SASO GSO IEC 60335-2-69

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES–

SAFETY –

PART 2-69: PARTICULAR REQUIREMENTS FOR

WET AND DRY VACUUM CLEANERS, INCLUDING POWER BRUSHE, FOR INDUSTRIAL AND COMMERCIAL USE

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FOREWORD

The Saudi Standards and Quality Organization (SASO) has adopted the international standard IEC 60335-2-69/2008Ed3.2 "Household and Similar Electrical Appliances - Safety - Part 2-69: Particular Requirements for Wet and Dry Vacuum Cleaners, Including Power Brush, For Industrial and Commercial Use" including its Amendments No. A1/2004 and No. A2/2007, issued by the International Electrotechnical Commission (IEC).

SASO has also translated this International Standard into Arabic without introducing any modifications.

Annex "AAA" given at the end of this Standard lists the National Modifications to be carried out on the Arabic and English texts of the above-mentioned Standard in order to suit the Electrical distribution System in the Kingdom.

Note: On implementing this Saudi Standard, the Saudi Standards corresponding to the International Standards, if any, mentioned in this adopted Saudi Standard shall be taken into consideration.

INTRODUCTION

The Saudi Arabian Standards Organization (SASO) has adopted the International Standard IEC 60335-1/2001 "Household and Similar Electrical Appliances– Safety - Part 1: General Requirements" including its Amendments No. 1/2004 and No. 2/2006, and approved as Saudi Standard SASO 1062/2007. SASO has also issued a number of standards each of which is concerned with the requirements of a particular electrical appliance and among which is IEC 60335-2-69/2008 "Household and Similar Electrical Appliances - Safety - Part 2-69: Particular Requirements for Wet and Dry Vacuum Cleaners, Including Power Brush, For Industrial and Commercial Use" including its Amendments No. A1/2004 and No. A2/2007.

In order to apply this Saudi Standard, it should be read in conjunction with SASO 1062/2007 because the Clause numbers herein are the same as those of Part 1. If a Clause in Part 1 is not applicable to this standard, the Clause number is included herein but with the words "Not applicable". And if a Clause in Part 1 has been replaced by new text to suit this standard, the Clause number herein is followed by the word "Replacement" and the new text of this Clause then follows on the next line. And if any addition has been added to this standard, the Clause number herein is followed by the word "Addition" and the new addition then follows on the next line. And if any modification has been done on a Clause of Part 1, the Clause number herein is followed by the word "Modification" and the modified text then follows on the next line. In case of introducing new Sub-clause, they should take the Clause number of Part 1 followed by the divisions 101, 102, … etc. In case of introducing new Figures, they should take the numerals 101, 102, … etc. In case of introducing new Annexes and/or Figures for the Annexes, they should take the numerals AA, BB, etc.

SASO reviews also the Saudi Standards adopted from the corresponding International Standards in order to know to which extent they are appropriate to the conditions of the Kingdom. When SASO assures that there is a necessity to carry out Deletion and/or Replacement and/or Addition and/or Modification, etc. on any Clause and/or Sub-clause of the adopted Standard, SASO will list these in an **Annex of the National Modifications** which will be added at the end of the relevant Standard

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES– SAFETY –

PART 2-69: PARTICULAR REQUIREMENTS FOR WET AND DRY VACUUM CLEANERS, INCLUDING POWER BRUSHE, FOR INDUSTRIAL AND COMMERCIAL USE

Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electrical motor-operated vacuum cleaners and includes appliances and stationary equipment specifically designed for wet suction, dry suction, or wet and dry suction for industrial and commercial use with or without attachments, for example for suction to withdraw dust or the like from work benches and production machines, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.

NOTE 101 Commercial uses are for example for use in hotels, schools, hospitals, factories, shops and offices for other than normal housekeeping purposes.

This standard also applies to machines handling hazardous dust, such as asbestos or liquids for which additional national requirements might apply.

It is also applicable to appliances making use of other forms of energy for the motor; but it is necessary that their influence is taken into consideration.

For battery operated appliances reference shall be made to IEC 60335-2-72.

NOTE 102 Attention is drawn to the fact that

– for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;

– in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

NOTE 103 This standard does not apply to

– appliances for household use to which IEC 60335-2-2 applies;

– centrally sited stationary vacuum cleaning systems;

– appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (vapour or gas);

– audio, video and similar electronic apparatus (IEC 60065);

– appliances for medical purposes (IEC 60601);

– hand-held motor-operated electric tools (IEC 60745);

– personal computers and similar equipment (IEC 60950);

– transportable motor-operated electric tools (IEC 61029);

– hand-held mains-operated electrical garden blowers, vacuums and blower vacuums (IEC 60335-2-100).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60312, Vacuum cleaners for household use – Methods of measuring the performance

IEC 60335-2-72, Household and similar electrical appliances – Safety – Part 2-72: Particular requirements for automatic machines for floor treatment for commercial and industrial use

IEC 60704-2-1, Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-1: Particular requirements for vacuum cleaners

IEC 61241-1-1, Electrical apparatus for use in the presence of combustible dust – Part 1-1: Electrical apparatus protected by enclosures and surface temperature limitation – Specification for apparatus

IEC 61241-10:2004, Electrical apparatus for use in the presence of combustible dust – Part 10: Classification of areas where combustible dusts are or may be present

ISO 2602, Statistical interpretation of test results – Estimation of the mean – Confidence interval

ISO 6344-2, Coated abrasives – Grain size analysis – Part 2: Determination of grain size distribution of macrogrits P12 to P220

ISO 7731, Safety of machinery; Auditory danger signals; General requirements, design and testing

ISO 11428, Ergonomics – Visual danger signals – General requirements, design and testing

1 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 Replacement:

normal operation

the normal operation P_m of the vacuum motor is obtained at the following power input:

$$P_m = 0,5 (P_f + P_i)$$

where

P_f is the input, in watts, when the appliance has been operated for 3 min, fitted with the nozzle and hose supplied by the manufacturer giving the highest input;

P_i is the input, in watts, when the appliance has been operated for 20 s with the nozzle sealed, immediately following the 3-minute-period with the nozzle open. Any valve or similar device used to ensure a flow of air to cool the motor in the event of a blockage of a main air inlet is rendered ineffective.

P_f and P_i are measured with the supply voltage adjusted to **rated voltage**, or to a voltage equal to the mean value of the **rated voltage range** if the difference between the limits of the **rated voltage range** does not exceed 10 % of the mean value of the range. If the difference between the limits of the **rated voltage range** exceeds 10 % of the mean value, the tests are carried out with the supply voltage set to the upper limit of the range.

The measurements are made with the appliance fitted with a clean dust bag and filter and with the water container, if any, empty. If the appliance is intended for use only with a hose, detachable nozzles are removed and the hose is laid out straight. If the appliance is provided with a hose as an optional accessory, it is operated without the hose.

Electrically driven devices, if any, are in operation but are not in contact with the floor or any other surface or with the means used to seal the air inlet.

The normal load is equal to the mean load P_r for the electrically driven agitating device such as a motor driven brush determined in accordance with the following:

– the agitating device operates on a carpet as specified in IEC 60312;

– the mean load P_r is determined when using the device in the following way:

After setting the device according to the manufacturer's instructions the device should be moved twice over a distance of 5 m in the direction giving the highest load;

– the motor responsible for the airflow operates under the same conditions as determining P_f , i.e. no airflow restrictions, and measurements are taken after 3 min;

– the device is adjusted to the carpet pile height in accordance with the recommendations of the manufacturer;

– it is necessary to move the agitating device slowly across the carpet in the usual manner to avoid carpet damage.

3.1.9.101 Soiled water discharge pumps are normally operated as follows.

The pump delivers a continuous flow of water without any soiled water discharge hose attached to the soiled water outlet of the machines unless the discharge hose is permanently attached to the machine. The vacuum motor shall work during the test, unless an interlock device is provided to prevent combined operation of both motors.

3.101
soiled water discharge pump
pump for discharging the soiled water from the machine.

3.102
water-suction cleaning appliance
appliance for aspirating an aqueous solution that may contain foaming detergent

3.103
motorized cleaning head
accessory containing a motor that is supplied from the appliance and which is attached to the end of a hand-held hose or tube

NOTE The main cleaning head permanently attached is not regarded as a motorized cleaning head.

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable, except as follows.

6.1 Replacement:

Vacuum cleaners and their attachments shall be of **class I, class II or class III** with respect to their protection against electric shock.

Metal parts that may continuously contact the body shall be considered as handles for which 22.36 applies.

Compliance is checked by inspection and by the relevant tests.

6.2 Addition:

Water suction appliances shall be so constructed that neither water nor foam from detergents can penetrate into the motor or come in contact with **live parts**.

Water suction appliances shall be at least IPX4.

7 Marking and instructions

This clause of Part 1 is applicable, except as follows.

7.6 Addition:

[symbol IEC 60417-5935 (DB:2000-10] motorized cleaning head for
water-suction cleaning

7.9 Addition:

The operation of the motor is deemed to be an adequate indication of the switch position.

7.12 Addition:

The front cover of the instruction manual shall include the substance of the following:

CAUTION Read the instruction manual before using the appliance.

This wording may be replaced by symbols ISO 7000-0434A/B and ISO 7000-1641 (DB:2004:01). If these symbols are used, their meaning is to be explained in the instructions for use.

The instruction manual shall include the substance of the following warnings, as applicable.

– CAUTION This appliance is not suitable for picking up hazardous dust.

– CAUTION This appliance is for dry use only and is not to be used or stored outdoors in wet conditions.

– WARNING Only use the brushes provided with the appliance or those specified in the instruction manual. The use of other brushes may impair safety.

The instruction manual shall give details regarding the following, as applicable:

– the precautions to be taken when using the appliance under specific conditions such as handling flammable liquids or dust and dust hazardous to health;

– a statement that the appliance is to be disconnected from its power source during cleaning or maintenance, and that when replacing parts or converting the appliance to another function:

  • for mains operated appliances, the plug is to be removed from the socket-outlet;

  • for battery operated appliances, the key of the supply switch is to be removed or an equivalent disconnection is to be made;

– the intended use of brushes which are specified for the appliance.

The instruction manual shall state the A-weighted sound pressure level L_{PA} in dB(A) emitted by the appliance. If the A-weighted sound pressure level exceeds 85 dB(A), it shall also state the sound power level L_{WA} in dB(A) and that appropriate ear protection has to be used (the sound level is measured in accordance with IEC 60704-2-1).

The instruction manual shall include the substance of the following.

This appliance is suitable for commercial use, for example in hotels, schools, hospitals, factories, shops, offices and rental businesses.

