SLOVENSKI STANDARD
SIST EN 60312:200X/oprAA:2008
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Sesalniki za uporabo v gospodinjstvu - Metode za merjenje lastnosti

Vacuum cleaners for household use - Methods of measuring the performance

Staubsauger für den Hausgebrauch - Prüfverfahren zur Bestimmung der Gebrauchseigenschaften

Aspirateurs de poussière à usage domestique - Méthodes de mesure de l'aptitude à la fonction

Ta slovenski standard je istoveten z: **EN 60312:200X/prAA:2008**

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Vacuum cleaners for household use - Methods of measuring the performance

Aspirateurs de poussière à usage domestique - Méthodes de mesure de l'aptitude à la fonction

Staubsauger für den Hausgebrauch - Prüfverfahren zur Bestimmung der Gebrauchseigenschaften

This draft amendment prAA, if approved, will modify the European Standard EN 60312:200X; it is submitted to CENELEC members for CENELEC enquiry.
Deadline for CENELEC: 2008-07-04.

It has been drawn up by CLC/TC 59X.

If this draft becomes an amendment, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

This draft amendment was established by CENELEC in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

This draft amendment to European Standard EN 60312:200X [1)] was prepared by WG 6 of the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances. It is submitted to the CENELEC enquiry.

This draft amendment has been prepared under Mandate M/353 given to CENELEC by the European Commission and the European Free Trade Association.

Annex ZA has been added by CENELEC.

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 60312:2007 are prefixed “Z”.

1) Circulated to CENELEC/IEC parallel vote and ratified on 2008-02-01.

Text of prAA to EN 60312

1.3 Definitions

Replace 1.3.16 by:

1.3.16
stroke speed
speed of the cleaning head, moved as uniformly as possible (0,5 m/s ± 0,02 m/s) during a forward or a return stroke. Cleaning heads with their own speed should be moved with their own speed

Add the following definitions:

1.3.Z1
vacuum cleaner
electrically operated appliance that removes dry material (dust, fibre, threads) from the surface to be cleaned by an airflow created by a vacuum developed within the unit. The material thus removed is separated in the appliance and the cleaned suction air is returned to the ambient

1.3.Z2
passive nozzle
cleaning head without any agitation devices

1.3.Z3
cleaning head width
the external maximum width of the cleaning head in mm

1.3.Z4
reference vacuum cleaner system

electrically operated equipment used to fix the reference dust removal ability on carpets with given air related parameters to improve the reproducibility of test results

NOTE Reference vacuum cleaner system is not suitable for other tests than dust pick-up from carpets.

1.4 General conditions for testing

1.4.6 Operation of the vacuum cleaner

Add after the first paragraph:

NOTE This only applies to those devices that may be operated by the user during normal use. Any safety device shall be allowed to operate.

1.4.7 Conditioning prior to tests

Add a new paragraph:

Tests carpets already being in use shall be stored unbeaten at standard atmospheric conditions according to 1.4.1. When not in use they should be hanging free, not lying or rolled.

Test carpets prior to first use shall be stored at standard atmospheric conditions for at least 24 h.

1.4.9 Mechanical operator

At the beginning of the second paragraph **delete** "In such cases".

Add a new paragraph:

It must be ensured that the bottom of the cleaning head makes full contact with the test surface. If this is not possible, the length of the tube must be adjusted.

1.4.11 Reference cleaner system

Replace 1.4.11 by:

Test carpets used in a laboratory for the determination of dust removal ability will over time change from their original conditions for example due to wearing or gradually filling with dust. The reference vacuum cleaner system described in 5.2.Z1 shall be used to regularly check the carpet conditions as a verification of test results obtained.

2.3 Dust removal from carpets

2.3.1 Test carpet

Replace 2.3.1 by:

A test carpet, in accordance with 5.1.1, shall be used. Due to the significant influence of humidity on this test, it is important to follow the procedure described in 1.4.7.

The carpet has to be fixed on the test floor at the end where forward stroke starts. A force of F = (60 + 10) N has to be applied at the other end of test carpet to have a defined tension of the carpet.

During measurements the carpet is kept in position on the test floor by use of carpet hold downs (see 5.2.4).

2.3.2 Test area and stroke length

Replace 2.3.2 by:

The direction of the stroke on the test area shall be in the direction of the carpet pile. The length of the test area (see Figure 7b) is (700 ± 5) mm. The width of the test area is equal to the test width of the cleaning head (see 1.3.12).

A length of at least 200 mm shall be added before the beginning of the test area and at least 300 mm after the end of the test area in order to allow acceleration and deceleration of the cleaning head.

