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Cleaning of air and other gases — Vocabulary

Épuration de l'air et autres gaz — Vocabulaire

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Foreword

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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 – overall efficiency) or as 1/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 m^2 (ft^2).

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 [m^3/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/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 µm, the fine range 0,1 µm ≤ x ≤ 2,5 µm, the coarse range 2,5 µm < x ≤ 10 µm, and the large coarse range x > 10 µm, 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 σg, is less than 1,15 µm

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 σg, exceeds 1,5 µm

3.2.7
quasi-monodisperse aerosol
aerosol, the width of whose distribution function, described by the geometric standard deviation σg, is between 1,15 µm and 1,5 µm

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 ±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 ePM_{10} 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 PM_{10} 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 *e*PM10”, “ISO *e*PM2,5” and “ISO *e*PM1”.

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 ± 0,15 (50 % ± 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 ± 0,15 (50 % ± 15 %)

3.2.123
particulate matter
PM
solid and/or liquid particles

3.2.124
particulate matter removal efficiency
$e\mathbf{PM}_x$
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* µm

3.2.125
particulate matter
PM_{10}
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
PM_1
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 accountancy 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 $W·s/cm^2$.

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 ($\mu W/cm^2$). 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/m^3). 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/cm^2) or J/m^2.

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

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3.6.28
ultraviolet germicidal irradiation
UV-C disinfection
UVGI
method for *disinfection* (3.6.1) of air, water and surfaces that uses radiation with *wavelength* (3.6.33) in the range of 100 nm to 280 nm to kill or inactivate microorganisms

Note 1 to entry: UV irradiation with a wavelength of 100 nm to 280 nm can cause damage to the DNA or RNA of the microorganisms.

3.6.29
UV-C radiation conversion efficiency
percentage of inputted electrical power that is converted into UV-C radiation power

Note 1 to entry: The UV-C conversion efficiency of a *low pressure UV-C lamp* (3.6.11) at 253,7 nm is between 25 % and 45 %.

Note 2 to entry: The UV-C conversion efficiency should be not less than 30 % in an air disinfection field under all circumstances due to energy consumption of the system.

3.6.30
UV susceptibility
extent to which a microorganism is sensitive to UV light or how easily it can be inactivated by UV irradiation

Note 1 to entry: UV susceptibility depends on the species and character of the microorganism. It can be described by a constant (k) with the unit of m^2/J.

3.6.31
upper-air in-room systems
UVC lamp devices mounted underneath room ceilings with UVC radiation directed horizontally or upward with adjustable louvers to keep UVC rays above eye and head level

3.6.32
waveband
spectrum section
spectrum band
part of the electromagnetic spectrum which can be a large spectral region, a small spectral band or narrow spectral lines

Note 1 to entry: Waveband is commonly expressed as a specific *wavelength* (3.6.33) range of values, which sometimes uses numbers or letters as code.

3.6.33
wavelength
distance between repeating units of a wave pattern

Note 1 to entry: Commonly designated by the Greek letter lambda (λ).

3.7 Terms related to stand-alone electrically-powered air cleaners

3.7.1
clean air delivery rate
CADR
flow rate of clean air (with respect to the target pollutant) delivered by the device under test

Note 1 to entry: CADR is calculated as the product of the measured operation decay rate and the associated test chamber volume.

Note 2 to entry: The unit is cubic metres per hour ($m^3\ h^{-1}$).

3.7.2
automatic operation mode
setting of the device under test chosen by the user in which the performance is regulated by the air cleaner without further user interaction

3.7.3
operation decay rate
reduction rate of the target pollutant in the test chamber due to operation of the device under test

Note 1 to entry: Units are per hour (h^{-1}).

3.7.4
manual operation mode
setting of the device under test, chosen by the user, that is not influenced by further external operator interaction, air quality sensor data, and/or timers throughout the duration of the test

3.7.5
maximum performance operation mode
manual operation mode where the *device under test* (3.1.45) is set to the highest flow rate with all air cleaning functions switched on and set to maximum, where applicable

Note 1 to entry: If the *device under test* (3.1.45) has zero flow rate, the *CADR* (3.7.1) is measured with all air cleaning functions switched on.

Note 2 to entry: "All air cleaning functions switched on" implies the requirements for testing that all available filters either for particle and gas filtration or a combination of both are inserted in the *device under test* (3.1.45) for each type of test described in the applicable parts of IEC 63086-2-1.

3.7.6
energy efficiency in maximum performance operation mode
volume of cleaned air provided by consumption of a certain amount of energy calculated by dividing the *CADR* (3.7.1) of the *device under test* (3.1.45) by the electrical power input

Note 1 to entry: The unit is cubic metres per Watt hour ($m^3 \cdot W^{-1} \cdot h^{-1}$).

3.7.7
target pollutant
specific air *pollutant* (3.1.12) with defined components, including three main categories: particulate matter, gaseous pollutants, and microorganisms

Note 1 to entry: Microorganisms can be considered a subgroup of particles.

3.7.8
test chamber
self-contained room with determined volume, shape, and dimensions, which is used to measure the performance of the *device under test* (3.1.45)

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