Annexes

The annexes of Part 1 are applicable except as folows.

Annex AA
(normative)

Particular requirements for vacuum cleaners, suction sweeping machines and dust extractors for the collection of dusts hazardous to health

The following modifications to the relevant clauses in this Part 2 are applicable to vacuum cleaners, suction sweeping appliances and dust extractors specifically designed for wet and/or dry suction for industrial and commercial use and specify the requirements for collecting non-explodable dusts hazardous to health.

NOTE 1 When sources other than electricity are used as the motive power (e.g. compressed air, internal combustion engine etc.) or a negative pressure unit is employed, the requirements for filtration of dust quoted in this standard can still apply.

NOTE 2 In this annex, subclauses that are numbered starting from 201 are additional to those in this Part 2.

3 Definitions

This clause of of this Part 2 is applicable except as follows.

3.201
explosive atmosphere (dust)
an atmosphere where the dust will explode when simultaneously subjected to the following conditions:

a) the dust must be combustible;

b) the dust must be in suspension in the atmosphere which must contain sufficient oxygen to support combustion;

c) the dust must have a particle size distribution that will propagate flame;

d) the dust concentration in the suspension must be within the explosible range;

e) the dust suspension must be in contact with an ignition source of sufficient energy. Reference can then be made to Annex BB if necessary.

3.202
hazardous dust

non-radioactive and non-explosive dust which is hazardous to health if inhaled, ingested or in contact with the skin

Examples: Any dust which is:

a) listed in the ECD 79/831/EEC[1)] amending 67/548/EEC for which the general indication of nature of risk is specified as very toxic, harmful, corrosive or irritant;

b) a dust for which an exposure limit has been established in the country of use;

c) a micro-organism which creates a hazard to the health of any person;

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1) European Council Directive 79/831/EEC of 18 September 1979 amending for the sixth time Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances

d) if the appliance is used for collecting radioactive dust, additional precautions for handling and final disposal should be taken in accordance with the appropriate codes and regulations which are outside the scope of this standard.

3.203
penetration *D*
degree of penetration of a filter as regards the ratio between the mean mass dust concentration in fresh air behind the filter and the mean mass dust concentration in the dust-laden air in front of the filter, averaged over the test time

3.204
mean velocity
$\overline{V}$
$\overline{V}$ Is calculated as follows:

$$\overline{V} = \frac{V_2}{F}$$

where

V_2 is the air flow rate (m^3/h);

F is the **essential filter** plane (m^2).

3.205
air change rate *L*
The number of hourly fresh air changes, calculated as follows:

$$L = \frac{V_2}{V_1}$$

where

V_1 is the room air volume (m^3).

3.206
safe change filter
filter which can be changed without atmospheric or operator contamination, such as by means of handling the filter from the exterior of an impervious membrane and by the use of a double sealing method of withdrawal, removal and replacement without exposing the interior of the filter housing

3.207
dust extractor
suction appliance with filtration which can be fitted to a machine tool or be placed adjacent to an operation where dust is being generated

3.208
essential filter
principal filter in a system which may use multiple filters and is a filter which ensures that the penetration limits of Table AA.1 are met

3.209
dust collection means
container having means of safe dust disposal to be undertaken when handled in accordance with the manufacturer's instructions

3.210
negative pressure unit
extraction unit used to ensure that the pressure within a working enclosure is below atmospheric

6 Classification

This clause of this Part 2 is applicable except as follows.

6.201 The appliances are classified according to dust classes:

- **L** (light hazard) suitable for separating dust with a limit value[1)] of occupational exposure of greater than 1 mg/m^3;
- **M** (medium hazard) for separating dust with a limit value of occupational exposure of greater than 0,1 mg/m^3;
- **H** (high hazard) for separating all dusts with all limit values of occupational exposure, including carcinogenic and pathogenic dusts.

7 Marking and instructions

This clause of this Part 2 is applicable except as follows.

7.1 *Addition:*

The manufacturer's model or type reference marked on the appliance shall include the dust class letter. The part number shall be marked on spare parts relating to safety, such as filters, **dust collection means** and disposable devices (e.g. rigid containers or plastic bags) when provided.

7.12 *Addition:*

The instructions shall contain the following information:

- information about the most important operational data of the appliance as specified in 3.1.9 of this Part 2, its dust class, its intended use and, if applicable, any limitations of use;
- an exact designation of spare parts relating to safety, such as filters and **dust collection means**, and information of where they may be obtained;

The instructions shall also advise the user to refer to any applicable safety regulations appropriate to the materials being handled, and shall include the substance of the following:

- before use, operators should be provided with information, instruction and training for the use of the appliance and the substances for which it is to be used, including the safe method of removal and disposal of the material collected;
- for user servicing, the appliance must be dismantled, cleaned and serviced, as far as is reasonably practicable, without causing risk to the maintenance staff and others. Suitable precautions include, decontamination before dismantling, provision for local filtered exhaust ventilation where the appliance is dismantled, cleaning of the maintenance area and suitable personal protection;
- in the case of class **H** and **M** appliances the outside of the appliance should be decontaminated by vacuum cleaning methods and wiped clean or treated with sealant before being taken out of a hazardous area. All the appliance parts shall be regarded as contaminated when removed from the hazardous area and appropriate action taken to prevent dust dispersal.