The instruction manual for mains operated appliances shall include the substance of the following:

– do not allow the rotating brushes to come into contact with the supply cord;

– regularly examine the supply cord for damage, such as cracking or ageing. If damage is found, replace the cord before further use;

– only replace the supply cord with the type specified in the instruction manual;

– only use the socket outlet on the appliance for purposes specified in the instruction manual.

For wet suction appliances, the instruction manual shall state the substance of the following:

– CAUTION If foam or liquid escapes from the appliance, switch off immediately.

– regularly clean the water level limiting device in accordance with the instructions and examine it for signs of damage.

The instructions for appliances having a current-carrying hose operating at other than **safety extra-low voltage** shall include the substance of the following:

CAUTION: This hose contains electrical connections:

– do not use to collect water;

– do not immerse in water for cleaning;

– the hose should be checked regularly and shall not be used if damaged.

If symbol IEC 60417-5935 is used, its meaning shall be explained.

7.14 Addition:

The height of symbol IEC 60417-5935 shall be at least 15 mm.

Compliance is checked by measurement.

7.101 Motorized cleaning heads shall be marked with

– **rated voltage** or **rated voltage range** in volts;

– **rated power input** in watts;

– name, trade mark or identification mark of the manufacturer or responsible vendor;

– model or type reference.

Motorized cleaning heads for **water-suction cleaning appliances**, except those of **class III construction** having a **working voltage** up to 24 V shall be marked with symbol IEC 60417-5935.

NOTE This symbol is an information sign and, except for the colours, the rules of ISO 3864 apply.

Compliance is checked by inspection.

7.102 Appliance outlets for accessories shall be marked with the maximum load in watts.

NOTE This marking may be on the appliance close to the appliance outlet.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.1 Addition:

NOTE 101 The soiled liquid picked up by the wet suction appliance is considered to be conductive.

8.1.4 Addition:

Isolated battery systems of 18 to 24 cells of either acid or alkaline electrochemistry, including gel batteries, shall be regarded as **Class III** provided that

– the maximum voltage per cell on charge does not exceed 2,7 V;

– there are no earthed parts (see Clause 27);

– conductive parts cannot fall on to and thereby bridge live parts of opposite polarity (see Clause 22).

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable.

10.1 Addition:

The power input of **motorized cleaning heads** is measured separately.

11 Heating

This clause of Part 1 is applicable except as follows.

11.3 Addition:

If it is necessary to dismantle the appliance for fitting thermocouples or other wiring, the input shall be measured before and after fitting at the lowest possible load, for example, with closed suction openings, with brushes not in contact with the floor, with declutched drive, etc. to check that the assembling has been accomplished properly.

11.4 Not applicable.

11.5 Addition:

For the heating test the normal load P_r on the motor driving the moving brushes can be simulated by a brake or other means.

11.6 Not applicable.

11.7 Addition:

Appliances are operated until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable, except as follows.

13.2 Addition:

For **class I appliances** where several motors operate at the same time, the leakage current shall not exceed 3,5 mA

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable except as follows.

15.1.2 Addition:

Wet suction appliances shall be operated for 10 min on a level surface wetted by a detergent solution specified in 15.2.

In practice the pick-up consists largely of air such that there is no overloading of the suction motor; the input load should be observed to avoid overloading.

15.2 Replacement:

Appliances having a liquid container shall be so constructed that spillage of liquid due to overfilling and, for unstable appliances and **hand-held appliances**, overturning, does not affect their electrical insulation.

Compliance is checked by the following tests:

Appliances having a liquid container and provided with an appliance inlet are fitted with an appropriate connector and flexible cable or cord; appliances having a liquid container and **type X attachment** are fitted with the lightest cross-sectional area specified in Table 11. Other appliances are tested as delivered.

The liquid container of the appliance is completely filled with water containing approximately 1 % NaCl and a further quantity, equal to 15 % of the capacity of the container or 0,25 l, whichever is the greater, is poured in steadily over a period of 1 min.

Hand-held appliances and appliances which are unstable are then, with the container completely filled and with the cover or lid in place, overturned from the most unfavourable of the normal positions of use, and are left in that position for 5 min unless the appliance returns automatically to its normal position of use.

NOTE 101 Appliances are considered to be unstable if they overturn when applying a force of 180 N at the top of the appliance in the most unfavourable horizontal direction while they are placed in the most unfavourable of the normal positions of use on a support inclined at an angle of 10° to the horizontal, the liquid container being filled to half the level indicated in the manufacturer's instructions.

Nozzles and **motorized cleaning heads** of **water-suction cleaning appliances** are placed in a container, the base of which is level with the surface supporting the appliance. The container is filled with a detergent solution to a level of 5 mm above its base, this level being maintained throughout the test.

The solution consists of 20 g of NaCl and 1 ml of a solution of 28 % by mass of dodecyl sodium sulphate in each 8 l of water.

The appliance is operated until its liquid container is completely full and for a further 5 min.

NOTE 102 The solution should be stored in a cool atmosphere and used within seven days of its preparation.

NOTE 103 The chemical designation of dodecyl sodium sulphate is C12H25NaSO4.

NOTE 104 If it is not possible to overfill the container for soiled liquid owing to the construction of the appliance, the test specified in 19.101 is considered to be adequate.

After each of these tests, the appliance shall withstand the electric strength test of 16.3.

Inspection shall show that there is no trace of liquid on insulation that could result in a reduction of **clearances** or **creepage distances** below the values specified in Clause 29.

NOTE 105 The appliance is allowed to stand in normal test room atmosphere for 24h before being subjected to the test of 15.3.

15.3 Modification:

The relative humidity shall be (93 ± 6) %.

15.101 Motorized cleaning heads of **water suction cleaning appliances** shall be resistant to liquids that may come into contact with them.

Compliance is checked by the following tests.

The **motorized cleaning head** is subjected to an impact test as described in IEC 60068-2-75, the value of the impact being 2 J. The **motorized cleaning head** is rigidly supported and three blows are applied to every point of the enclosure that is likely to be weak.

It is then subjected to the free fall test procedure 1 of IEC 60068-2-32. It is dropped 4 000 times from a height of 100 mm onto a steel plate having a thickness of not less than 15 mm. It is dropped

– 1000 times on its right side;

– 1000 times on its left side;

– 1000 times on its front face;

– 1000 times on its cleaning surface.

The **motorized cleaning head** is then subjected to the test described in 14.2.7 of IEC 60529, the water containing approximately 1 % NaCl.

The **motorized cleaning head** shall then withstand the electric strength test of 16.3, the voltage being applied between the **live parts** and the solution, and inspection shall show that there is no trace of saline solution on insulation which could result in a reduction of **clearances** and **creepage distances** below the values specified in Clause 29.

NOTE The test is not carried out on **motorized cleaning heads** of **class III construction** having a **working voltage** up to 24 V.

16 Leakage current and electric strength

This clause of Part 1 is applicable.

16.3 Addition:

Current-carrying hoses, except for their electrical connections, are immersed for 1 h in water containing approximately 1 % NaCl, at a temperature of 20 °C ± 5 °C. While the hose is still immersed, a voltage of 2 000 V is applied for 5 min between each conductor and all the other conductors connected together. A voltage of 3 000 V is then applied for 1 min between all the conductors and the saline solution.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.1 Addition:

Appliances are also subjected to the test of 19.101.

The test of 19.7 is only carried out on **motorized cleaning heads**.

19.2 Addition:

The appliance is tested without liquid in the container.

NOTE 101 The term restricted heat dissipation means without liquid in the container.

19.7 Addition:

Motorized cleaning heads are tested with the rotating brush or similar device locked for 30 s.

19.9 Not applicable.

19.10 Addition:

NOTE 101 For this test the lowest possible load for radial turbines is obtained with the air inlet sealed. Other turbine types may have different characteristics.

In the case of cleaners driving a brush or agitator, the belt is removed.

19.101 Appliances having containers that are provided with shut-off device(s) or valve(s) are again subjected to the test of 15.2.

Stop valves or other fluid shut-off devices are made inoperative. If two or more independent shut-off devices are provided, only one of them is made inoperative at a time, provided that they have passed the test of operating

3 000 times satisfactorily. Otherwise all devices that failed are made inoperative.

NOTE Care should be taken to suck up an air-liquid mixture to prevent overloading of the motor of the suction unit. The input power should be observed to avoid overloading.

After this test, the appliance shall be subjected to the electrical strength test of 16.4. Inspection shall show that water has not entered the appliance to any dangerous extent. In particular, there shall be no trace of water on the electrical insulation that would result in the reduction of **clearance and creepage distances** below the limits specified in Clause 29.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.1 Addition:

NOTE 101 **Motorized cleaning heads** are not subjected to this test.

20.2 Addition:

This requirement does not apply to rotating brushes and similar devices, or to moving parts exposed during the fitting of accessories that allow conversion from one application to another.

20.101 Shaft ends and similar rotating parts shall be protected if they protrude by more than a quarter of their diameter, unless the end is rounded and less than 50 mm in length.

Injury due to unintentional closing or slamming of parts, such as movable side walls and covers, shall be prevented.

Wheels or rollers for the transport of appliances heavier than 20 kg shall be located or protected so that injury to the feet of the operator is prevented.

Compliance is checked by inspection, by measurement and by manual test.

21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Modification:

The impact value is increased to 1,0 J ± 0,04 J.

21.101 Those parts of the machine which are subjected to impact in normal use are tested as follows:

If failure of the part subject to impact would cause a failure to comply with this specification, any spot of the machine which may be exposed during normal cleaning function to impacts or blows shall be subjected to a single blow with an impact energy of 6,75 Nm. The impact stress on the free-standing machines shall be exerted by a steel sphere with a diameter of 50,8 mm and mass of 0,535 kg dropped from a height of 1,3 m or hanging on a string acting as a pendulum, falling from a height of 1,3 m.

21.102 Current-carrying hoses shall be resistant to crushing.

Compliance is checked by the following test.

The hose is placed between two parallel steel plates each having a length of 100 mm, a width of 50 mm and the edges of the longer sides rounded with a radius of 1 mm. The axis of the hose is positioned at right angles to the longer sides of the plates. The plates are placed at a distance of approximately 350 mm from one end of the hose.

The steel plates are pressed together at a rate of 50 mm/min ± 5 mm/min until the applied force is 1,5 kN. The force is then released and the electric strength test of 16.3 is carried out between the conductors connected together and the saline solution.

21.103 Current-carrying hoses shall be resistant to abrasion.

Compliance is checked by the following test.

One end of the hose is attached to the connecting rod of the crank mechanism shown in Figure 102. The crank rotates at 30 revolutions per minute resulting in the end of the hose moving horizontally backwards and forwards over a distance of 300 mm.

