SLOVENSKI STANDARD
SIST EN 60312-1:2013

01-julij-2013

Sesalniki za uporabo v gospodinjstvu - 1. del: Sesalniki za suho čiščenje - Metode za merjenje lastnosti (IEC 60312-1:2010, spremenjen + A1:2011, spremenjen)

Vacuum cleaners for household use - Part 1: Dry vacuum cleaners - Methods for measuring the performance (IEC 60312-1:2010, modified + A1:2011, modified)

Staubsauger für den Hausgebrauch - Teil 1: Trockensauger - Prüfverfahren zur Bestimmung der Gebrauchseigenschaften (IEC 60312-1:2010, modifiziert + A1:2011, modifiziert)

Aspirateurs de poussière à usage domestique - Partie 1: Aspirateurs a sec - Méthodes de mesure de l'aptitude à la fonction (CEI 60312-1:2010, modifiée + A1:2011, modifiée)

Ta slovenski standard je istoveten z: **EN 60312-1:2013**

ICS:

97.080	Aparati za nego tal	Floor treatment appliances

SIST EN 60312-1:2013 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60312-1

May 2013

ICS 97.080

Supersedes EN 60312:2008 (partially)

English version

Vacuum cleaners for household use - Part 1: Dry vacuum cleaners - Methods for measuring the performance
(IEC 60312-1:2010, modified + A1:2011, modified)

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

CONTENTS

Foreword

This document (EN 60312-1:2013) consists of the text of IEC 60312-1:2010+A1:2011 prepared by SC 59F, "Surface cleaning appliances", of IEC TC 59, "Performance of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 59X, "Performance of household and similar electrical appliances".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-03-04
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2016-03-04

This document partly supersedes EN 60312:2008.

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 60312-1:2010 are prefixed “Z”.

EN 60312 is divided into 3 parts:

- EN 60312-1, *Vacuum cleaners for household use – Part 1: Dry vacuum cleaners – Methods for measuring the performance*

- prEN 60312-2, *Vacuum cleaners for household use – Part 2: Wet cleaning appliances – Methods of measuring the performance*

- prEN 60312-3, *Vacuum cleaners for household use – Part 3: Cleaning robots for household use – Dry cleaning – Methods of measuring performance*

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This European Standard also specifies, as far as necessary, the test methods which shall be applied in accordance with the standardisation mandate M353 related to Council Directive 92/75 of the European Commission.

Endorsement notice

The text of the International Standard IEC 60312-1:2010+A1:2011 was approved by CENELEC as a European Standard with agreed common modifications.

COMMON MODIFICATIONS

1 Modification to Clause 3

Add:

"3.Z1
reference vacuum cleaner system
electrically operated laboratory equipment used to measure the reference dust removal ability on carpets with given air flow and active brush bar related parameters to improve the reproducibility of test results

Note 1 to entry: reference vacuum cleaner system is not suitable for other tests than dust pick-up from carpets.

3.Z2
hybrid vacuum cleaner
vacuum cleaner that can be both mains and/or battery operated

3.Z3
battery operated active nozzle
cleaning head provided with an agitation device to assist dirt removal driven by a battery operated motor"

2 Modification to Clause 4

In the Note, replace:

"When not in use they should be preferably hanging free, or may be lying flat, pile upwards and uncovered but not rolled."

with:

"When not in use they should be hanging free."

3 Modification to 4.10

Delete entire clause including heading and replace with:

"4.Z1 Reference vacuum cleaner system

Test carpets used in a laboratory for the determination of dust removal ability will, over time, change from their original conditions, for instance due to wearing or gradual filling with dust. It is therefore required that the reference vacuum cleaner system as defined in 3.17 be used to regularly check the carpet conditions as a verification of the test results obtained and being recorded.

The reference vacuum cleaner system is designed to obtain 75 % of dust removal after 5 double strokes, both with passive and active nozzle (only for carpet).

The reference vacuum cleaner system has to be tested on each carpet used prior to each sample testing and the test results shall be recorded, after correction according to 6.17.2.2 by using the calibrated dust removal ability K_c. The expected result should be near to the 75 % of dust removal ability after 5 double strokes, however a deviation of ± 5 % is allowed.

