IEC 62885-4

Edition 1.0 2020-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Surface cleaning appliances – Part 4: Cordless dry vacuum cleaners for household or similar use – Methods for measuring the performance

Appareils de nettoyage des sols – Partie 4: Aspirateurs à sec sans fil à usage domestique ou analogue – Méthodes de mesure de l'aptitude à la fonction

IEC 62885-4:2020-07(en-fr)

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SURFACE CLEANING APPLIANCES –

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62885-4 has been prepared by subcommittee 59F: Surface cleaning appliances, of IEC technical committee 59: Performance of household and similar electrical appliances.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
59F/397/FDIS	59F/404/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with IEC 62885-2:2016, to which it refers, and which is applicable unless otherwise specified in this standard. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC 62885-2:2016. Amendments to these clauses and subclauses are given under the same references whilst additional subclauses, tables, figures and notes are numbered from 101. Additional annexes are lettered AA, BB, etc.

A list of all the parts in the IEC 62885 series, under the general title *Surface cleaning appliances*, can be found on the IEC website.

In this standard, the following print types are used:

– terms defined in Clause 3: **bold type**

Where the term **dry vacuum cleaner** is used, it shall be read **cordless dry vacuum cleaner**.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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SURFACE CLEANING APPLIANCES –

Part 4: Cordless dry vacuum cleaners for household or similar use – Methods for measuring the performance

1 Scope

This part of IEC 62885 is applicable to measurements of the performance of **cordless dry vacuum cleaners** for household use or under conditions similar to those in households. The results obtained under this document are intended to be comparable to the results obtained under IEC 62885-2 for mains-connected vacuums.

The purpose of this document is to specify essential performance characteristics of **cordless dry vacuum cleaners** which are of interest to users and to describe methods for measuring these characteristics.

NOTE 1 Owing to the influence of environmental conditions, variations in time, origin of test materials and proficiency of the operator, most of the described test methods give more reliable results when applied to comparative testing of a number of appliances at the same time, in the same laboratory and by the same operator.

NOTE 2 This document is not intended for mains-operated vacuum cleaners or cleaning robots.

NOTE 3 Cordless handheld vacuums are excluded, except for 5.7.2 and 5.8.

For safety requirements, reference is made to IEC 60335-1 and IEC 60335-2-2.

A recommendation on information for the consumer at the point of sale is given in Annex B of IEC 62885-2.

2 Normative references

Clause 2 of IEC 62885-2:2016 applies with the following addition:

IEC 62885-2:2016, *Surface cleaning appliances – Part 2: Dry vacuum cleaners for household or similar use – Methods for measuring the performance*

IEC 62301:2011, *Household electrical appliances – Measurement of standby power*

3 Terms and definitions

Clause 3 of IEC 62885-2:2016 applies with following additions.

3.101
cordless dry vacuum cleaner
dry vacuum cleaner that is not mains-operated

Note 1 to entry: The term "cordless" is equivalent to "battery-operated" throughout the document.

3.102
fully charged
point during charging when, according to the manufacturer's instructions, by indicator or time period, the product does not need to be charged anymore (see 4.6.101 for specific charging instructions)

3.103
fully discharged
point in use when the manufacturer's instructions state the product is **fully discharged** or the vacuum motor stops spinning, whichever comes first

3.104
charging time
time required to **fully charge** a cordless dry vacuum cleaner from a **fully discharged** condition

3.105
replacement battery
battery that is identical in type, fit and performance to the battery supplied with the cordless product, and is changeable without tools

3.106
runtime
effective cleaning time provided by a cordless dry vacuum cleaner from a **fully charged** condition as per 3.102 until the vacuum has dropped to less than 40 % of initial suction performance or when the vacuum is **fully discharged** as per 3.103, whichever comes first

4 General conditions for testing

Clause 4 of IEC 62885-2:2016 applies with the following modifications.

4.3 Voltage and frequency

Replace the content of 4.3 of IEC 62885-2:2016 with the following:

Unless otherwise stated, charging for measurements shall be carried out at rated voltage with a tolerance of ±1 % and, if applicable, at rated frequency.