The hose is supported by a rotating smooth roller over which a belt of abrasive cloth moves at a speed of 0,1 m/min. The abrasive is corundum grit size P 100, as specified in ISO 6344-2.

A mass of 1 kg is suspended from the other end of the hose, which is guided to avoid rotation.

In the lowest position, the mass has a maximum distance of 600 mm from the centre of the roller.

The test is carried out for 100 revolutions of the crank.

After the test, **basic insulation** shall not be exposed and the electric strength test of 16.3 is carried out between the conductors connected together and the saline solution.

21.104 Current-carrying hoses shall be resistant to flexing.

Compliance is checked by the following test.

The end of the hose intended to be connected to the **motorized cleaning head** is attached to the pivoting arm of the test equipment shown in Figure 103. The distance between the pivot axis of the arm and the point where the hose enters the rigid part is 300 mm ± 5 mm. The arm can be raised from the horizontal position by an angle of 40° ± 1°. A mass of 5 kg is suspended from the other end of the hose or from a convenient point along the hose so that when the arm is in the horizontal position the mass is supported and there is no tension on the hose.

NOTE 1 It may be necessary to reposition the mass during the test.

The mass slides against an inclined plate so that the maximum deflection of the hose is 3°.

The arm is raised and lowered by means of a crank that rotates at a speed of 10 ± 1 r/min.

The test is carried out for 2 500 revolutions of the crank after which the fixed end of the hose is turned through 90° and the test continued for a further 2 500 revolutions. The test is repeated in each of the other two 90° positions.

NOTE 2 If the hose ruptures before 10 000 revolutions of the crank, the flexing is terminated.

After the test, the hose shall withstand the electric strength test of 16.3.

21.105 Current-carrying hoses shall be resistant to torsion.

Compliance is checked by the following test.

One end of the hose is held in a horizontal position with the remainder of the hose freely suspended. The free end is rotated in cycles, each cycle consisting of five turns in one direction and five turns in the opposite direction, at a rate of 10 turns per minute.

The test is carried out for 2 000 cycles.

After the test, the hose shall withstand the electric strength test of 16.3 and shall not be damaged to such an extent that compliance with this standard is impaired.

21.106 Current-carrying hoses shall be resistant to cold conditions.

Compliance is checked by the following test.

A 600 mm length of hose is bent as shown in Figure 104 and the ends are tied together over a length of 25 mm. The hose is then placed for 2 h in a cabinet having a temperature of –15 °C ± 2 °C. Immediately after the hose is removed from the cabinet it is flexed three times, as shown in Figure 105, at a rate of one flexing per second.

The test is carried out three times.

There shall be no cracks or breaks in the hose and it shall withstand the electric strength test of 16.3.

NOTE Any discoloration is neglected.

22 Construction

This clause of Part 1 is applicable except as follows.

22.35 Modification:

Delete the note.

Addition:

These parts are subject to the hammer test of Clause 21. If this insulation does not meet the requirement of 29.3, these are subject to the following impact test.

A sample of the covered part is conditioned at a temperature of 70 °C ± 2 °C for seven days (168 h). After conditioning, the sample is allowed to attain approximately room temperature.

Inspection shall show that the covering has not shrunk to such an extent that the required insulation is no longer given or that the covering has not peeled off, so that it may move longitudinally.

After this, the sample is maintained for 4 h at a temperature of –10 °C ± 2 °C.

While still at this temperature, the sample is then subjected to impact by means of the apparatus shown in Figure 101. The weight "A", having a mass of 0,3 kg, falls from a height of 350 mm on to the chisel "B" of hardened steel, the edge of which is placed on the sample.

One impact is applied to each place where the insulation is likely to be weak or damaged in normal use, the distance between the points of impact being at least 10 mm.

After this test it shall show that the insulation has not peeled off, and an electric strength test as specified in 16.3 is made between metal parts and metal foil wrapped round the insulation in the area required to be insulated.

22.101 Appliances shall be constructed so as to prevent the penetration of objects from the floor, which may impair their safety.

Machines for wet use shall have no **live parts** at a distance of less than 30 mm from the floor where there is an opening which could admit liquid.

Compliance is checked by inspection and measurements.

22.102 The addition of a power outlet shall not impair the safety of the appliance.

Compliance is checked by the test of this standard taking the manufacturer's instructions into consideration.

22.103 **Class I appliances** or **class II appliances** shall employ a mains isolating switch or switches having a contact separation in all poles that provide full disconnection under overvoltage category III conditions. Additional switches may be of single pole construction.

Components such as RFI suppressors, mains indicating lights and phase rotation indicators can be connected to the live side of the isolating switch, providing any failure does not constitute a failure to comply with the requirements of this standard.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows:

24.1.3 Addition:

The main switch in vacuum cleaners shall be tested for 50 000 cycles of operations.

24.2 Addition:

For appliances worn on the body in normal use, a remote switching device may be located at the end of an **interconnecting cord**, when the switching device cannot come into contact with the floor when the appliance is worn on the user.

The strain relieves on both sides of the **interconnecting cord** shall comply with 25.15.

24.101 Appliances shall be constructed so that, in normal use, there will be no electrical or mechanical failure that could impair compliance with this standard. The insulation shall not be damaged and contacts and connections shall not work loose as a result of such things as heating and vibration.

Compliance is checked by the tests of this standard and for appliances with motors provided with **self-resetting thermal cut-outs** as follows.

The appliance is supplied at a voltage equal to 1,1 times **rated voltage**, under locked rotor conditions so as to cause the **thermal cut-out** to operate within a few minutes, until the **thermal cut-out** has performed 200 cycles of operation.

After the test the appliance shall withstand the tests of Clause 16.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.1 Addition:

Appliances classified as IPX7 shall not be provided with an appliance inlet.

Appliances classified as IPX4, IPX5 or IPX6 shall not be provided with an appliance inlet, unless both inlet and connector have the same classification as the appliance when coupled or separated, or unless inlet and connector can

only be separated by the use of a tool and have the same classification as the appliance when coupled.

Appliances provided with appliance inlets shall also be provided with an appropriate cord set.

25.7 Addition:

Power **supply cords** shall be not lighter than:

– if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 60245 IEC 53);

– if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 53).

25.14 Addition:

For appliances incorporating a **type X attachment** or **type Y attachment** the number of flexings is 20 000.

25.15 Modification:

Replace Table 12 by the following:

Table 12

Pull force and torque

Mass of appliance kg	**Pull force** N	**Torque** Nm
≤ 1	30	0,1
>1 and ≤4	60	0,25
> 4	125	0,40

Addition:

The test is also applied to the cord in the cord set for appliances classified as IPX4 or higher that are provided with an appliance inlet. The cord set is fitted to the appliance inlet prior to the commencement of the test.

25.23 Addition:

NOTE 101 There is no limitation on the length of conductors in flexible hoses.

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable except as follows.

29.2 Addition:

The microenvironment is pollution degree 3 unless the insulation is enclosed or located so that it is unlikely to be exposed to pollution due to normal use of the appliance.

30 Resistance to heat and fire

This clause of Part 1 is applicable.

31 Resistance to rusting

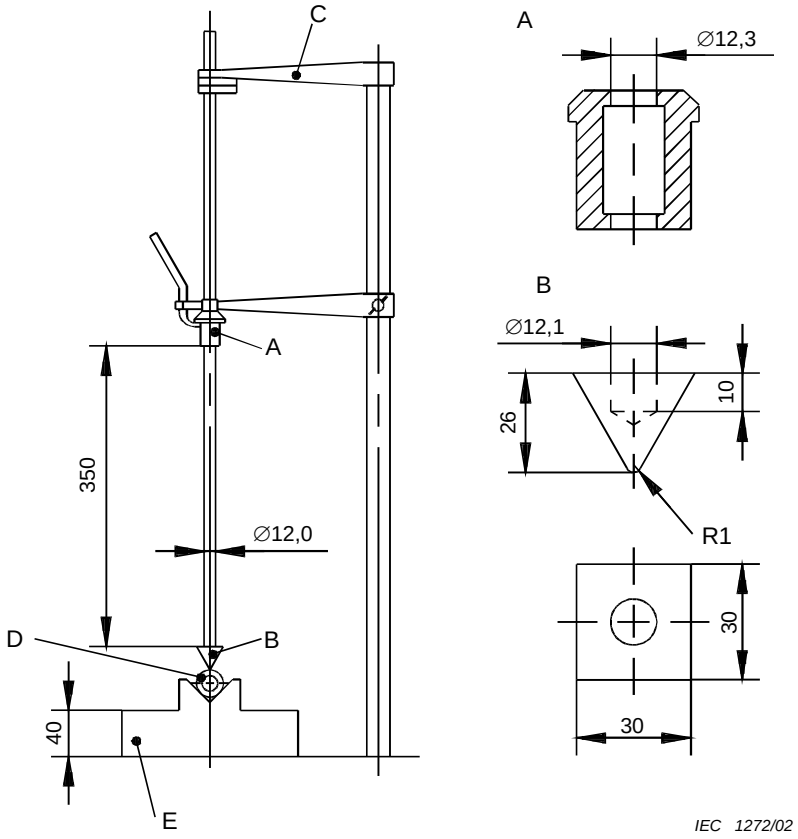
This clause of Part 1 is applicable.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable, except as follows.

Addition:

NOTE 101 For machines intended to pick up hazardous dust, additional requirements are specified in Annex AA to this standard.