NOTE In case the deviation exceeds the ± 5 % limit, the test carpet can be replaced or the reference vacuum cleaner system can be calibrated by the manufacturer.

Due to the fact that dust pick-up ability may differ between carpets used for active or passive nozzles, the result from tests between active and passive nozzles shall not be compared.

Test carpets designated for testing of passive nozzles shall only be cleaned with a passive nozzle on the face. Test carpets designated for testing active nozzles shall only be cleaned with an active nozzle on the face."

4 Modification to 5.2.2

Add at end:

"The linear density of the dust inside the crevice shall be between 0,0340 g/mm and 0,0290 g/mm crevice length. Otherwise, the filling has to be repeated.

NOTE The inserts are emptied from dust after the last measurement of each cleaning cycle."

5 Modification to 5.2.3

At the end of the second paragraph add the following before the first formula:

"The mean value of dust removal ability for 2 cleaning cycles is calculated as follows:

$$K_{cr}(2) = (k_{cr}(1) + k_{cr}(2))/2$$

$$k_{cr} = \frac{m_L - m_r}{m_L} \cdot \frac{L}{B} \cos 45° \times 100$$ "

Replace the description of k_{cr} with:

"k_{cr} is the dust removal ability for a single cleaning cycle, in per cent;"

6 Modification to 5.3.4

In the second paragraph, change the formula to read:

"The amount of test dust to be used is calculated from the formula

$(B - 0{,}02)\ m \times 0{,}7\ m \times 125\ g/m^2$;"

In the second paragraph, replace the entire second sentence with the following:

"For uniform distribution of the test dust over the test area minus 10 mm on each side, it is recommended that a dust spreader as described in 7.3.5 be used."

7 Modification to 5.11.2

Delete "Note 2" *and renumber* "Note 1" *to* "Note".

8 Modification to 5.11.3

Delete the last sentence.

9 Modification to 5.11.4

Delete entire clause.

10 Modification to 5.11.5

Delete entire clause.

11 Modification to 5.11.6

Replace the first sentence "With the vacuum cleaner prepared according to 5.11.3, and the challenge agent neutralized per 5.11.4 the test proceeds as follows:" with:

"The test proceeds as follows:"

12 Modification to 6.15

Replace "IEC 60704-1" *with* "EN 60704-1."

Replace "IEC 60704-2-1" *with* "EN 60704-2-1."

13 Modification to 6.16.2.4

Delete the following text:

"With P_{eff} measured in accordance with 6.16.1.3 and the energy consumption per 10 m^2, E(10 m^2) with 5 double stokes is calculated as follows:

$$E(10\ m^2) = P_{eff} \times 200/B$$

The results shall record whether the surface was solid, i.e. hard floor, or with crevice, i.e. hard floor with crevice."

Add: "Same procedure as described in 6.16.1.4."

Add:

"6.16.2.Z1 Energy consumption of battery powered nozzles

The energy consumption of battery powered nozzles is defined as a difference of energy between the discharge of the fully charged battery pack and the same battery pack after its use for the test of dpu on carpet and/or hard floor.

$$E_{pbn} = E_{pbn}(0) - E_{pbn}(1)\ (Wh)$$

E_{pbn} : Energy consumption of powered battery nozzle

$E_{pbn}(0)$: Energy consumption of powered battery nozzle with fully charged battery pack

$E_{pbn}(1)$: Energy consumption of powered battery pack after use

6.16.2.Z2 Energy consumption of powered battery pack fully charged

The energy consumption of a powered battery pack fully charged is defined as follows:

Charge the battery pack following the Instruction For Use (IFU) manual. When the battery pack is fully charged, discharge the pack while monitoring the voltage and the time.

The discharge current is linked to the declared capacity of the battery C and equal to C/10. The discharge runs until 1 V / cell for NiCd or NiMH batteries and similar. For Li-Ion-batteries the discharge current is 0,2 C. Discharge is terminated at 2,5 V.

Then the energy used $E_{pbn}(0)$ can be calculated in Wh.