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1) Reference should be made to national regulations existing in some countries about the prevention of dust dispersal.

- the manufacturer, or an instructed person, shall perform a technical inspection at least annually, consisting of, for example, inspection of filters for damage, air tightness of the appliance and proper function of the control mechanism. On class **H** appliances the appliance filtration efficiency should be tested at least annually;
- when carrying out service or repair operations, all contaminated items which cannot be satisfactorily cleaned, are to be disposed of; such items shall be disposed of in impervious bags in accordance with any current regulation for the disposal of such waste.

The method by which covers of non-dust proof compartments should be removed for cleaning should also be included in the instructions.

For **dust extractors** the substance of the following shall be included:

It is necessary to provide for an adequate **air change rate *L*** in the room if the exhaust air is returned to the room. Reference to National Regulations is necessary.

7.14 *Addition:*

Class **L, M** and **H** appliances shall be fitted with a label having a surrounding border 30 mm ± 0,5 mm wide. The label shall be marked with red diagonal stripes 10 mm ± 0,5 mm wide, spaced 20 mm ± 0,5 mm apart on a white background. The letter L, M or H shall also be incorporated (see Figure AA.201).

The following warning shall be given on the label and in the operating instructions:

WARNING: This appliance contains dust hazardous to health. Emptying and maintenance operations, including removal of the **dust collecting means**, must only be carried out by authorised personnel wearing suitable personal protection. Do not operate without the full filtration system fitted.

Covers and guards which do not require tools for removal shall be fitted with an additional label worded: REMOVE FOR CLEANING.

7.15 *Addition :*

Lettering in warning notices on the appliance shall have a minimum height of 3 mm.

The warning notices shall be so positioned that they can easily be seen by the operator when switching the appliance on or off.

19 Abnormal operation

This clause of this Part 2 is applicable except as follows.

19.201 The **essential filter** shall be of adequate strength to withstand the severest conditions created by the suction system when the **essential filter** is clogged and subject to pulsing air flow.

Compliance is checked by inspection and the following test:

Use a clogging medium (e.g. French chalk) to give 90 % of the maximum differential pressure, obtained by the method used when measuring P_i in 2.2.9, and a pulsing effect achieved by covering the inlet to the appliance for 5 s followed by opening for 1 s.

NOTE Any parts, with the exception of the essential filter itself, may be dried to facilitate the flow of the clogging medium. The pulsing test should be repeated 30 times over a period of 3 min.

*Fracture or break-down of the **essential filter** system shall not occur. If a safety switch is fitted to protect the motor and filter system, it is rendered inoperable.*

22 Construction

This clause of this Part 2 is applicable except as follows.

22.201 Dust collecting appliances shall be built in accordance with the dust classes given in 6.201 and meet the values given in Table AA.1:

Table AA.1 – Appliance penetration limits

Dust class		Suitability for hazardous dust with limit values for occupational exposure mg x m^{-3}	Degree of penetration *D* %	Mean velocity $\overline{V}$ through the filter plane, at the max. airflow of the appliance or measured under the conditions of P_f according to IEC 60335-2-69, whichever is greater* m^3 x m^{-2} x h^{-1}
L	(light hazard)	>1	<5	≤500
M	(medium hazard)	>0,1	<0,5	≤200
H	(high hazard)	All small particle dusts including carcinogens and pathogens	<0,005	≤200
* If a manufacturer can show evidence of maintenance of filtration efficiency after 50 cleaning cycles, in accordance with the manufacturer's instructions, then the **mean velocity** $\overline{V}$ through the filter plane can be exceeded by agreement when type tests are undertaken.				
NOTE 1 Maintenance of filtration efficiency can be demonstrated either by examination of service records, or the test cycles specified in AA.22.203. NOTE 2 For type approval, appliances using an identical construction of essential filter mounting and with an identical airflow velocity can be approved by testing one model in the range.				

As a minimum requirement for dust class **L** and **M** appliances the degree of **penetration** of the filter material shall be determined.

Test methods for compliance are under consideration.