Cordless dry vacuum cleaner chargers not marked with rated frequency shall be powered at either (50 ± 1) Hz or (60 ± 1) Hz with a total harmonic distortion < 3 %, as is common in the country of use. All charging should occur at the nominal system voltage of the country concerned.

4.4 Running-in of dry vacuum cleaner

Replace the heading and content of 4.4 of IEC 62885-2:2016 with the following:

4.4 Running-in of cordless dry vacuum cleaner

Prior to the first test (and following preparations in line with the manufacturer's instructions) on a new **cordless dry vacuum cleaner**, it shall be **fully charged** in accordance with the manufacturer's instructions and then discharged by running with unrestricted air flow. The sequence shall be repeated one more time with an interval of at least 30 min after each discharge. No operation shall be carried out during this waiting time. For **active nozzles** during discharge, the agitation device shall be running but not in contact with the floor.

Prior to conducting any series of tests, the age, condition, and history of the product shall be recorded.

4.4.101 Preparation of battery

Any unused Li-ion battery shall be **fully charged** and **fully discharged** once prior to conducting the first test on a **cordless dry vacuum cleaner**. All other battery chemistry/technology types shall be **fully charged** and **fully discharged** three times prior to conducting the first test on a **cordless dry vacuum cleaner**. **Fully charged** and **fully discharged** conditions are defined in 3.102 and 3.103, respectively.

NOTE It is understood that some cordless vacuums do not allow discharge below a certain energy level for battery protection.

4.6 Operation of the dry vacuum cleaner

Subclause 4.6 of IEC 62885-2:2016 applies with the following addition to the end of the subclause:

For declaration and compliance purposes, related tests for a given cleaning task shall be conducted with the same **cordless dry vacuum cleaner** setting, **cleaning head** and **cleaning head** setting. These settings shall be reported. Related tests are:

– tests measuring the dust removal from carpet, the energy consumption for cleaning a carpet, **runtime** on carpet, and the noise level on carpet;

– tests measuring the dust removal from hard floor with crevices and the energy consumption for cleaning a hard floor with crevices, **runtime** on hard floor, and the noise level on hard floor.

4.6.101 Charging of the cordless dry vacuum cleaner

All testing performed on **cordless dry vacuum cleaners** is to be non-invasive. Only the battery(-ies) provided with the product, and **replacement battery**(-ies) as per 3.105, shall be used to power the vacuum. Each test is started with a **fully charged** sample, as per 3.102. The manufacturer's charging unit, module, or docking system that is provided with the specific **cordless dry vacuum cleaner** under test, shall be used for recharging the battery to a **fully charged** state. The **charging time** could be 24 h in length or longer, as determined by the items below. Proceed in the following order until a charging duration is determined.

a) If the battery charger, appliance (the charged device), the battery itself, or any kind of user interface (e.g. app) has an indicator to show that the battery is **fully charged**, that indicator shall be used as follows:

   - If the indicator shows that the battery is **fully charged** within 19 h, the charging shall be continued for at least 5 h beyond the full indication. The charging shall be terminated at not more than 24 h.
   - Conversely, if the full-charge indication has not appeared within 19 h of charging, the charging shall continue until 5 h after the indication is present.

b) If there is no indicator, but the manufacturer's instructions indicate that charging this battery or this capacity of battery should be complete within 19 h, the charging shall be for 24 h. If the instructions indicate that charging may take longer than 19 h, the charging shall be run for the longest estimated charge time plus 5 h.

c) If there is no indicator and no time estimate in the manufacturer's instructions, but the charging current is stated on the charger or in the instructions, calculate the charging duration D in h as the longer of 24 h or:

$$D = 1{,}4 \times \frac{C_C}{I_C} + 5\,\text{h}$$

where

D is the duration in h;

C_C is the rated charge capacity in Ah;

I_C is the charge current in A.

d) If none of the above applies, the duration of the charging shall be 24 h.

4.6.1.102 Battery conditions for testing

After a full charge, the **cordless dry vacuum cleaner** should be tested no earlier than 30 min and no later than 12 h. The cleaner shall be disconnected from the charger during this period.

