM-TS

adsorbent (3.5.4) in the form of a three-dimensional structure that is many times thicker than flat sheet and used as a finished element in a device

EXAMPLE Flexible open-cell structures, i.e. of thicker impregnated foam, corrugated pads, etc. and air permeable rigid structures, i.e. of bonded particles, honeycomb trays, extruded monoliths, etc.

3.5.41

gas purifier

apparatus for totally or partially removing one or more constituents from a gas mixture

3.5.42

lag time

rise time

time between initial injection of *contaminant* (3.1.12) and reaching 95 % of the *challenge concentration* (3.5.16) for an empty duct measured at the downstream sampling location

Note 1 to entry: Lag/rise time is specific to a particular test, challenge gas and gas flow rate

3.5.43

molecular contamination

contamination (3.1.13) present in gas or vapour phase in an air stream and excluding compounds in particulate (solid) phase regardless of their chemical nature

3.5.44

molecular sieve

silica-based mineral having a crystalline three-dimensional structure with cavities and channels whose surfaces can adsorb small molecules

3.5.45

open valve time

time at which challenge contaminants are initially injected into the test duct

3.5.46

ppb(v)

parts per billion by volume concentration measure normally used to record ambient levels of outdoor pollution

Note 1 to entry: Units are mm^3/m^3 .

3.5.47

ppm(v)

parts per million by volume concentration measure normally used to record pollution levels in, for example, work place safety

Note 1 to entry: Units are cm^3/m^3 and ml/m^3 .

3.5.48

physisorption

physical adsorption

attraction of an *adsorbate* (3.5.3) to the surface, both outer surface and inner pore surface, of an *adsorbent* (3.5.4) by physical forces (Van der Waals forces)

3.5.49

pores

minute passageways through which gas can pass or that expose to the gas stream the internal surfaces of an *adsorbent* (3.5.4) medium

3.5.50

macro-pores

largest sized *pores* (3.5.49) (diameter > 50 nm) of *adsorbent* (3.5.4) media

3.5.51

meso-pores

intermediate sized *pores* (3.5.49) (diameter > 2 nm and < 50 nm) of *adsorbent* (3.5.4) media

3.5.52

micro-pores

smallest sized *pores* (3.5.49) (diameter < 2 nm) of *adsorbent* (3.5.4) media

3.5.53

ambient pressure

absolute barometric pressure immediately outside the test rig

3.5.54

purge time

time required for the contaminant sampling system and monitoring instrument to register a change from an initial value lower than 1 % of the *challenge concentration* (3.5.16) to a final value greater than 95 % of the challenge concentration (or vice versa), as when a single instrument is switched from upstream to downstream monitoring and back

3.5.55

removal efficiency

fraction or percentage of a challenge contaminant that is retained by a GPAC medium or device at a given time

Note 1 to entry: Removal efficiency is also known simply as "efficiency".

3.5.56

removal efficiency versus capacity curve

plot of the GPACD *removal efficiency* (3.5.55) against the integrated capacity over the duration of a challenge test for a particular *challenge concentration* (3.5.16) and air flow

3.5.57

removal efficiency versus normalised dose curve

plot of the GPACD *removal efficiency* (3.5.55) against the normalised dose over the duration of a challenge test for a particular *challenge concentration* (3.5.16) and air flow

3.5.58

removal efficiency versus time curve

plot of the GPAC medium or device *removal efficiency* (3.5.55) against time over the duration of a challenge test for a particular *challenge concentration* (3.5.16) and air flow

3.5.59

end removal efficiency

removal efficiency (3.5.55) calculated from the concentrations at the end of the test

3.5.60

initial removal efficiency

removal efficiency of an unexposed filter or unexposed GPACD calculated as soon as possible after the start of a test

3.5.61

integrated removal efficiency

numerically integrated fraction or percentage of a challenge *contaminant* (3.1.12) that is removed by a GPACD (3.5.34) over a specified time or dose period

3.5.62

residence time

relative time that an increment of gas [or *contaminant* (3.1.12)] is within the boundaries of the medium volume

Note 1 to entry: An example of the medium volume is a bed of granules or a non-woven sheet.