6.16.2.Z3 Energy consumption of powered battery pack after its use

The energy consumption of a powered battery pack after its use is defined as follows:

Charge the battery pack following the Instruction For Use (IFU) manual. When the battery pack is fully charged, you can perform dust pick up measurement.

When the dust pick-up measurement is done, discharge the pack while monitoring the voltage and the time.

Discharge current and termination of discharge are the same as in 6.16.3.1.

Then the energy used $E_{pbn}(1)$ can be calculated in Wh.

6.Z1 Determination of energy efficiency

6.Z1.1 General

This subclause refers to mains powered dry vacuum cleaners only; hybrid vacuum cleaners have to be tested with the battery removed or disconnected.

Since “energy consumption” alone is not linked to a certain cleaning result “energy consumption” and “dust removal ability” have to be measured and brought into a defined relationship called “energy efficiency”.

“Energy efficiency” is calculated from the figures of “energy consumption” and “dust removal ability”.

6.Z1.2 Determination of energy efficiency on carpets

6.Z1.2.1 Determination of energy consumption

The energy consumption on carpets is determined according to 6.16.1

6.Z1.2.2 Reference level

The reference level is fixed to a dust removal ability of 65 % on a Wilton test carpet according to 7.2.1.3.2. To consider the reproducibility on different test carpets and the deviations from a test carpet's original conditions the reference vacuum cleaner system as described in 4.10 is used to measure and normalise the reference level K_{calc} according to the specific conditions of the test carpet used for the determination of energy efficiency.

To determine the normalised reference level of the carpet used for energy efficiency measurement, the dust removal ability of the test carpet is measured according to 5.3. The dust removal ability in per cent is then normalised by applying the calibration value, which is given with the reference cleaner system using the following formula:

$$K_{calc} = K_{ref} / K_c \times 65\%$$

K_{ref}: Measured dust removal ability of the reference vacuum cleaner system on the test carpet used for the determination of energy efficiency

K_c: Calibrated dust removal ability of the reference vacuum cleaner system used for the test. This value, expressed in percent, is communicated by the manufacturer.

K_{calc}: normalised reference level

According to the vacuum cleaner under test, the reference cleaning system has to be equipped with an active or passive nozzle. A separate carpet has to be used for measurements with active nozzles

6.Z1.2.3 Dust removal ability

The dust removal ability from carpets shall be examined according to 5.3. Different to 5.3.7, the measurements have to be done and recorded not only after five double strokes but after each double stroke until the reference level is reached. The fifth double stroke is necessary for the calculation of the Cleaning Performance index 6.Z1.2.5.

If the normalized reference level is not reached after 10 DS the measurement should be stopped. In this case the dpu curve has to be extrapolated. If extrapolation does not reach an intersection with the normalized reference level K_{calc}, the curve is to be continued by a fix slope of 1 % by 50 DS The intersection of the extrapolated curve or of the fix slope line with the normalized reference level K_{calc} is the number of DS for the efficiency calculation.

Three separate measurements shall be carried out. Prior to each measurement, the sequence of preparations outlined in 5.3.3 to 5.3.6 shall be performed in total.

After each double stroke, the cleaning head shall be lifted at least 50 mm clear of the carpet, and the hose and tubes of the vacuum cleaner shall be agitated before the vacuum cleaner is

switched off. The dust receptacle shall not be removed before the motor has completely stopped.

Once the cleaner has completely stopped, the receptacle(s) and removable filters are carefully removed and reweighed. Due to effects of possible static charge build up during the time the vacuum cleaner is picking up dust, it is necessary to ensure that the receptacle has completely stabilised prior to recording the weight.

The dust removal ability is calculated as the ratio of the weight increase of the dust receptacle and removable filters as defined in 4.5 during the single double strokes to the weight of the test dust distributed on the test area.