Therefore, the stroke length is at least 1 200 mm for the given test length of 700 mm but shall not be greater than 1 600 mm. The centreline of the front edge of the cleaning head is aligned to the centreline of the beginning of the acceleration area at the beginning of the stroke, i.e. there shall be 10 mm overlap at each edge of the test area, allowing the distance of 200 mm to be used for acceleration The cleaning head shall reach the end of the stroke when the rear edge of the active cleaning depth is at least 200 mm past the end of the test area. The reverse stroke is carried out in the same way until the front edge of the cleaning head is at the start of the acceleration length at the beginning of the test area.

2.3.3 Cleaning cycle

Replace the 2nd and 3rd paragraphs by:

The active depth of the active cleaning head shall move at uniform stroke speed (0,50 ± 0,02) m/s and in a straight line over the test area.

For optimum control of the double stroke movement it is recommended that an electromechanical operator (see 1.4.9) be used.

It is important that the cleaning head is kept moving at uniform speed over the test area and that it follows a straight line by using the carpet hold downs as guides. The guides should have a distance of 5 mm from carpet surface to ensure an undisturbed airflow. It is recommended that a mechanical operator (see 1.4.9) be used to simulate the operation of the cleaning head as described.

NOTE 1 The two carpet hold-downs serve the purpose of holding the test carpet in position during measurement and of acting as guides to keep the cleaning head in a straight line as it is moved over the test area.

NOTE 2 Vacuum cleaners equipped with a self drive device shall be operated as recommended by the manufacturer. In this case the stroke speed is determined by the vacuum cleaner.

2.3.6 Embedding of dust into carpet

Replace 2.3.6 by:

The dust shall be embedded into the test carpet by carrying out 10 double strokes over the carpet parallel with the direction of manufacture with a roller, in accordance with 5.2.6.1. The speed of the roller over the test area shall be uniform 0,5 m/s with the forward stroke being in the direction of manufacture. It is important to ensure that the test area is completely and evenly rolled. The carpet is then left for a period of 10 min to recover from rolling.

2.3.7 Preconditioning of dust receptacle

Replace the first sentence by:

In order to minimize the effects of humidity the dust receptacle shall be preconditioned as follows:

2.3.8 Determination of dust removal ability

Replace the first and second paragraphs by:

Three separate cleaning cycles shall be carried out. Prior to each cleaning the sequence of preparations outlined in 2.3.4 to 2.3.7 shall be performed in total. After each cleaning cycle the cleaning head shall be lifted between 20 mm and 100 mm clear of the carpet. At the end of three cleaning cycles hose and tube of the vacuum cleaner have to be agitated while the vacuum cleaner is still running to get the remaining dust into the dust receptacle. The cleaner shall be switched off and the motor has to stop completely.

After each cleaning cycle the amount of dust removed is determined by removing and weighing the dust receptacle and other additional filter devices (e. g. filters for motor protection) then subtracting the weight of the empty dust receptacle and the other filter devices recorded after preconditioning described in 2.3.7.

NOTE For vacuum cleaners equipped with technical devices being part of the appliance used to separate the dust from the air flow and having additional filters to be changed or cleaned by the user (bagless vacuum cleaners) the weight of all those devices must be taken into account for the dust removal ability.

Replace the definitions of the formula by:

W_f weight of the dust receptacle after one cleaning cycle, in grams;

K_{ct} dust removal ability for one cleaning cycle, in per cent;

K_m (3) mean dust removal from three cleaning cycles, in per cent.

Replace the last sentence of this subclause by:

EXAMPLE: 45 %, 47 % and 49 % give a range of four percentage units and two extra cleaning cycles shall be carried out.

2.10 Dust emission of the vacuum cleaner

Replace 2.10 by:

2.10 Fractional filtration efficiency

The aim of this test is to determine the ability of a vacuum cleaner to retain dust, depending on particle size, from the intake aerosol containing a predefined concentration of test dust.

This test is not suitable for determining permeability of filters or filter materials.

2.10.1 Test conditions

Measuring equipment required for the test is specified in 5.2.9.

In preparation of the test, the vacuum cleaner should be equipped with a new dust receptacle and new filters according to specifications. It is to be set to operate at maximum airflow.

The vacuum cleaner is placed centrally under the test hood in its normal operation condition.

Dust will be fed

- to vacuum cleaners with a suction hose through this hose,
- to vacuum cleaners without a suction hose (for instance Uprights) through a suitable auxiliary hose which is connected and sealed tightly to the suction nozzle by use of a nozzle adaptor.

2.10.2 Determining the test dust quantity

For the entire duration of dust being fed, the dust concentration *c* shall be 0,1 g/m³ in the intake aerosol.

Therefore the maximum airflow *q* for the vacuum cleaner with the given filter equipment shall be determined, according to 2.8.