Dimensions in millimeters

Key

A = Weight

B = Chisel

C = Fixing arm

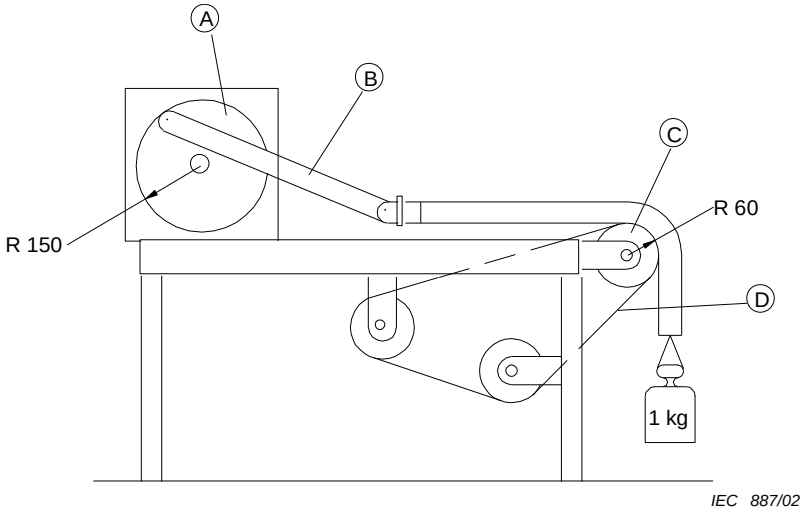
D = Sample

E = Base having mass of 10 kg

Figure 101

Impact test apparatus

Dimensions in millimetres



Key

A Crank mechanism

B Connecting rod

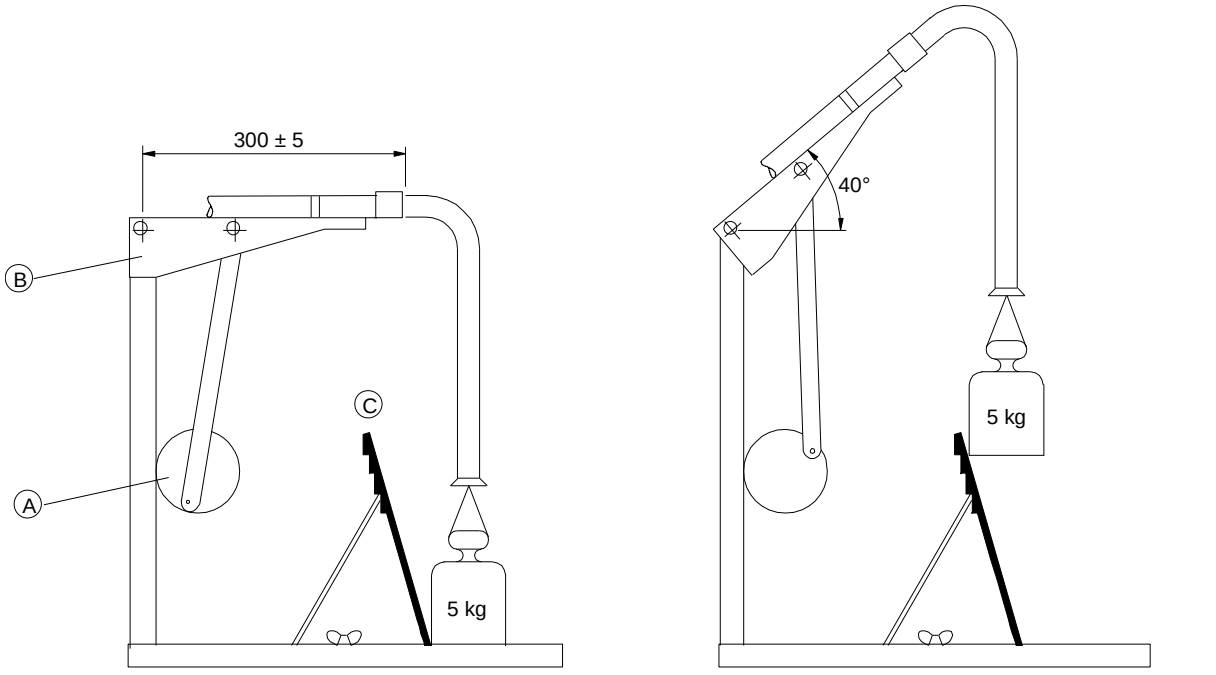
C Roller, diameter 120 mm

D Abrasive cloth belt

Figure 102

Apparatus for testing the abrasion resistance of current-carrying hoses

Dimensions in millimetres



Key

A Crank mechanism

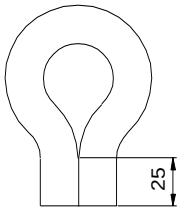
B Arm

C Inclined plane

Figure 103

Apparatus for testing the resistance to flexing of current-carrying hoses

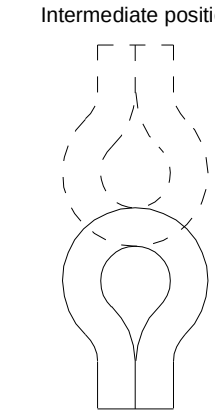
Dimensions in millimetres



IEC 889/02

Figure 104

Configuration of the hose for the freezing treatment



IEC 890/02

Figure 105

Flexing positions for the hose after removal from the freezing cabinet

Annexes

The annexes of Part 1 are applicable except as follows.

Annex A
(normative)

Routine tests

NOTE 101 For the purposes of this standard, this annex of Part 1 is considered normative.

A.3 Addition:

For appliances of **dust class H**, compliance with the penetration requirement of Table AA.1 has to be shown either for the complete appliance or for the essential filter element.

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.

AA.3 Definitions

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

AA.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.

AA.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;

d) if the appliance is used for collecting radioactive dust, additional precautions for handling and final disposal should be taken in accordance

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

with the appropriate codes and regulations which are outside the scope of this standard.

AA.3.203
penetration D

degree of penetration of a filter material, a filter or an appliance, determined as follows:

$$D = \frac{\dot{m}_{out}}{\dot{m}_{in}} \times 100\ \%$$

where

$\dot{m}_{out}$ is the average mass concentration of the test aerosol in the downstream air during the sampling time

$\dot{m}_{in}$ is the average mass concentration of the test aerosol in the upstream air during the sampling time

AA.3.204
mean velocity

$\bar{V}$
$\bar{V}$ Is calculated as follows:

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

where

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

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

AA.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).

AA.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

AA.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

AA.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

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

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

AA.6 Classification

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

AA.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;

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

– **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.

AA.7 Marking and instructions

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

AA.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.

AA.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;

- max. flow rate (m³/h) and max. underpressure (hPa);

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. The instructions for **class H** appliances shall include the following:

  WARNING: Do not reuse the **essential filter element** after removal out of the appliance.

- 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. In addition, on class **H** appliances, the appliance filtration efficiency should be tested at least annually, or more frequently as may be specified by national requirements. The test method that can be used to verify the appliance's filter efficiency are specified in AA.22.201.2. If the test fails, it shall be repeated with a new essential filter;

- 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.

The instructions shall contain

– for **class H** appliances, the meaning of the warning label according to Figure AA.1.1; including the corresponding warning text according to AA.7.14;

– for **class M** and **L** appliances, the meaning of the relevant warning label according to Figure AA.1.2

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.

AA.7.14 Addition:

Class H appliances shall be fitted with the label according to Figure AA.1.1.

Class M and **L** appliances shall be fitted with the relevant label according to Figure AA.1.2.

The following warning shall be given on the label for **class H** appliances:

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

For **class L, M** and **H** appliances, covers and guards which do not require tools for removal shall be fitted with an additional label worded: REMOVE FOR CLEANING.

AA.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.

AA.19 Abnormal operation

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

AA.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 test of AA.22.201.4.

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.

AA.22 Construction

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

AA.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

Penetration limits

Dust class	**Suitability for hazardous dust with limit values for occupational exposure** mg x m^{-3}	**Degree of penetration** D %	**Essential filter material test** a)	**Essential filter element test** a)	**Assembled appliance test method**
L (light hazard)	> 1	< 1	AA.22.201.1 or AA.22.201.2	Not required	AA.22.201.3 if essential filter material test is not carried out
M (medium hazard)	≥ 0,1	< 0,1	AA.22.201.1 or AA.22.201.2	Not required	AA.22.201.3
H (high	<0,1 ,	< 0,005	Not required	AA.22.201.2	AA.22.201.3

hazard)	including carcinogenic dusts and dusts contaminated with carcinogens and/or pathogens				
NOTE Appliances using an identical construction of essential filter and mounting and with an identical airflow velocity can be approved by testing one model in the range.					
a) These tests may be conducted by the filter/material manufacturer.					

NOTE Appliances of dust class M are suitable for wood dust.

Compliance is checked by the following tests:

AA.22.201.1 Essential filter material test

For **dust class L** and **M** appliances the degree of penetration of the filter material is determined as follows:

Compliance is tested using apparatus similar to Figure AA.2. An integrally measuring photometer or a suitable particle measuring system can be used. The test is carried out using 6 new material samples.

The dust laden air is sucked through the filter material for one hour, the air flow velocity at the measuring point P being the same as the air flow velocity at the filter in the appliance.

The test dust used is a wide spectrum quartz dust in a concentration of (200 ± 20 mg/m³) , where 90 % of the particle diameters at the measuring point P are between 0,2 µm and 2 µm, based on Stokes diameter [2)].

The degree of penetration is calculated by means of the following formula:

$$D = \frac{C_H - C_o}{C_v - C_o} \times 100\,\% \qquad (1)$$

where

2) Information on supply sources can be found on the IEC website, dashboard SC61J.

C_H = the light-scattering signal downstream of the filter;

C_O = the blank value of the apparatus for ambient air;

C_V = the light scattering signal upstream of the filter.

The degree of penetration is averaged over the duration of the test, the first readings being taken 5 min after the commencement of the flow of dust laden air through the filter sample material.

The degree of penetration D is determined for 6 samples.

The arithmetic mean of the 6 values, plus twice the standard deviation, shall be less than the required value of D according to Table AA.1.

AA.22.201.2 Essential filter element test.

For **dust class H** appliances the degree of penetration of the **essential filter** element shall be determined as follows:

Compliance is checked by using apparatus similar to Figure AA.4.

On appliances with a ducted outlet Figure AA.3 can be used.

All dust filters are removed, except the **essential filter** element.

It shall be ensured that the **essential filter** element is evenly loaded with the test aerosol.

The test is carried out with a new **essential filter element.**

The test aerosol is a narrow spectrum mist of paraffin oil, dispersed oil particulate (DOP) or NaCl, in a concentration between 10 mg/m³ and 100 mg/m³.

According to Stokes diameter, 90 % of the number of particles are below 1 µm.

An integrally functioning photometer or a suitable particle counter is used to measure D continually.

NOTE The effect of carbon brush dust shall be taken into consideration.

After the first 5 min adjustments may be made if necessary. After a second delay of 20 min D is calculated with equation [1].

D is not allowed to exceed the limit value given in Table AA.1.

AA.22.201.3 Assembled appliance test.

For **dust class M and H** appliances a polydisperse limestone dust of particle size distribution 10 % < 1 µm, 22 % < 2 µm, 75 % < 5 µm is used [3)] for testing, in an apparatus similar to Figure AA.4.

After a minimum of 3 cycles, when the airflow velocity has fallen to 20 m/s in the nominal suction hose diameter, with a maximum measuring time of 8 h, D is determined, either gravimetrically with a 95 % one-sided confidence level according to ISO 2602, or with an equivalent measuring system.

If the fan of the vacuum cleaner under test is strong enough to maintain the required airflow rate, Q_E may be reduced to zero.

The upstream concentration of the test substance during the entire test shall be 5 g/m^3 airflow.

D shall not exceed the values given in Table AA.1.