The dust removal ability, in per cent, for each double stroke has to be calculated separately as the mean value from the three measurements according to the following procedure:

for n=1 to 10 and m=1 to 3:

$$D_r(m,n) = W_f(m,n) - W_i(m)$$

$$K_{ct}(m,n) = D_r(m,n) / D_d(m) \times 100$$

$$K_{ct}(n) = (K_{ct}(1,n)+K_{ct}(2,n)+K_{ct}(3,n)) / 3$$

With:

$W_i(m)$	is the weight of the initially empty dust receptacle for each measurement, in grams;
$W_f(m,n)$	is the weight of the dust receptacle after each double stroke in every measurement in grams;
$D_r(m,n)$	is the amount of dust removed from the carpet after each double stroke in every measurement, in grams;
$D_d(m)$	is the amount of dust distributed on the carpet for each measurement, in grams;
$K_{ct}(m,n)$	is the dust removal ability after each double stroke and each measurement, in per cent;
$K_{ct}(n)$	is the mean dust removal from three measurements for each double stroke, in per cent.
n	number of double strokes
m	number of measurements

If the range of results for each a single double stroke n is greater than three percentage units, 2 extra measurements shall be made and the mean dust removal ability has to be calculated as $K_{ct}(n) = (K_{ct}(1,n) + K_{ct}(2,n) + K_{ct}(3,n) + K_{ct}(4,n) + K_{ct}(5,n)) / 5$

6.Z1.2.4 Calculation of energy efficiency

Energy efficiency is defined as the energy consumption necessary to reach the normalised reference level K_{calc}.

NOTE Annex D provides the method for the calculation of the number of double strokes X_{calc} to reach the normalised reference level K_{calc}.

First the number of double strokes necessary to reach the reference level shall be calculated (X_{calc}).

Then the calculated energy consumption for 10 m² and 5 double strokes according to 6.16.1 shall be applied to $\boldsymbol{X_{calc}}$ according to the formula below:

$$\mathbf{W_c = X_{calc} \times E / 5 \text{ in Ws}}$$

where

W_c: energy efficiency for carpet cleaning: specific energy consumption to clean the defined area up to the reference level, given in Ws
X_{calc}: number of double strokes to reach the normalised reference level K_{calc}
E: Energy consumption (6.16.1)

6.Z1.2.5 Cleaning performance index

The cleaning performance index of carpets is defined as a ratio of the dust removal ability after 5DS to the normalised reference level K_{calc}

$$K_{TP} = K_T(i)/K_{calc}$$

K_{TP}: Cleaning performance index on carpets
$K_T(i)$: is the mean dust removal for i cleaning cycles in per cent (5.3.7)
K_{calc} : Normalised reference level (6.17.2.2) in per cent

6.Z2.3 Determination of energy efficiency on hard floors with crevices

6.Z2.3.1 Determination of energy consumption

The energy consumption on hard floor with crevices is determined according to 6.16.2

6.Z2.3.2 Reference level

The reference level is fixed at a dust removal ability of 95 %.

K_{ref} = 95 %

The reference vacuum cleaner system is not designed for measuring dust pickup from crevices.

6.Z2.3.3 Dust removal ability

The dust removal ability from hard floor with crevices shall be examined according to 5.2. Different to 5.2.3 the measurements have to be done and recorded not only after five double strokes but after each double stroke until the reference level is reached. The fifth double stroke is necessary for the calculation of the Cleaning Performance index 6.17.3.5

If the reference level is not reached after 10 DS the measurement should be stopped. In this case the dpu curve has to be extrapolated. If extrapolation does not reach an intersection with the reference level K_{ref}, the curve is to be continued by a fix slope of 1 % by 50 DS The intersection of the extrapolated curve or of the fix slope line with the reference level K_{ref} is the number of DS for the efficiency calculation.

Three separate measurements shall be carried out. Prior to each measurement, the sequence of preparations outlined in 5.2.2 shall be performed in total.

The quantity of dust removed from the crevice after each double strokes is determined as the difference in weight of the crevice insert before and after the double stroke.