Note 2 to entry: In typical use and in this document, this value neglects the fact that the medium and possible support structures occupy a significant portion of the volume of the bed (residence time is calculated as total bed volume/air flow rate).

3.5.63

retentivity

measure of the ability of an *adsorbent* (3.5.4) or GPACD to resist *desorption* (3.5.22) of an *adsorbate* (3.5.3)

Note 1 to entry: Computed as the residual capacity (fraction remaining) after purging the adsorbent with clean, conditioned air only, following challenge breakthrough.

3.5.64

normalised retentivity

measure of the ability of an *adsorbent* (3.5.4) or GPACD to resist *desorption* (3.5.22) of an *adsorbate* (3.5.3) per *GPACD face area* (3.5.35)

Note 1 to entry: Computed as the residual capacity (fraction remaining) after purging the adsorbent with clean, conditioned air only, following challenge breakthrough and expressed per *GPACD face area* (3.5.35).

3.5.65

sorbates

molecular compounds that are retained in the *adsorbent* (3.5.4) of the device

Note 1 to entry: The sorbate will refer to both intended compounds like the selected challenge gas in a test or pollution in real service but also any other compounds present in the air stream, e.g. gases and vapours (3.5.71).

3.5.66

sorption

process in which gas or liquid molecules are removed by the GPACM by *absorption* (3.5.1) or *adsorption* (3.5.7)

3.5.67

space velocity

measure of *residence time* (3.5.62) of the air flow to pass through the *adsorbent* (3.5.4) bed

EXAMPLE Space velocity = volumetric flow rate/total volume of the bed.

Note 1 to entry: Space velocity = (residence time)⁻¹.

3.5.68

test end time

time when a desired concentration or other termination criteria have been met in any of the prescribed test procedures

Note 1 to entry: See also the definition for *breakthrough time* (3.5.11).

3.5.69

test start time

time when contaminant concentration upstream equals the *challenge concentration* (3.5.16) for an empty duct

3.5.70

transit time

gas or *vapour* (3.5.71) flow time to pass through the sorbent

Note 1 to entry: Transit time is calculated by dividing the sorbent volume by the air flow rate.

3.5.71

vapour

substance whose vapour pressure is less than the *ambient pressure* (3.5.53) at ambient temperature, but is present in the gas phase through evaporation or sublimation

3.5.72

zeolite

aluminium silicate granules or pellets having an open lattice structure with *pores* (3.5.49) running through them which can trap small molecules

3.6 Terms related to UVC devices

3.6.1

air disinfection

process that can remove, inactivate or destroy the *airborne microorganisms* (3.6.12), especially *pathogens* (3.6.15) in air

Note 1 to entry: Disinfection is a less lethal process of inactivating microorganisms compared to sterilization.

3.6.2

cutaneous damage

any damage to the skin, particularly that caused by *exposure* (3.6.4) to UV-C energy

3.6.3

erythema

reddening of the skin, with or without inflammation, caused by the actinic effect of solar radiation or artificial optical radiation

3.6.4

exposure

subjection to infectious agents, irradiation, particulate matter or chemicals that can have harmful effects

3.6.5

fluence rate

fluence across a surface

Note 1 to entry: Fluence rate is expressed in J/m^2 , J/cm^2 , or $\text{W}\cdot\text{s}/\text{cm}^2$.

3.6.6

inactivation rate

reduction in active microorganism concentration expressed as N_0/N (%) or $\log(N_0/N)$, in which N_0 is the original active microorganism concentration, N is the active microorganism concentration after disinfection

3.6.7

in-duct systems

UVC lamp devices placed up-stream or down-stream of the cooling coil or in other enclosed sections of the HVAC duct system

3.6.8

in-duct UVGI device

device consisting of UV lamps, ballast and other accessories, all of which can be mounted in ducts of an HVAC system to disinfect the air or a surface

3.6.9

irradiance

power of electromagnetic radiation incident on a surface per unit surface area

Note 1 to entry: Irradiance is expressed in microwatts per square centimetre ($\mu\text{W}/\text{cm}^2$). UV-C irradiance is also expressed in mW/cm^2 or W/m^2 .