Make a note in the report if it is not possible to test owing to a short **runtime**.

This document does not currently address changing performance throughout the whole **runtime** of some appliances. Results at different states of battery charge can vary. The subclauses potentially affected are 5.1 to 5.6, 5.8 to 5.11 and 6.16. It is recommended to perform test 5.101 first to understand the potential effect of discharge.

For tests where more than one repeat is needed, testing should be carried out within the "90 % performance **runtime**" ($t_{90\%rt}$) as determined in 5.101. However, if during the repeat, the "90 % performance **runtime**" of the **cordless dry vacuum cleaner** is exceeded, that repeat shall be annulled, and the product is to be **fully charged** or a **replacement battery** be employed to repeat the test.

4.7 Conditioning prior to each test

Subclause 4.7 of IEC 62885-2:2016 is not applicable.

5 Dry vacuum cleaning tests

Clause 5 of IEC 62885-2:2016 applies with the following modifications.

5.1.5 Preconditioning of dust receptacle

Subclause 5.1.5 of IEC 62885-2:2016 is applicable with the following modification in paragraphs 2 and 4:

The **cordless dry vacuum cleaner** under test is equipped with a clean dust receptacle and allowed to run with an unimpeded air flow with the nozzle clear of the surface for 30 s.

Since the **cordless dry vacuum cleaner** air flow can have an effect on the weight mass of the dust receptacle during the 30 s of preconditioning, caution should be taken so that the weight mass of the dust receptacle has stabilized before weighing.

5.8.1 Purpose

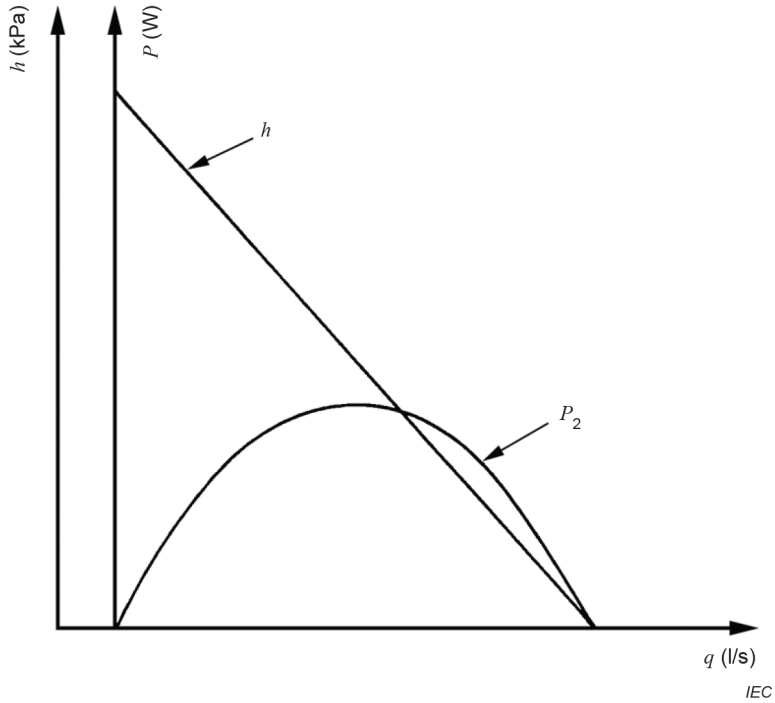
Subclause 5.8.1 of IEC 62885-2:2016 applies with the following addition:

P_1, the input power and η, the efficiency, are not relevant for **cordless dry vacuum cleaners**.

5.8.5 Determination of air data

Subclause 5.8.5 of IEC 62885-2:2016 applies with the second paragraph and Figure 9 removed; the third paragraph is replaced by the following paragraph, and Figure 101 is added:

For each measuring point, the air flow and vacuum are recorded 15 s after the throttling. The cleaner is then again operated unthrottled for 15 s. This procedure is continued until all the entire curves have been plotted, the measuring point for maximum vacuum being the last one.