The dust removal ability for n double strokes is then calculated as

for i=1 to 3	$m_L(i)$
for n=1 to 10 and i=1 to 3	$m_r(i,n)$
for n=1 to 10 and i=1 to 3	$k_{cr}(i,n) = \frac{m_L(i) - m_r(i,n)}{m_L(i)} \frac{L}{B} \cos 45° \times 100$
for n=1 ÷ 10	$k_{cr}(n)=(k_{cr}(1,n)+k_{cr}(2,n)\ k_{cr}(3,n))/3$

where

$k_{cr}(i,n)$	is dust removal ability, in per cent after each DS and cleaning cycle
$k_{cr}(n)$	is mean value of removal dust from 3 cleaning cycles for each DS, in per cent
$m_L(i)$	is dust quantity in the crevice before each DS, in grams
$m_r(i,n)$	is dust quantity in the crevice after each DS in each cleaning cycle, in grams
L	is the length of the crevice, in millimetres
B	is the cleaning head width, in millimetres
n	number of double strokes
i	number of measurements

If the range of results for a single double stroke n is greater than three percentage units, 2 extra cleaning cycles shall be made and the mean dust removal ability has to be calculated as $k_{cr}(n) = (k_{cr}(1,n) + k_{cr}(2,n) + k_{cr}(3,n) + k_{cr}(4,n) + k_{cr}(5,n)) / 5$

6.Z2.3.4 Calculation of energy efficiency

Energy efficiency is defined as the energy consumption necessary to reach the reference level K_{ref}.

NOTE Annex D provides the method for the calculation of the number of double strokes to reach the reference level K_{ref}

First the number of double strokes necessary to reach the reference level X_{calc} shall be calculated.

Then the calculated energy consumption for 10m² and 5 double strokes according to 6.16.2 shall be applied to X_{calc} according to the formula below:

$$W_{hf} = X_{calc} \times E / 5 \text{ in Ws}$$

where

W_{hf}:	energy efficiency for hard floor cleaning: specific energy consumption to clean the defined area up to the reference level, given in Ws
X_{calc}:	is the number of double strokes to reach the reference level
E:	Energy consumption (according to 6.16.2)

6.Z2.3.5 Cleaning performance index

The cleaning performance index of hardfloor with crevices is defined as a ratio of the dust removal ability after 5DS to the fixed reference level K_{ref}.

$$K_{cP} = K_{cr}(i)/K_{ref}$$

K_{cP}:	Cleaning performance index on hardfloor with crevices.
K_{cr} (i):	is the mean dust removal ability for i cleaning cycles in per cent. (5.2.3)
K_{ref} :	Fixed reference level for dust removal ability at 95 % (6.17.3.2)

14 Modification to 7.2.1.4

Delete the following text:

"Using a suitable vacuum cleaner all loose pile and fibre is removed over the entire surface of the carpet until an amount no greater than 0,5 g/m^2 is removed during the 5 mins cleaning process. The weight of the carpet is recorded.

Using an in house reference vacuum cleaner, a dust removal test according to 5.3 is carried out and the result recorded and plotted on a graph. This is repeated until the resulting curve is flat and parallel with the horizontal axis and the difference between the average results of each of two consecutive tests is no greater than

- 1 percentage point for the Wilton carpet and the category C and
- 3 percentage points for the other carpets,

is once more weighed and the result should be no more than 2 g higher than the weight recorded after the fibre removal. If so then further cleaning runs should be made until this weight is within the 2 g tolerance allowed. This weight is the official carpet weight and is to be used between tests to minimise dust build up over the life of the carpet. The maximum allowable deviation from this weight is +/- 5 g."

Add:

"Using a vacuum cleaner with dust removal ability similar to the reference vacuum cleaner system all loose pile and fibre is removed over the entire surface of the carpet until an amount no greater than 0,5 g/m^2 is removed during the 5 min cleaning process. The weight of the carpet is recorded.

Using a vacuum cleaner with dust removal ability similar to the reference vacuum cleaner system, a dust removal test according to 5.3 is carried out and the result recorded and plotted on a graph. This procedure is repeated until the resulting curve is flat and parallel with the horizontal axis and the difference between the average results of two consecutive tests is no greater than

- 1 percentage point for the Wilton carpet and the category C and
- 3 percentage points for the other carpets,

It is once more weighed and the result should be no more than 2 g higher than the weight recorded after the fibre removal. If so, then further cleaning runs should be made until this weight is within the 2 g tolerance allowed. This weight is the official carpet weight and is to be used between tests to minimise dust build up over the life of the carpet. The maximum allowable deviation from this weight is ± 5 g."