NOTE A test for suction sweeping machines is under consideration. The influence of air temperature, humidity and density shall be taken into consideration.

After this test, a further test shall be carried out according to AA.22.201.2.

_____

3) Information on supply sources can be found on the IEC website, dashboard SC61J.

AA.22.201.4 Burst strength test

For **dust classes L, M and H**, a clogging medium (e.g. French chalk) is used to give 90 % of the maximum differential pressure obtained by the method used when measuring P_i in 3.1.9, and a pulsing effect is achieved by covering the inlet to the machine 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. All collection bags and pre-filters shall be removed from the appliance to ensure that the essential filter is subjected to the full loading of the clogging media and the pulsing effect of blocking the inlet as described.

The pulsing test shall be repeated 30 times over a period of 3 min.

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

AA.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 class **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. If airflow indicator adjustments are necessary, they shall be adjustable without **tools.**

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 and excluding appliances of dust class **L**) the indicator shall operate before the suction velocity becomes less than as stated by the manufacturer or 20 m/s, whichever is greater, referring to the largest section in the hose, or the dust source is shut off by a mechanism in the dust collector. If airflow indicator adjustments are necessary, they shall be adjustable without tools. If the dust source cannot be shut off (e.g. when there is a conveyer belt system in a production process), then at least one of the following warning signals shall be given:

– an acoustic warning signal, if used, shall comply with ISO 7731;

– a visual warning signal, if used, shall comply with ISO 11428;

– a pair of voltage-free contacts and installation instructions for their use as a warning signal switching device.

Compliance is checked by inspection and the following test.

Operate the appliance in accordance with the instructions for use, at nominal voltage, at rated voltage +6 %, and at rated voltage –10 %; and, if necessary, compare the values with the specified values. No leaking of dust shall occur.

AA.22.203 Class **M** and **H** appliances may be provided with a **safe change filter** if a dust free filter exchange cannot be guaranteed. 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 carrying out 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.

AA.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.

AA.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.

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

Compliance is checked by inspection.

AA.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.

AA.22.208 In dust class **H** appliances the **essential filter** shall only be removable by the use of a **tool.**

Compliance is checked by inspection.

AA.22.209 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.

AA.22.210 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.

AA.22.211 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

Table AA.2

Materials having a low susceptibility to ageing

Abbreviation	Chemical name	Common name
NBR	Acrylonitrile-butadiene rubbers	Nitrile
NBR/PVC	Blend of acrylonitrile-butadiene rubber and polyvinyl chloride	
CO	Polychloromethyloxiran	Epichlorhydrin
ACM	Copolymer of ethyl acrylate (or other acrylates) and a small amount of a monomer which facilitates vulcanisation	Polyacrylate
CR	Chloroprene rubber	Neoprene
IRR	Isobutene-isoprene rubber	Butyl
XNBR	Carboxylic-acrylonitrile-butadiene rubbers	Carboxylic nitrile
BIIR	Bromo-isobutene-isoprene rubbers	Bromobutyl
CIIR	Chloro-isobutene-isoprene rubbers	Chlorobutyl
PDM	Polydimethylsiloxane	Silicone rubber

AA.22.212 Dust class **H** appliances shall be fitted with **essential filters** of the type for which the likelihood of damage to the filter medium during storage or fitting is a minimum.

NOTE Provision of a protective mesh screen as an enclosure for the filter media is considered acceptable.

Compliance is checked by inspection.

AA.22.213 Dust class **H** appliances shall not be fitted with filters with a limited shelf life of less than five years.

Compliance is checked by inspection.

AA.22.214 Class **M** and **H** appliances shall be constructed so as to guard against accidental entry and the release of **hazardous dust** from any part of the appliance when not in use.

Compliance is checked by inspection and the use of test probe B of IEC 61032.

AA.22.215 Class **H** appliances not to the requirements of IP6X and class **M** appliances not to the requirements of IP5X shall conform to the following:

a) covers and guards not in accordance with IP65 and not protecting against both mechanical and electrical hazards shall not require **tools** for their removal;

b) covers and guards not in accordance with IP6X but protecting against mechanical and electrical hazards shall have electrical interlocks which disconnect the mains supply on removal, or require the use of **tools** for removal. Covers and guards fitted with electrical interlocks shall not require **tools** for their removal. The interlock shall be double pole if protecting against electrical hazard, and double or single pole if protecting against mechanical hazard;

b) if an **essential filter** is used to ensure there is no entry of dust into the compartment, then that filter shall require **tools** for its removal.

Compliance is checked by inspection.

AA.32 Radiation, toxicity and similar hazards

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

AA.32.201

NOTE 1 None of the classes covered by this standard is suitable for collecting radioactive dust unless expert advice with regard to protection of operator and appliance is obtained from a relevant authority.

NOTE 2 Information on the explosion risk of certain dusts is given in Annex BB.

AA.32.202 Hazards relating to toxicity are covered for certain classes of appliances in Clause 22 of this annex.

Dimensions in millimetres (±0,5 mm)

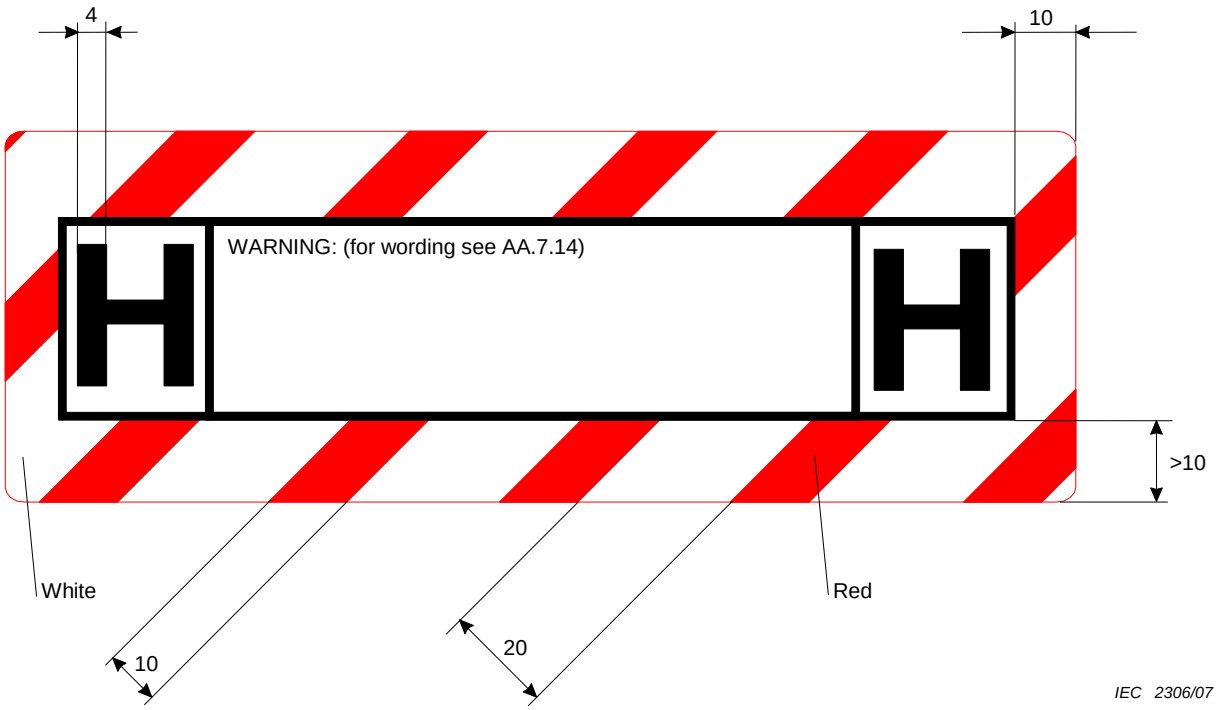


Figure AA.1.1
Warning label for class H appliances

Dimensions in millimetres (±0,5 mm)