Key

h vacuum in the measuring box, in kilopascals (kPa)

q air flow, in litres per second (l/s)

P_2 suction power, in watts (W)

Figure 101 – Air data curves

5.9.2.1 Test conditions

Subclause 5.9.2.1 of IEC 62885-2:2016 applies with the second bullet point replaced with the following:

- The plenum chamber shall be fitted with a 19 mm orifice plate.

5.9.2.3 Procedure

Subclause 5.9.2.3 of IEC 62885-2:2016 applies with the second paragraph replaced with the following:

With the feed tube closed, the **cordless dry vacuum cleaner** is run for at least 15 s. Subsequently, the initial vacuum, h_0, shall be determined.

5.10 Total emissions while vacuum cleaning

Subclause 5.10 of IEC 62885-2:2016 does not apply, but is under consideration.

5.11.5 Verification of particle transport

Subclause 5.11.5 of IEC 62885-2:2016 is replaced by:

NOTE 101 There are known issues with the particle transport within this test. Measures are under development to ensure and verify a proper particle transport. Changes may be necessary to the measuring equipment or to the way the test is performed.

5.11.6 Test procedure

Subclause 5.11.6 of IEC 62885-2:2016 is replaced by:

The test can be conducted either by using a single particle counter that is switched between the intake and exhaust channels while counting, or by using two particle counters that count intake and exhaust samples simultaneously.

Particle registration is carried out by a particle analysing system (see 7.3.8.5) that can be operated with a suitable aerosol dilution system to adapt the count rate capacity and the particle concentration of the aerosol intake and the exhaust channel, respectively. The results of any single trial shall be recorded as follows:

- counter events/class; i.e. the number of events recorded by the particle counter, separately for each range of particle size as well as for aerosol intake channel and exhaust channel;
- sample air volumes, VA_{ex} (exhaust) and VA_{in} (intake); i.e. the volumes of the aerosol samples analysed by the particle counter combined in the course of the trial;
- applicable dilution factors k_{VA} (intake or exhaust) of the particle analysis system; i.e. the ratio between the volume of the air sample extracted from the channel and the sample air volume analysed by the particle counter;
- time t_{clean} for the latest clean air stability check, sampling time t_{dust}, number of test periods n.

The following test procedure for a single trial may be repeated with several **cordless dry vacuum cleaners** of identical type. Then, the final result of the trial shall be averaged arithmetically.

Proper dilution ratio needs to be verified. Prove that the air is not over-concentrated by serial dilution, and prove that it is not over-diluted on the exhaust by lessening the dilution serially; see 7.3.8.5.

5.11.6.101 Single particle counter procedure

A single trial proceeds as follows:

- Conditioning: dust is fed for 5 min while the particle concentration in the intake channel is monitored (quantity of test dust in accordance with 5.11.3). Afterwards, the **cordless dry vacuum cleaner** has to be fully re-charged or a **replacement battery** employed. For **dry cordless vacuum cleaners** having a "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of less than 5 min, this procedure has to be repeated until an accumulated conditioning running time of 5^{+1}_{-0} min has been reached.
- Clean air stability check: the **cordless dry vacuum cleaner** is operated for a time t_{clean} (minimum 2 min but no more than 10 min) without dust being fed until acceptable and stable conditions are achieved. Stability is defined as follows:
  - – no more than ±10 % variation in particle counts observed over 100 counts during 30 s measurement periods when evaluated for a minimum of 2 min; or
  - – fewer than 100 particle counts observed during 30 s measurement periods, when evaluated for a minimum of 2 min.

  The particle analysing system shall be allowed to flush for up to 15 s between the 30 s measurement periods. If stability is not met within the minimum 2 min evaluation period, and the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) has been reached, the device shall be fully recharged, or a **replacement battery** employed to repeat the clean air stability check.

- Sampling: feed the quantity of dust m (as per 5.11.3) for a time t_{dust} of 5 min, during which the maximum number n of test periods can be completed within the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of the **cordless dry vacuum cleaner** less the time t_{clean} for the latest clean air stability check. No more than n = 5 test periods are carried out in the following order:
  - Particle counting from intake channel for 30 s (intake measurement). Repeat this intake measurement $n - 1$ times. Allow the particle analysing system to flush for up to 15 s in between.
  - Flushing of particle analysing system with the applicable sample stream for at least 10 s, but not longer than 30 s.
  - Particle counting from exhaust channel for 30 s (exhaust measurement). Repeat this exhaust measurement $n - 1$ times. Allow the particle analysing system to flush for up to 15 s in between.