15 Modification to 7.2.1.5

Replace "in house vacuum cleaner" *with* "reference vacuum cleaner system"

Add after final paragraph:

"In any case the carpet should not to be used for more than 600 cleaning cycles. Then a new carpet has to be installed."

16 Modification to 7.3.2

Add note before figure:

"NOTE The crevice insert should lay at the same level of rest of the surface used for floor simulation."

17 Modification to 7.3.8.4

Delete the note.

18 Modification to 7.3

Add before Clause 8:

"7.3.Z1 Reference vacuum cleaner system

The reference vacuum cleaner system is used to eliminate the influence of different properties of testing carpets according to 7.2.1.3.2.

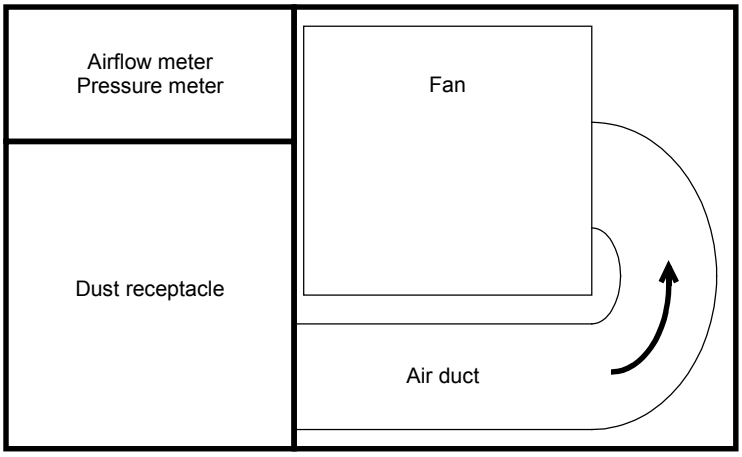

Figure Z1 - Body of the reference cleaner system"

19 Modification to Annex A

Add the following text to the end of Annex A:

"A.1
Details of the reference vacuum cleaner system mentioned in 7.3.14 are available from:

SLG Prüf– und Zertifizierungs GmbH
Burgstädter Strasse 20
D-09232 HARTMANNSDORF

Germany

phone: +49 3722 7323 0

www.slg.de.com"

20 Modification to Annex B

Add at end:

"For energy labelling purposes the Council Directive N° 92/75/EEC of the EU Commission is to be taken into account."

21 Addition of annexes

Add the following new annexes:

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60688	-	Electrical measuring transducers for converting A.C. and D.C. ectrical quantities to analogue or digital signals	EN 60688	-
IEC 60704-1	-	Household and similar electrical appliances - Test code for the determination of airborne noise - Part 1: General requirements	EN 60704-1	-
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	EN 60704-2-1	-
ISO 554	-	Standard atmospheres for conditioning and/or testing - Specifications	-	-
ISO 679	-	Methods of testing cements - Determination of strength	-	-
ISO 1763	-	Carpets - Determination of number of tufts and/or loops per unit length and per unit area	-	-
ISO 1765	-	Machine-made textile floor coverings - Determination of thickness	-	-
ISO 1766	-	Textile floor coverings - Determination of thickness of pile above the substrate	-	-
ISO 2424	-	Textile floor coverings - Vocabulary	-	-
ISO 2439	-	Flexible cellular polymeric materials - Determination of hardness (indentation technique)	EN ISO 2439	-
ISO 3386-1	-	Polymeric materials, cellular flexible - Determination of stress-strain characteristics in compression - Part 1: Low-density materials	EN ISO 3386-1	-
ISO 5167-1	-	Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements	EN ISO 5167-1	-
ISO 8543	-	Textile floor coverings - Methods for determination of mass	-	-
ISO 12103-1	-	Road vehicles - Test dust for filter evaluation - Part 1: Arizona test dust	-	-