The quantity *m* of dust to be fed for duration t_{DUST} is calculated consequently as:

$$m = c * t_{DUST} * q \ .$$

2.10.3 Test procedure

With the vacuum cleaner prepared according to 2.10.2, the test proceeds as follows:

- the vacuum cleaner is operated for 5 min under the closed hood without dust being fed,
- particle counts are taken for 30 s from the aerosol intake channel and from the exhaust channel in order to determine backgrounds,
- dust is fed for 10 min while the particle concentration in the aerosol channel is monitored,
- meanwhile 5 measurement cycles are carried out, each consisting of:
  - particle registration from aerosol intake channel for 30 s (upstream measurement),
  - flushing of particle analysing system for 15 s,
  - particle registration from exhaust channel for 30 s (downstream measurement),
  - flushing of particle analysing system for 15 s.

Particle registration is by optical particle counter which can be operated with a suitable aerosol dilution system to adapt count rate capacity and the particle concentration of aerosol intake and of exhaust channel, respectively. The results of these measurement cycles 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,
- sample air volumes, VAD (upstream) and VAU (downstream); i.e. the volumes of the aerosol samples analysed by the particle counter combined in the course of the test,
- applicable dilution factors k_{VA} (upstream or downstream) 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.

The test procedure shall be repeated with at least 3 vacuum cleaners of identical type.

2.10.4 Evaluation

Based on the particle counts obtained in the 5 measurement cycles, for aerosol intake channel and exhaust channel, the fractional filtration efficiency is derived for each particle class.

The individual measurements are considered to be samples of a full distribution, and a statistical analysis is performed accordingly.

Given the particle counts $z(k,l)_U$ of the aerosol intake channel (upstream) for particle class *k* obtained from each individual measurement cycle l, the corresponding lower limits of the 95 % -confidence range, $\underline{Z(k)}_U$, are obtained as follows:

- Summation of particle counts obtained for particle class *k* in 5 individual measurements upstream

$$Z(k)_U = \sum_{l=1}^{5} z(k,l)_U$$

where

k	index of particle class;
l	running index of individual measurement cycles;
$z(k,l)_U$	particle count upstream in class *k* from individual measurement cycle *l*;
$Z(k)_U$	particle sum upstream in class *k* from all 5 measurement cycles.

- Determination of the 95 % lower - confidence limits $\underline{Z(k)}_{U\_95}$ for the particle sums $Z(k)_U$:

  If $Z(k)_U > 50$: $\underline{Z(k)}_{U\_0,95} = Z(k)_U - 1{,}96 * \left(Z(k)_U\right)^{\frac{1}{2}}$

  If $Z(k)_U \leq 50$: $\underline{Z(k)}_{U\_0,95}$ from 5.2.9, Table 1.

Given the particle counts $z(k,l)_D$ of the exhaust channel (downstream) for particle class *k* obtained from each individual measurement cycle *l*, the corresponding upper limits of the 95 % - confidence range, $\overline{Z(i)}_{D\_0,95}$ are similarly derived by:

- Summation of particle counts obtained for particle class *l* in 5 individual measurements downstream

$$Z(k)_D = \sum_{l=1}^{5} z(k,l)_D$$

  where

k	index of particle class;
l	running index of individual measurement cycles;
$z(k,l)_D$	particle count downstream in class *k* from individual measurement cycle *l*;
$Z(k)_D$	particle sum downstream in class *k* from all 5 measurement cycles.

- Determination of corresponding upper limits of the 95 % - confidence range $\overline{Z(k)}_{D\_0,95}$ from particle sums $Z(k)_D$:

  If $Z(k)_D > 50$: $\overline{Z(k)}_{D\_0,95} = Z(k)_D - 1{,}96 * \left(Z(k)_D\right)^{\frac{1}{2}}$

  If $Z(k)_D \leq 50$: $\overline{Z(k)}_{D\_0,95}$ from 5.2.9, Table 1.

From the statistical limits calculated above, the lower limit of the 95 % - confidence range of the fractional filtration efficiency, $\underline{E(k)}_{0,95}$, is obtained for each particle class *k*:

$$\underline{E(k)}_{0,95} = 1 - \left(\frac{\overline{Z(k)}_{D\_0,95} * k_{VA\_D} * \left(\frac{VA_U}{VA_D} \right)}{\underline{Z(i)}_{U\_0,95} * k_{VA\_U}} \right)$$

where

k	index of particle class;
$E(k)_{0,95}$	lower limit of confidence for filtration efficiency of particle class *k*;
k_{VA_D}	downstream dilution factor of particle analysis system;
k_{VA_U}	upstream dilution factor of particle analysis system;
VA_D	downstream sample air volume analysed;
VA_U	upstream sample air volume analysed;
$Z(k)_{D\_0,95}$	upper limit of confidence for partial sum class *k* from downstream measurements;
$Z(k)_{U\_0,95}$	lower limit of confidence for particle sum class *k* from upstream measurements.

This evaluation shall be carried out in every test.