This procedure shall be repeated (and the previous results not taken into account) if the time t_{clean} for the latest clean air stability check is greater than 2 min, and $t_{clean} + t_{dust}$ is greater than the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of the **cordless dry vacuum cleaner**.

5.11.6.102 Dual particle counter procedure

If two particle counters are used, their calibration and count rates shall be verified. The particle counts between counters shall not differ by more than 10 % for each particle size range when counts are over 100 for 30 s.

A single trial proceeds as follows:

- Conditioning: dust is fed for 5 min while the particle concentration in the intake channel is monitored (quantity of test dust in accordance with 5.11.3). Afterwards, the device has to be fully recharged or a **replacement battery** employed. For **cordless dry vacuum cleaners** having a "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of less than 5 min, this procedure has to be repeated until an accumulated conditioning running time of 5^{+1}_{-0} min has been reached.
- Clean air stability check: the **cordless dry vacuum cleaner** is operated for a time t_{clean} (minimum 2 min but no more than 10 min) without dust being fed until acceptable and stable conditions are achieved. Stability is defined as follows:
  - no more than ± 10 % variation in particle counts observed over 100 counts during 30 s measurement periods when evaluated for a minimum of 2 min; or
  - fewer than 100 particle counts observed during 30 s measurement periods, when evaluated for a minimum of 2 min.

  The particle analysing system shall be allowed to flush for up to 15 s between the 30 s measurement periods. If stability is not met within the minimum 2 min evaluation period, and the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) has been reached, the device shall be fully recharged, or a **replacement battery** employed to repeat the clean air stability check.
- Sampling: feed the quantity of dust m (as per 5.11.3) for a time t_{dust} during which a maximum of n = 5 test periods are carried out. Each test period consists of simultaneous particle counting from both intake and exhaust channels for 30 s. Allow the particle analysing system to flush for up to 15 s between each test period. The number of n = 5 test periods can be reduced if $t_{clean} + t_{dust}$ exceeds the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of the **cordless dry vacuum cleaner**.

This procedure shall be repeated (and the previous results not taken into account) if the time t_{clean} for the latest clean air stability check is greater than 2 min, and t_{clean} + t_{dust} is greater than the "90 % performance **runtime**" ($t_{90\%rt}$ as per 5.101.4) of the **cordless dry vacuum cleaner**.

5.101 Runtime determination for cordless dry vacuum cleaners

5.101.1 Test equipment

For **cordless dry vacuum cleaners** having passive or active floor cleaning nozzles, a hard, flat floor in accordance with 7.3.1 (floor test plate) shall be used for determination of **runtime** on hard flooring. Carpet in accordance with 7.2.1.3.2 (Wilton carpet) shall be used for determination of **runtime** on carpet. The carpet shall be glued flat to a separate wooden test plate in accordance with 7.3.1, as shown in Figure 102. The whole underside of the carpet panel shall be glued securely to prevent a **cordless dry vacuum cleaner** from lifting the carpet away from the wooden test plate during testing. In the middle of each floor surface, an opening of 6 mm in diameter shall be placed with a connection to a vacuum measurement hose (Figure 102), which is connected to an appropriate vacuum measuring instrument.

For cordless dry handheld vacuums and **cordless dry vacuum cleaners** designed for "above floor cleaning", the alternative B air data chamber in accordance with 5.8 and a 19 mm fixed orifice shall be used for the determination of **runtime**.

Figure 102 – Carpet and hard floor test plates with suction tap locations

5.101.2 Test setup

The main air inlet of the cleaning nozzle (both passive and active floor cleaning nozzles) shall be placed directly over the 6 mm opening as shown in Figure 103. The handle height above the floor surface shall be set as described in 4.8. Any possible movement or external impact of the nozzle shall be avoided during each test trial. The operation of the **cordless dry vacuum cleaner** for this test is described in 4.6.1, but with the active floor cleaning nozzle in contact with the floor.