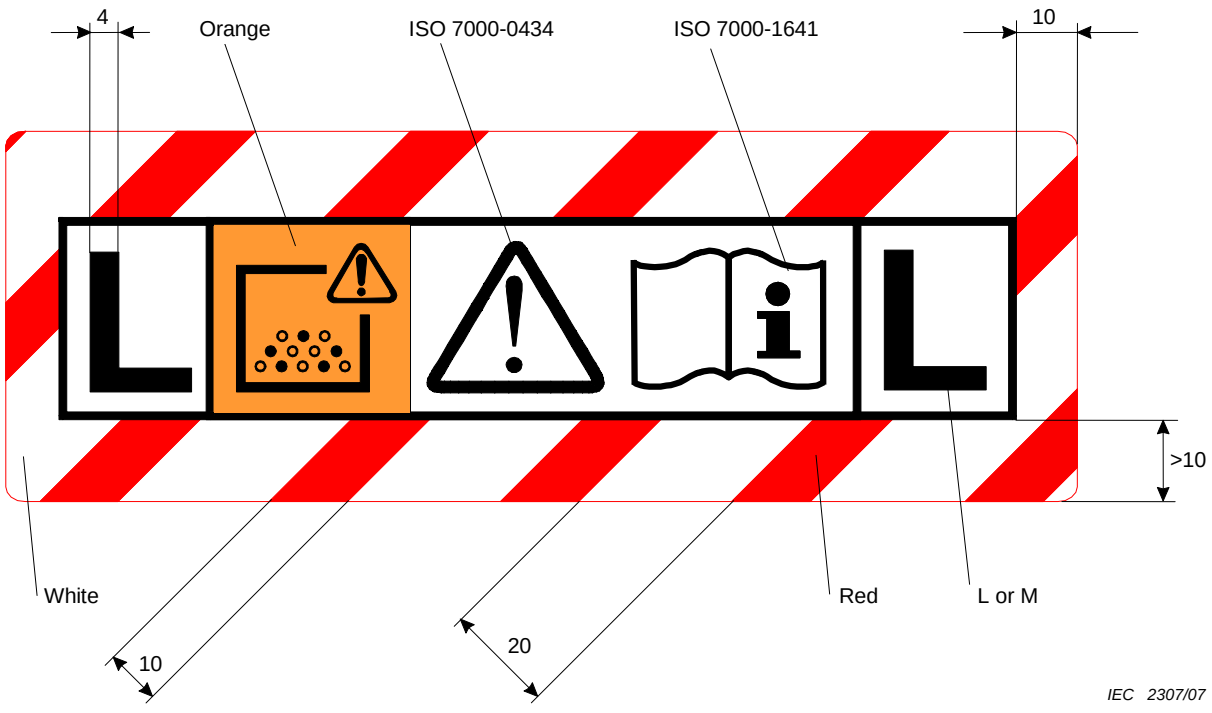


Figure AA.1.2
Warning label for class L and M appliances

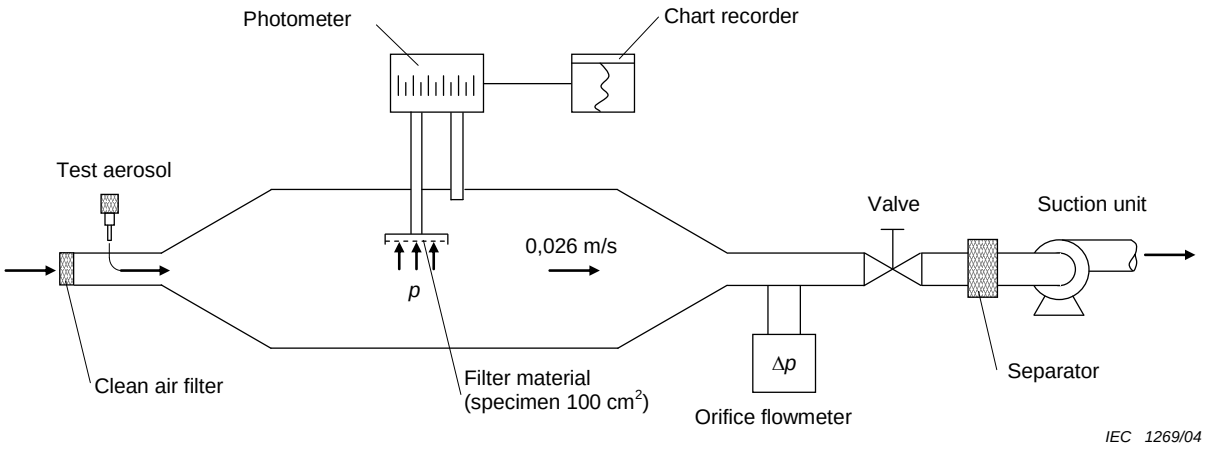


Figure AA.2

Test method for essential filter material

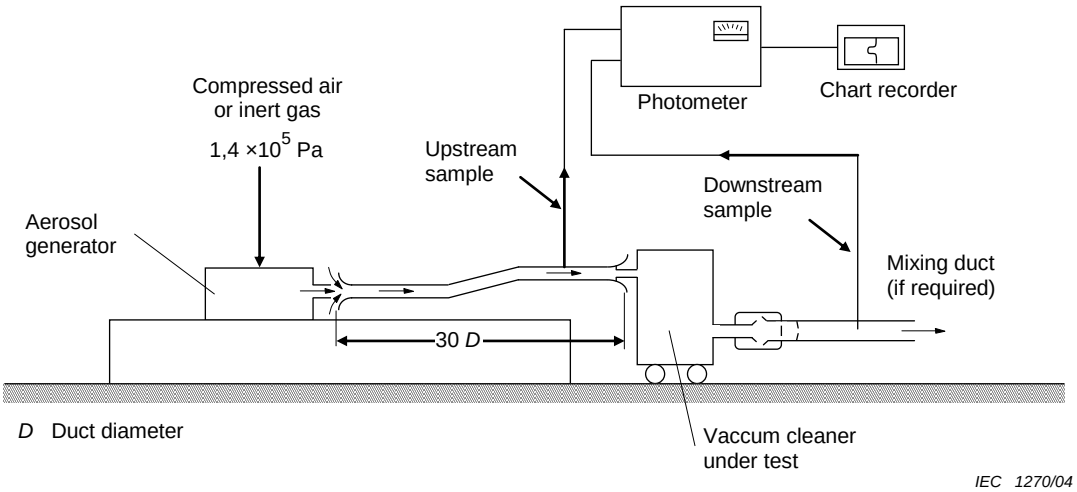
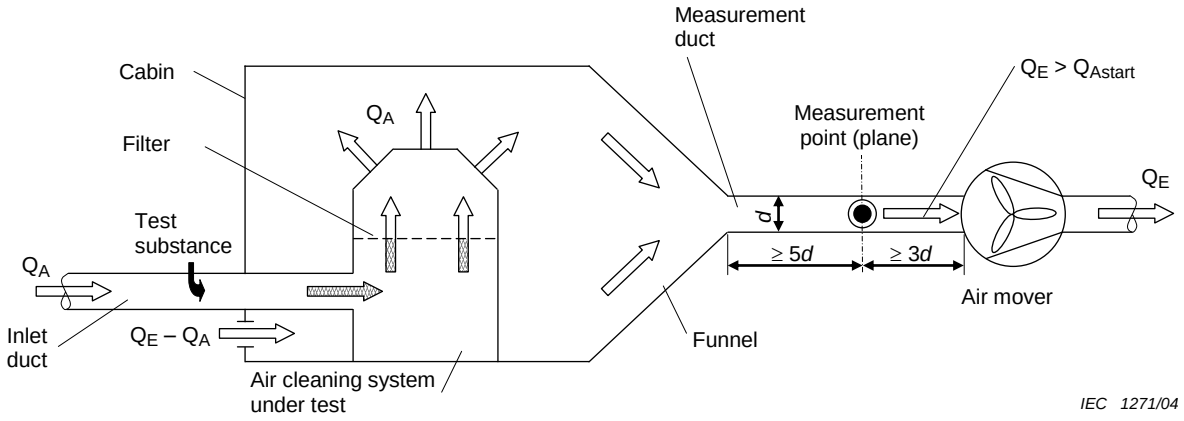


Figure AA.3

In situ essential filter element test



NOTE The air entering at Q_E should be filtered. The filter used shall be of dust class M.

Figure AA.4

Assembled appliance test

Annex BB
(informative)

List of dusts which are an explosion risk when subject to ignition conditions

The values of explosion parameters are included as a guide for those concerned with the design and operation of dust-handling appliances. The dust samples are not necessarily in the most hazardous form that could arise in industry. In addition, the design of the appliance, the quantity of material and the methods of handling should all be taken into account when considering explosion hazards.

Dust	**Minimum ignition temperature** °C	**Minimum explosible concentration** kg/m^3	**Minimum ignition energy** mJ
Acetamide	560	-	-
Acetoparaphenetidine	-	-	11,5
Acetyl-p-nitro-o-toludine	450	-	-
Acetyl salicylic acid (Aspirin)	550	0,015	16
Acrylonitrile-butadiene-styrene copolymer	400	-	-
Acrylonitrile-vinylidene chloride copolymer	-	0,05	70
Alkyd powder coatings	360	0,028	22
Aluminium, 6 μm	-	0,03	13
Aluminium, <1400 μm	420	-	-
Aluminium, cuttings and buffings	480	-	-
Aluminium, fibres	610	-	-
Aluminium, linishings	600	-	-
Aluminium, polishings	460	-	-
Aluminium, swarf	590	-	-
Aluminium octoate	460	-	-
Animal feed stuff	450	-	-
Anthracene	-	-	7
Anthraquinone	670	-	-
Asbestos, resinated	480	-	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m3	Minimum ignition energy mJ
Azodicarbonamide	-	0,6	130
Barley, milled	370	-	-
Battery case dust	400	-	-
Benzoic acid	600	0,011	12
Benzoyl peroxide	-		31
Benzoyl peroxide 44 %, gypsum 56 %	-	-	12
Bleach powder, 60/100 μm	580		
Bone flour, steamed	540	-	-
Boron carbide	640	-	-
Bread	450	-	-
Bronze	440	-	-
Brunswick green	360	-	-
Cadmium sulphide	700	-	-
Cadmium sulphoselenide	710	-	-
Cadmium yellow	390	-	-
Cadmium zinc sulphide	660	-	-
Calcium citrate	470	-	-
Calcium gluconate	550	-	-
Calcium pantothenate	430	-	-
Calcium propionate	530	-	-
Calcium silicide	-	-	< 4,6
Calcium stearate	450	-	24
Caprolactam	430	0,07	60
Carbon, 13 % volatile	590	-	45
Casein	460	-	-
Casein meal, steamed	460	-	-
Cellulose, bleached	410	-	-
Cellulose acetate	340	-	-
Cellulose acetate, fibres	430	-	-
Cellulose acetate butyrate	380	-	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m^3	Minimum ignition energy mJ
Cellulose triacetate	390	-	-
Charcoal, wood	470	-	-
Chicken manure	680	-	-
Chloro-amino-toluene sulphonic acid	650	-	-
p-Chloro o-toluidine hydrochloride	650	-	-
Coal, 30 % volatile	530	-	-
Coal, 36 % volatile	490	-	-
Coal, anthracite < 63 μm	530	-	-
Coal, Pittsburgh < 74 μm	530	0,03	-
Coal, pulverized < 150 μm	550	-	-
Coal, silkstone	490	-	-
Cocoa, bean husk	400	-	-
Coconut shell	490	-	-
Coffee	360	-	-
Coffee 55 %, chicory 45 %	370	0,1	140
Cork	400	-	-
Cornflour	390	-	-
Cornstarch	380	0,15	-
Cyclohexanone peroxide	-	-	21
Detergent, high non-ionic	410	-	-
Detergent, low non-ionic	560	-	-
Detergent, standard ABS	520	-	-
Dextrine	440	-	-
Dextrose monohydrate	350	-	-
Diamino stilbene disulphonic acid	450	-	-
Dibutyl tin maleate	600	-	-
Dibutyl tin oxide	530	0,012	7
Dihydro streptomycin sulphate	670	-	-
Dimethyl acridan	540	-	-
Dimethyl diphenyl urea	490	-	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m^3	Minimum ignition energy mJ
Dinitroaniline	470	-	-
Dinitrobenzoyl chloride	380	-	-
Dinitro stilbene disulphonic acid	450	-	-
Diphenyl guanidine + 1,5 % de-dusting powder	540	-	28
Diphenyol propane	-	0,012	11
Epoxide resin	-	-	9
Epoxy powder, semi-gloss coating	-	0,013	-
Epoxy resin	490	0,012	12
Esparto grass	-	-	-
Face powder	440	-	-
Farina starch, 20 % H_2O	-	-	-
Ferrochrome	600	-	-
Fish meal	520	-	-
Flour, English 13 % H_2O	-	-	-
Flour, wheat	390	-	100
Grain, distillers dried solubles	420	0,06	128
Grain, dried brewers	440	0,009	-
Grass	380	-	-
Gum, arabic, 250/1400 μm	550	-	-
Hoof and horn, hydrolysed	460	-	-
Hops, ground	340	-	-
Hydroxy ethyl cellulose	420	-	-
Hydroxy ethyl methyl cellulose	410	-	-
Irish moss	540	-	-
Isinglass	520	-	-
Jaborandi leaf	470	-	-
Lauryl peroxide	-	-	12
Lead stearate, dibasic	-	-	12
Leather, < 420 μm	520	-	-
Liquorice root	-	0,2	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m^3	Minimum ignition energy mJ
Magnesium swarf	610	-	-
Maize gluten meal	430	-	-
Maize husk	430	-	-
Male fern, crushed	510	-	-
Malt, coarse	390	-	-
Manganese ethylene bis-dithio carbamate	270	0,07	35
Manioc flour	430	-	-
Meat meal	500	-	-
Meat and bone meal	440	-	-
Melamine formaldehyde resin	410	0,02	68
Methyl cellulose	480	-	-
2,2 Methylene bis-4-ethyl-6-tertiary butyl phenol	310	-	-
Methyl methacrylate	-	-	13
Milk powder	440	-	-
Milk powder, skimmed	-	-	-
Monochloracetic acid	620	-	-
Monosodium salt of tri-chloroethyl phosphate	540	-	-
β-Naphthol	670	-	-
Nigrosine hydrochloride	630	-	-
p-Nitro o-anisidene	400	-	-
Nitrocellulose	-	-	30
Nitrodiphenylamine	480	-	-
Nitrofurfural semi-carbazone	240	-	-
m-Nitro p-toluidine	470	-	-
p-Nitro o-toluidine	470	-	-
Nylon, ground flock	450	-	-
Nylon 11	-	0,005	32
Paper	400	0,03	-
Paper tissue, < 1400 μm	-	-	39