22.202 All dust removal appliances shall be capable of achieving an adequate removal of dust, and an indication shall be given as follows:

a) vacuum cleaners of dust classes **M** and **H** shall be provided with an indicator which operates before the air velocity, through the largest hose (or tube) supplied by the manufacturer, falls below 20 m/s, referring to the largest section in the hose or to the vacuum cleaner inlet, whichever is the greatest;

b) for suction-sweeping appliances, the indicator shall operate before the reduction of pressure in the suction region of the brush area becomes less than 50 N/m^2. This also applies to the side brush area;

c) for **dust extractors** (excluding negative pressure units) the indicator shall operate before the suction velocity becomes less than as stated by the manufacturer or 20 m/s, referring to the largest section in the hose (or tube), whichever is the greater, or the dust source is shut off by a mechanism in the dust collector. If the dust source cannot be shut off (e.g. when there is a conveyer belt system in a production process), then a warning signal shall be given;

d) an acoustic warning signal, if used, shall work within an audio-frequency between 500 Hz and 3 000 Hz and a pulse time between 0,5 s and 5 s. The A-weighted sound pressure level shall be between 15 dB and 30 dB higher than the 1 m-surface sound pressure level of the appliance;

e) if a visual warning signal is used it shall work with a pulse time between 0,5 s and 5 s, emitting yellow light. The bulbs in warning lights shall have a minimum power input of 45 W. The warning lights shall be visible from all sides of the appliance;

f) a pair of voltage-free contacts and installation instructions for their use as a warning signal switching device;

g) if airflow indicator adjustments are necessary, they shall be adjustable without **tools.**

Compliance is checked by inspection and the following test:

Operate the mechanism and, if necessary compare the actual values with the specified values. No leaking of dust should occur.

22.203 Class **M** and **H** appliances may be provided with a **safe change filter** if a dust free filter exchange cannot be guaranteed. Class **H** appliances shall be fitted with a non-reusable **essential filter**. If Class **M** and **H** appliances are provided with a built-in filter cleaning mechanism for the **essential filter**, the action shall not be detrimental to the filtration efficiency.

Compliance is determined by the filtration tests of AA.22.201 or AA.22.207 after conducting 50 cleaning cycles.

A cleaning cycle shall comprise collecting a suitable dust so that the airflow velocity is reduced below 20 m/s and then cleaned according to the manufacturer's instructions. The appliance is then emptied and the test is repeated.

22.204 If the appliance is provided with a built-in cleaning mechanism, it shall restore the required suction performance.

A cleaning mechanism conforms with the requirements when, after the cleaning:

- for suction-sweeping appliances the reduction of pressure in the brush area is 50 N/m^2;
- for other appliances the suction air-flow is 20 % greater than the minimum air-flow volume as specified in AA.22.202.

Compliance is determined by comparing the suction air-flow with the desired value after operating the cleaning device according to the manufacturer's instructions. The cleaning operation shall be performed when the minimum suction air-flow has been reached.

22.205 Class **H** appliances shall be so constructed that outside decontamination shall be as simple as is practicable and shall be fitted with tightly sealed containers which can withstand the stresses of transportation.

For class **M** appliances removal of the collection bag with minimum dust release, in accordance with the manufacturer's instructions, shall be possible.

Compliance is checked by inspection.

22.206 Class **M** (except suction sweeping appliances) and **H** appliances shall be fitted with a disposable collection means.

Compliance is checked by inspection.

22.207 Class **M** and **H** appliances shall be so constructed that the **essential filter** will not be damaged when collecting sharp objects such as broken glass or nails which may be sucked up.

Compliance is checked by operating the appliance normally to collect 1 kg/(kW input), with a maximum of 1 kg, of upholstery tacks, 13 mm long, and no tack shall damage the essential filter. This test should be conducted before the test of AA.22.201 or AA.22.208.

22.208 In class **H** appliances when new, the filtration penetration of the assembled appliance shall be less than 0,005 %.

In class **M** appliances, if the appliance is suitable for wood according to the instructions for use, the filtration penetration of the assembled appliance shall be less than 0,5 %.

Test methods for compliance with the penetration limits are "under consideration".

22.209 In dust class **H** appliances the **essential filter** shall only be removable by the use of a **tool.**

Compliance is checked by inspection.

22.210 In class **M** and **H** appliances the air exhaust shall not unduly disturb dust lying on the floor.

Compliance is checked by the following test:

The working hose shall be fitted to the inlet and the intake end shall be positioned in an upward direction at a minimum height of 2 m above floor level. The exhaust velocity shall not exceed 1 m/s at a height of 50 mm above floor level. The appliance shall be at least 2 m from any wall or vertical surface. The humidity of the air in the test area shall not exceed 60 % and the test shall be carried out in still air conditions.

22.211 In dust class **H** appliances the **essential filter** shall be at less than atmospheric pressure.

For class **L** and **M** appliances, if the **essential filter** is on the positive side, then the penetration tests of AA.22.201 are conducted to ensure compliance with the requirements of Table AA.1.

Compliance is checked by inspection and the appropriate tests.

22.212 In dust class **H** appliances replacement **essential filters** shall have durable integral seals if they affect the requirements specified in AA.22.205.

NOTE **Essential filters** constructed for use with seals having one side to atmospheric pressure and tested by the manufacturer in this state, do not affect the requirement of AA.22.205 and do not require integral seals, although the provision of integral seals is recommended. Suitable materials are listed in Table AA.2