For cordless dry handheld vacuum cleaners and those designed for "above-floor cleaning", the cleaning nozzle or tube shall be adapted to the measuring chamber to provide an airtight seal, as per 5.8.4.2.

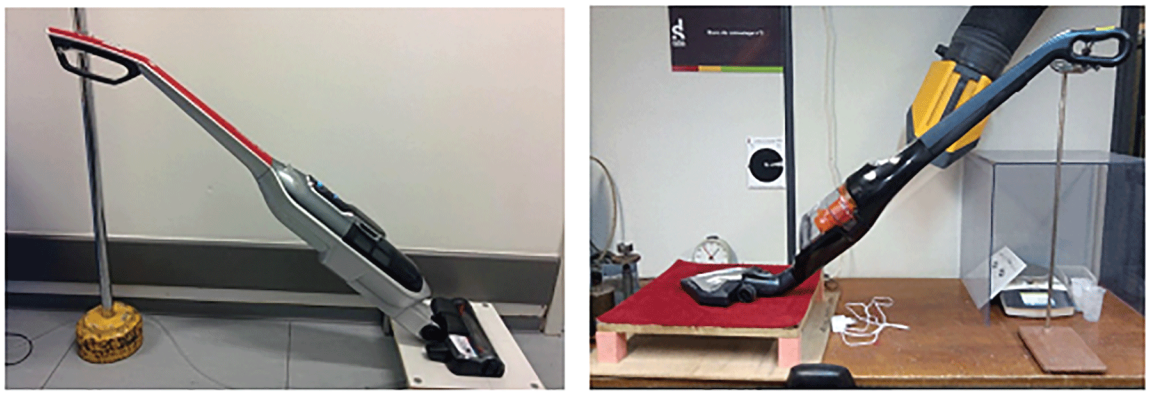


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Figure 103 – Test setup runtime determination

5.101.3 Test procedure

Prior to the test, the appliance shall be **fully charged** as per 3.102. Turn on the appliance and record the vacuum pressure value every second until the appliance is **fully discharged** in accordance with 3.103. For **cordless dry vacuum cleaners** with active floor cleaning nozzles, the agitator brush shall be rotating during **runtime** determinations. For general purpose, **cordless dry vacuum cleaners**, designed to clean both carpet and hard flooring, the **runtime** determinations will be performed on both carpet and hard floor surfaces.

At least three separate trials shall be conducted on carpet for carpet-only **cordless dry vacuum cleaners**, and three separate trials on a hard floor for hard-floor-only **cordless dry vacuum cleaners**. For general purpose vacuums, three separate trials on each floor surface shall be conducted.

For cordless handheld and "above the floor" vacuum cleaners, three separate trials in the alternative B chamber with a 19 mm orifice plate shall be performed.

5.101.4 Determination of the runtime

The moving average of the vacuum at a certain point in time is calculated as the mean value of the currently measured vacuum averaged over the last 10 measured values:

$$h_{\text{floor}}(t_{\text{m}}) = \frac{h_{\text{m}}(t_{\text{m}}) + h_{\text{m}}(t_{\text{m}}-1) + h_{\text{m}}(t_{\text{m}}-2) + \ldots + h_{\text{m}}(t_{\text{m}}-9)}{10}$$

where

t_{m} is the point in time of the measurement, in s;

$h_{\text{m}}(t_{\text{m}})$ is the measured vacuum at a time t_{m}, in kPa;

$h_{\text{floor}}(t_{\text{m}})$ is the moving average of the vacuum at a time t_{m}, in kPa.

To determine the initial vacuum $h_{\text{floor},0}$, energize the vacuum for 10 s to ensure stable measurement conditions, and then evaluate the first 10 measured vacuum values:

$$h_{\text{floor},0} = h_{\text{floor}}(t_{\text{m}} = 19)$$

Subsequently, continue recording time and vacuum when h_{floor} has dropped to 90 % and 40 % of $h_{\text{floor},0}$ or until the vacuum is **fully discharged**, as per 3.103.