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m^3	Minimum ignition energy mJ
Peat	450	-	-
Peat, dried	-	0,1	-
Pectin, powdered	390	-	-
Penicillin, N-ethyl, piperidine salt of	310	-	-
Phenol formaldehyde	520	-	-
Phenol formaldehyde resin	450	0,015	-
Phenothiazine	590	-	-
Polyester resin < 1400 μm	400	-	-
Polyethylene	390	0,02	38
Polyethylene, commercial	-	-	57
Polyethylene, ground	400	-	-
Polyethylene glycol	320	-	-
Polyethylene high density < 90 μm	-	-	17
Polypropylene	380	-	43
Polyurethane	460	-	-
Polyvinyl acetate	450	-	-
Polyvinyl acetate, beads	-	-	70
Polyvinyl chloride	510	-	-
Polyvinyl chloride, dispersion resin	550	-	-
Polyvinylidene chloride	670	-	-
Poppy flower	410	0,4	600
Potato, dried, < 200 μm	450	-	-
Propyliodine	470	-	-
Protein	480	-	-
Protein, groundnuts	460	-	-
Protein concentrate	390	-	-
Provender	370	-	-
Quillaia bark	450	-	-
Rag, < 1400 μm	470	-	-
Rayon, viscose	420	-	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m^3	Minimum ignition energy mJ
Rayon flock	-	0,03	-
Rayon flock, 8 denier, 1,5 mm	425	0,15	-
Resin, rubber	400	-	-
Resin, synthetic	400	-	-
Rubber	380	-	-
Rubber, latex	450	-	-
Rubber, synthetic	410	-	-
Rubber accelerator	310	-	-
Rubber crumb	440	-	-
Sawdust	430	-	-
Senna	440	0,01	105
Silicon	900	-	-
Soap	570	0,02	25
Sodium acetate	560	0,15	-
Sodium carboxy methyl cellulose	320	1,1	440
Sodium salt of 2,2 dichloropropionic acid	520	-	-
Sodium salt of 2,2 dihydroxy naphthalene disulphonic acid	510	-	-
Sodium glucaspaldrate	600	-	-
Sodium glucoheptonate, dried	600		
Sodium monochloracetate	550	-	-
Sodium propionate	470	-	-
Sodium toluene sulphonate	530	-	-
Sodium xylene sulphonate	490	-	-
Sorbic acid	440	-	-
Soya bean	390	0,23	370
Soya meal	410	0,18	330
Starch	470	-	-
Starch, cold water	490	-	-
Starch, maize 10 % H_2O	-	0,15	-
Stearic acid	330	-	-

Dust	Minimum ignition temperature °C	Minimum explosible concentration kg/m3	Minimum ignition energy mJ
Steel	450	-	-
Streptomycin sulphate	700	-	-
Sugar	330	0,015	48
Sulphur	220	0,02	-
Tallow, hydrogenated	620	-	-
Tartaric acid	350	-	-
Tea	500	-	-
Tobacco, dried	320	-	-
Urea	900	-	-
Urea formaldehyde moulding powder	450	0,04	-
Urea formaldehyde moulding powder, paper filled	430	0,07	49
Wax, paraffin	340	-	-
Whey flour	480	-	-
Wood	360	-	-
Wood, flour	380	0,06	100
Wood, flour, < 1400 μm	410	-	100
Wood, ground fluffed	450	-	-
Wood, shavings	400	0,1	-
Wood pulp, dehydrated	450	-	-
Wood pulp, flock	470	-	-
Zinc stearate	420	-	14

Annex CC
(normative)

Particular requirements for vacuum cleaners, suction sweeping machines and dust extractors for the collection of dusts which are an explosion risk

The following modifications to the relevant clauses in this part 2 are applicable to vacuum cleaners, suction sweeping machines and dust extractors for the collection of dusts which present an explosion risk.

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

CC.1 Scope

This clause of this part 2 is applicable except as follows:

Addition:

This standard applies to non-fixed motor-operated vacuum cleaners, suction sweeping appliances and dust extractors specifically designed for wet and/or dry suction for industrial and commercial use and specifies additional requirements for collecting **combustible dusts** in **zone 22**.

CC.3 Definitions

This clause of this part 2 is applicable except as follows:

Addition:

CC.3.201
combustible dust
dust with a particle size below 1 mm, able to undergo an exothermic reaction with air when ignited

CC.3.202
type 22 appliance
vacuum cleaner, suction sweeping machine or dust extractor suitable for suction of combustible dust in **Zone 22**. The inner part of the appliance where the dust is collected is considered to be **Zone 20**

NOTE The inner part of suction hoses and nozzles are considered to be Zone 22.

CC.3.203
Zone 20
See 6.2 of IEC 61241-10.

CC.3.204
Zone 22
See 6.2 of IEC 61241-10.

CC.3.205
electrostatic earthing
connection to earth with a maximum resistance of 1 MΩ

CC.3.206
conductive parts
parts made of materials with a specific resistance of not more than 10 000 Ω.m.

CC.4 General requirement

This clause of this part 2 is applicable except as follows:

Addition:

CC.4.201

Appliances of **Type 22** shall comply with dust class **L**, **M** or **H** according to Annex AA. For dust class **L**, there is an indicator required in accordance with AA.22.202. Appliances of **Type 22** and **class L** shall comply with the requirements of AA.22.209. For all appliances, flow-through collector motors are not allowed.

CC.4.202

The temperature of the surfaces of a **Type 22** appliance that are in contact with **combustible dust** shall not exceed 135 °C.

NOTE Lower temperatures can be stated by the manufacturer.

Compliance is checked by the tests of Clauses 11 and 19.

CC.6 Classification

This clause of this part 2 is applicable except as follows:

CC.6.1 Addition:

Type 22 appliances shall be of Class I.

CC.6.2 Addition:

Type 22 appliances shall be at least IP54 according to IEC 60529.

NOTE 1 The test is carried out with air-moving fans working.

NOTE 2 Data lead connectors are not required to be IP54 if they are SELV and their current is limited to 20 mA.

Compliance is checked by the appropriate tests

CC.6.201 The appliances are classified as follows:

– **Type 22**: Appliances that are suitable for operation in **Zone 22.**

CC.7 Marking and instructions

This clause of this part 2 is applicable except as follows:

CC.7.1 Addition:

Appliances shall be marked in accordance with IEC 61241-1-1, for example "Ex II 3D T135°C".

Appliance inlets shall be marked with the essence of the statement: "Do not plug or unplug under load."

CC.7.6 **Type 22** vacuum cleaners and suction sweeping machines shall be clearly and permanently marked with the symbol of Figure CC.1.

Type 22 dust extractors shall be clearly and permanently marked with the symbol of Figure CC.2.

CC.7.12 Addition:

The instructions for use shall include the substance of the following.

For all **Type 22** appliances:

– The dust container has to be emptied when necessary, but also after every use;

– extension cords shall not be used;

– the correct rotation sense shall be ensured if necessary, to avoid blowing and high temperatures caused by rotation in the wrong sense.

– "For dusts with an ignition energy less than 1mJ additional restrictions of the labour authorities may apply."

Note Typical values for ignition energy can be found in Annex BB.

– "During normal operation surface temperatures may rise to (T_{max}) °C", if T_{max} exceeds 80 °C.

– "**Type 22** appliances are not suitable to pick up dusts or liquids of high explosion risk, nor mixtures of **combustible dust** with liquids."

– "WARNING – Only use accessories approved by the manufacturer for **Type 22** use. The use of other accessories may cause explosion hazard."

– "The appliance shall only be operated when all filters, including filters for motor cooling air, are in position and undamaged."

For suction sweeping machines:

– **Type 22** suction sweeping machines are suitable for picking up **combustible dust** in **Zone 22**.

For vacuum cleaners:

– **Type 22** vacuum cleaners are suitable for picking up **combustible dust** in **Zone 22**. They are not suitable to be connected with dust-generating machines.

For dust extractors:

– **Type 22** dust extractors are suitable to be connected to dust-generating machines in **Zone 22**. It has to be ensured that no ignition sources will be picked up**. Conductive machine parts**, including suction hoods and **conductive parts** of Class II machines, shall be **electrostatically earthed**. **Electrostatic earthing** can be accomplished through the dust extractor or through a separate **electrostatic earthing** means.

– **Type 22** dust extractors are not suitable for machines where ignition sources are produced.

Information shall be given about the national regulations that apply for the installation of data lead wiring and power sockets in **Zone 22**.

The meaning of the symbols according Figure CC.1 or Figure CC.2 shall be explained, including the substance of the following warnings:

– Do not pick up glowing dust or other ignition hazards (Figure CC.1).

– Do not pick up glowing dust or other ignition hazards. Do not use with spark-generating machines (Figure CC.2).

CC.11 Heating

This clause of this part 2 is applicable except as follows:

Addition:

Table 3 – Maximum normal temperature rises

Addition:

NOTE 101 For parts that come into contact with combustible dust, the values in the table are based on an ambient temperature of 40 °C.

CC.19 Abnormal operation

This clause of this part 2 is applicable except as follows:

CC.19.7 Addition:

Delete Note 101 of this part 2.

Addition:

The appliance shall be tested until stable conditions are reached.