3.6.10

effective irradiance

power of UVC radiation from electromagnetic radiation received on a surface per unit surface area

3.6.11

low pressure UV-C lamp

mercury vapour discharge lamp, without a coating of phosphors, in which the partial pressure of the vapour does not exceed 100 Pa during operation and which mainly produces ultraviolet radiation of 253,7 nm

3.6.12

airborne microorganism

particle of biological origin suspended in air

Note 1 to entry: Airborne microorganisms include bacteria, fungi, their spores and viruses.

3.6.13

test microorganism

biological surrogate representing the typical *pathogen* (3.6.15)

Note 1 to entry: Test microorganism is chosen to be safer than the real pathogen in order to prevent the infection of testers or analysts.

3.6.14

ocular damage

damage to the eye, particularly that caused by *exposure* (3.6.4) to UV energy

3.6.15

pathogen

infectious agent that causes diseases in its host

Note 1 to entry: Pathogens include some viruses, bacteria, prions, fungi and parasites.

3.6.16

permissible exposure time

PET

calculated time period that humans, with unprotected eyes and skin, can be exposed to a given level of UV irradiance without exceeding the NIOSH recommended exposure limit (REL) or ACGIH *Threshold Limit Value*[®] (TLV[®]) (3.6.23) for UV radiation

3.6.17

personal protective equipment

PPE

equipment used to shield or insulate a person from chemical, physical or thermal hazard

Note 1 to entry: Equipment includes protective clothing, helmets, goggles, respirators and other gear.

3.6.18

photokeratitis

corneal inflammation after over *exposure* (3.6.4) to *ultraviolet radiation* (3.6.24)

3.6.19

photokeratoconjunctivitis

inflammation of cornea and conjunctiva after *exposure* (3.6.4) to *UV radiation* (3.6.24)

Note 1 to entry: Exposure to wavelengths shorter than 320 nm is most effective in causing this condition. The peak of the action spectrum is approximately 270 nm.

3.6.20

portable in-room disinfection UVC device

easy-to-carry equipment to use in spaces requiring ultraviolet ray *air disinfection* (3.6.1) and/or disinfection of surfaces

EXAMPLE UVC device installed on mobile cars.

3.6.21
radiometer

instrument used to measure radiometric quantities, particularly UV irradiance or fluence

Note 1 to entry: Radiometers may be specified to operate for a particular spectral range such as UV-C.

3.6.22
stratum corneum

outer dead layer of human skin

3.6.23
Threshold Limit Value^{®1)}
TLV[®]

guidelines on exposure level under which most people can work consistently for eight hours a day, day after day, without adverse effects

Note 1 to entry: Used by the ACGIH to designate degree of *exposure* (3.6.4) to *contaminants* (3.1.12).

Note 2 to entry: TLVs can be expressed as approximate milligrams of particulate matter per cubic metre of air (mg/m³). TLVs are listed either for 8 h as a time-weighted average (TWA) or for 15 min as a short-term exposure limit (STEL).

3.6.24
ultraviolet radiation
UV radiation

optical radiation for which the wavelengths are shorter than those for visible radiation

Note 1 to entry: UV radiation wavelengths are commonly subdivided into:

- UV-A: 315 nm to 400 nm;
- UV-B: 280 nm to 315 nm;
- UV-C: 100 nm to 280 nm.

3.6.25
ultraviolet C
UV-C

ultraviolet radiation (3.6.24) from 100 nm to 280 nm

3.6.26
UV dose

product of UV irradiance and specific *exposure* (3.6.4) time on a given microorganism or surface

Note 1 to entry: UV dose is expressed in millijoules per square centimetre (mJ/cm²) or J/m².

3.6.27
UV-C dose-response curve

quantified relationship between the *inactivation rate* (3.6.6) of a specific microorganism and the average UV-C dose it received

1) Threshold Limit Value[®] (TLV) is the trademark of a product supplied by the American Conference of Governmental Industrial Hygienists (ACGIH). This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.