Addition of the following subclause not contained in this part 2:

CC.19.8 Addition:

The test is repeated after interchanging two of the three-phase leads in the plug to induce rotation in the wrong sense, if possible, and if there is no warning signal for incorrect rotation sense.

CC.22 Construction

This clause of this part 2 is applicable except as follows:

CC.22.201 The suction fan shall be on the clean air side and shall be protected against intake of particles greater than 8 mm.

Compliance is checked by inspection and measurement.

CC.22.202 Appliances shall be so constructed that a minimum of dust will deposit in or on the appliance.

Compliance is checked by inspection.

CC.22.203 Outer parts of the appliance, parts enclosing collected dust, nozzles and dust conduits shall not be made from aluminium containing more than 7,5 % of magnesium and not be coated with aluminium coating.

Nozzles made of cast aluminium containing more than 7,5 % of magnesium have to be protected against impact by steel or resilient protectors.

Compliance is checked by inspection.

CC.22.204 Dust deflectors shall not be made of materials that generate sparks on impact.

Compliance is checked by inspection.

CC.22.205 Downstream of the essential filter the air is considered to be free of combustible dust.

CC.23 Internal wiring

Addition:

Cables and wires not within the IP54 compartment shall not be lighter than 60245 IEC 66.

NOTE This requirement does not apply to external data wiring, for which national regulations might apply.

Compliance is checked by inspection.

CC.24 Components

This clause of this part 2 is applicable except as follows:

Addition:

CC.24.1 Addition:

Components located within enclosures containing collected **combustible dust** shall be suitable for **Zone 20**.

Compliance is checked by inspection.

CC.24.201 Filters for cooling air needed to comply with CC.6.2 shall only be removable with the aid of a tool.

Compliance is checked by inspection.

CC.25 Supply connection and external flexible cords

This clause of this part 2 is applicable except as follows:

CC.25.1 Addition:

Appliance inlets shall be so arranged, that the plug is inserted from below. When disconnected, the appliance inlet shall be protected against deposition of dust by a permanently attached dust cover.

Compliance is checked by inspection.

CC.25.7 Addition:

Power supply cords for **Type 22** appliances shall not be lighter than 60245 IEC 66.

NOTE This requirement does not apply to external data wiring, for which national regulations might apply.

Compliance is checked by inspection.

CC.30 Resistance to heat and fire

This clause of this part 2 is applicable except as follows:

Addition:

CC.30.2 Addition:

Non-metallic parts surrounding collected **combustible dust** shall be resistant to ignition and spread of fire. This requirement does not apply to removable dust-collection media placed within the flame-resistant enclosure, e.g. paper disposal bags.

Compliance is tested as follows:

Non-metallic parts covering but not supporting the collected **combustible dust** are subjected to the glow-wire test according to IEC 60695-2-11, the test being made at a temperature of 550 °C.

Non-metallic parts supporting the collected **combustible dust** shall have a glow-wire flammability index of at least 850 °C according to IEC 60695-2-12, the test sample being no thicker than the relevant part and are subjected to the glow-wire test according to IEC 60695-2-11, the test being made at a temperature of 750 °C. Parts that withstand the glow-wire test of IEC 60695-2-11, but which, during the test, produce a flame that persists for longer than 2s, are subjected to the needle-flame test of Annex E.

The needle-flame test is not carried out on parts which are made of material classified as V-0 or V-1 according to IEC 60695-11-10, provided that the test sample was not thicker than the relevant part.

NOTE The test of CC.30.2 is not carried out on appliances exclusively denoted for wood, having a maximum rated power of 1200 W and the volume of whose dust container does not exceed 50 dm^3 .

CC.30.201 **Type 22** appliances shall not create any ignition source.

All **conductive parts** that are in contact with combustible dust shall be **electrostatically earthed**.

NOTE 1 The requirement for **electrostatic earthing** does not apply to small **conductive parts**, when their time constant (resistance to earth times capacity) is below 0,02 s.

NOTE 2 Filter materials are not required to be conductive.

Compliance is checked as follows:

The **electrostatic earthing** is measured with minimum 100 V DC, with an electrode surface not exceeding 20 cm^2. The electrode is applied with a force of 10 ± 2 N.

CC.32 Radiation, toxicity and similar hazards

This clause of this part 2 is applicable except as follows:

CC.32.201

NOTE Information on the explosion risk of certain dusts is given in Annex BB.

IEC 2308/07

Figure CC.1

Marking – Type 22 vacuum cleaners and suction sweeping machines

IEC 2309/07

Figure CC.2

Marking – Type 22 dust extractor

Annex DD
(normative)

Particular requirements for vacuum cleaners for use in ESD protected areas

The following modifications to the relevant clauses in this part 2 are applicable to vacuum cleaners for use in ESD protected areas.

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

DD.1 Scope

This clause of this part 2 is applicable except as follows:

Addition:

This standard applies to non-fixed motor-operated vacuum cleaners specifically designed for dry suction for industrial and commercial use in **ESD protected areas**.

DD.3 Definitions

This clause of this part 2 is applicable except as follows:

DD.3.201
type ESD vacuum cleaner
vacuum cleaner for use in ESD protected areas

DD.3.202
ESD protected area (EPA)
area with a minimum risk for electrostatic discharge that could damage electronic devices, and in which people present in that area are not subjected to any additional risk

DD.3.203
electrostatic earthing
connection to earth with a maximum resistance of 1 MΩ

DD.3.204
conductive parts
parts made of materials with a specific resistance of not more than 10 000 Ω·m

DD.4 General requirement

This clause of this part 2 is applicable except as follows:

Addition:

Appliances of **Type ESD** shall comply with dust class **L**, **M** or **H** according to Annex AA.

DD.6 Classification

This clause of this part 2 is applicable except as follows:

DD.6.1 Addition:

Type ESD vacuum cleaners shall be Class I.

DD.6.2 Addition:

Type ESD appliances shall be at least IP54 according to IEC 60529.

NOTE The test is carried out with air moving fans working.

Compliance is checked by the appropriate tests

DD.7 Marking and instructions

This clause of this part 2 is applicable except as follows:

DD.7.1 Addition:

Type ESD vacuum cleaners shall be clearly and permanently marked with the following symbol:

DD.7.12 Addition:

The instructions for use shall contain the essence of the following information.

For all **Type ESD** appliances:

– Extension cords shall be Class I.

– "**Type 22** appliances are not suitable to pick up dusts or liquids of high explosion risk, nor mixtures of **combustible dust** with liquids."

– "WARNING – Only use accessories approved for **Type ESD** use. The use of other accessories may cause electrostatic discharges."

– "The appliance shall only be operated when all filters, including filters for motor cooling air, are in position and undamaged."

– **Type ESD** dust extractors are suitable to be connected to dust generating machines in **EPAs**. It has to be ensured that no ignition sources will be picked up**. Conductive machine parts**, including suction hoods and **conductive parts** of Class II machines, shall be **electrostatically earthed**. **Electrostatic earthing** can be accomplished through the dust extractor or through a separate **electrostatic earthing** means.

– **Type ESD** dust extractors are not suitable for machines where ignition sources are produced.

Information shall be given about the national regulations that apply for the installation of data lead wiring and power sockets in **EPAs**.

DD.22 Construction

This clause of this part 2 is applicable except as follows:

DD.22.201 Appliances shall be so constructed that a minimum of dust will deposit in or on the appliance.

DD.24 Components

This clause of this part 2 is applicable except as follows:

DD.24.1 Addition:

Components located within enclosures shall be suitable for **EPA's.**

Compliance is checked by inspection.

DD.24.201 Filters for cooling air needed to comply with DD.6.2. shall only be removable with the aid of a tool.

Compliance is checked by inspection.

DD.30 Resistance to heat, fire and tracking

This clause of this part 2 is applicable except as follows:

DD.30.2 Addition:

Non-metallic parts surrounding collected **dust** shall be electrically conductive.

DD.30.201 **Type ESD** appliances shall not create any ignition source.

All conductive parts shall be electrostatically earthed.

NOTE The requirement for **electrostatic earthing** does not apply to small **conductive parts**, when their time constant (resistance to earth times capacity) is below 0,02 s.

Compliance is checked as follows:

The **electrostatic earthing** is measured with 100 V DC, with an electrode surface not exceeding 20 cm^2. The electrode is applied with a force of 10 ± 2 N.

DD.32 Radiation, toxicity and similar hazards

This clause of this part 2 is applicable except as follows:

DD.32.201

NOTE Information on the explosion risk of certain dusts are given in annex BB.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-2, Household and similar electrical appliances – Safety – Part 2-2: Particular requirements for vacuum cleaners and water suction cleaning appliances

ISO 3864:2002 Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas

Annex AAA

National Modifications for

the Values of the Rated Voltages and Frequencies

With respect to the rated voltages and frequencies, the following modifications shall be applied:

Clause No.	Text as specified in IEC 60335-2-69	Text after modification	Remarks
1, First Paragraph	This Clause of Part 1 is replaced by the following: This International Standard deals with the safety of electrical motor-operated vacuum cleaners and includes appliances and stationary equipment specifically designed for wet suction, dry suction, or wet and dry suction for industrial and commercial use with or without attachments, for example for suction to withdraw dust or the like from work benches and production machines, their **rated voltage** being not more than 250 V for single-phase appliances and 480 V for other appliances.	This Clause of Part 1 is replaced by the following: This International Standard deals with the safety of electrical motor-operated vacuum cleaners and includes appliances and stationary equipment specifically designed for wet suction, dry suction, or wet and dry suction for industrial and commercial use with or without attachments, for example for suction to withdraw dust or the like from work benches and production machines,their **rated voltages** and **rated frequencies** being as specified in Tables AAA-1 & AAA-2 for single-phase appliances and 480 V for other appliances	

Table AAA-1

Single-Phase Rated Voltages & Rated Frequencies in the GCC Countries

Country Name	Rated Voltage V	Rated Frequency Hz
United Arab Emarits	240	50
Kingdom of Bahrin	230	50
Kingdom of Saudi Arabia	220	60
Sultanate of Oman	240	50
Qatar	240	50
Kuwait	240	50

Table AAA-2

Three-Phase Rated Voltages & Frequencies in the GCC Countries

Country Name	Rated Voltage V	Rated Frequency Hz
United Arab Emarits	-	-
Kingdom of Bahrin	-	-
Kingdom of Saudi Arabia	380	60
Sultanate of Oman	-	-
Qatar	-	-
Kuwait	-	-

DRAFT STANDARD

N0. 15786

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES–

SAFETY –

PART 2-69: PARTICULAR REQUIREMENTS FOR

WET AND DRY VACUUM CLEANERS, INCLUDING POWER BRUSHE, FOR INDUSTRIAL AND COMMERCIAL USE

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