

Edition 1.0 2009-07

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Vacuum cleaners for commercial use - Methods for measuring performance





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office 3, rue de Varembé CH-1211 Geneva 20 Switzerland Email: inmail@iec.ch

Email: inmail@iec.ch Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: <u>www.iec.ch/searchpub</u>
- The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.
- IEC Just Published: www.iec.ch/online news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch Tel.: +41 22 919 02 11 Fax: +41 22 919 03 00



Edition 1.0 2009-07

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Vacuum cleaners for commercial use - Methods for measuring performance

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE XB

ISBN 2-8318-1042-2

CONTENTS

FO	REWC	RD		6				
INT	RODU	JCTION		8				
1	Scop	Scope						
2	Norm	ative re	ferences	9				
3	Term	Terms and definitions						
4 General conditions for testing								
	4.1	Atmospheric conditions						
	4.2	Test equipment and materials						
	4.3	Voltage and frequency						
	4.4	Running-in of vacuum cleaner and attachments						
	4.5	Equipment of the vacuum cleaner						
	4.6	Operation of the vacuum cleaner						
	4.7	Condit	Conditioning prior to tests					
	4.8	Initial a	application of dust	13				
	4.9	Mecha	nical operator	13				
	4.10	Numbe	er of samples	13				
	4.11	In-hous	se reference cleaner system(s)	13				
5	Dry v	acuum	cleaning tests	14				
	5.1	Dust re	emoval from hard flat floors	14				
		5.1.1	Test equipment					
		5.1.2	Test area and stroke length	14				
		5.1.3	Removal of remaining dust					
		5.1.4	Distribution of test dust					
		5.1.5	Preconditioning of dust receptacle					
		5.1.6	Determination of dust removal ability					
	5.2	Dust removal from hard floors with uneven surfaces						
		5.2.1	Test equipment					
		5.2.2	Distribution of test dust					
	- 0	5.2.3	Determination of dust removal ability					
	5.3		emoval from carpets					
		5.3.1 5.3.2	Test carpet					
		5.3.2	Test area and stroke length					
		5.3.4	Conditioning of test carpet Distribution of test dust					
		5.3.5	Embedding of dust into carpet					
		5.3.6	Preconditioning of dust receptacle					
		5.3.7	Determination of dust removal ability					
	5.4		emoval along walls					
	0.1	5.4.1	Test equipment and materials					
		5.4.2	Distribution of test dust					
		5.4.3	Determination of dust removal ability along walls					
	5.5		emoval from carpets					
	5.6	Maximum usable volume of the dust receptacle2						
		5.6.1	Conditions for measurement					

		5.6.2	Introduction of moulding granules	20
		5.6.3	Determination of maximum usable volume of dust receptacle	20
	5.7	Air dat	a	20
		5.7.1	Conditions for measurement	21
		5.7.2	Test equipment	21
		5.7.3	Determination of air data	21
	5.8	Perforr	mance with loaded dust receptacle	22
		5.8.1	Determination of suction pressure change with loaded dust	
			receptacle	
		5.8.2	Throttling to simulate loaded dust receptacle	
		5.8.3	Determination of performance with loaded dust receptacle	
	5.9	Filtration efficiency of the vacuum cleaner		
		5.9.1	Test conditions	
		5.9.2	Determining the test dust quantity	
		5.9.3	Test procedure	
		5.9.4	Evaluation	
		5.9.5	Particle concentration and dilution	
		5.9.6	Record keeping	29
	5.10		filtration equivalence of the vacuum cleaner	
			Object of the test	
		5.10.2	Test procedure	30
			Determination of HEPA equivalence	
	5.11	Total e	emissions of the vacuum cleaner	30
		5.11.1	Test method	30
6	Misc	ellaneou	us tests	30
	6.1	Motion	resistance	31
		6.1.1	Test carpet and test equipment	31
		6.1.2	Determination of motion resistance	31
	6.2	Cleaning under office furniture		31
		6.2.1	Distribution of test dust	32
		6.2.2	Determination of free office furniture height	32
	6.3	Maxim	um radius of operation	32
		6.3.1	Conditions for measurement	32
		6.3.2	Determination of radius of operation	32
	6.4	Impact	resistance	32
		6.4.1	Test equipment	33
		6.4.2	Determination of impact resistance	33
	6.5	Deform	nation of hose and connecting tubes	33
		6.5.1	Test equipment	33
		6.5.2	Determination of permanent deformation	33
	6.6	Bump t	test	34
		6.6.1	Test equipment	34
		6.6.2	Test cycle	35
		6.6.3	Test procedure	36
	6.7	Flexibi	lity of the hose	36
		6.7.1	Preparation of test object	
		6.7.2	Determination of the flexibility of the hose	
	6.8	Renes	ted hending of the hose	37

		6.8.1	Test equipment	37		
		6.8.2	Test method	38		
	6.9	Life test		38		
	6.10	Mass		39		
	6.11	Weight in hand		39		
	6.12	2 Dimensions				
	6.13	Noise level		39		
	6.14	Energy	consumption	39		
		6.14.1	Energy consumption when vacuuming of carpets	39		
		6.14.2	Energy consumption with vacuuming of hard floors with uneven surfaces	41		
7	Test	Test material and equipment				
	7.1	Material for measurements				
		7.1.1	Test carpets	42		
		7.1.2	Standard dust type			
		7.1.3	Fibre material			
		7.1.4	Moulding granules	45		
	7.2	Equipm	nent for measurements	45		
		7.2.1	Floor test plate	45		
		7.2.2	Test plates with uneven surfaces	45		
		7.2.3	Carpet-beating machine	45		
		7.2.4	Carpet hold-downs and guides	46		
		7.2.5	Dust spreader	47		
		7.2.6	Rollers for embedding	47		
		7.2.7	Equipment for air data measurement	48		
		7.2.8	Test equipment for determining the fractional filtration efficiency of the vacuum cleaner	52		
		7.2.9	Device for motion resistance test	54		
		7.2.10	Device for impact test	54		
		7.2.11	Device for determination of deformation of hoses and connecting tubes	55		
		7.2.12	Mechanical operator			
		7.2.13	Weighing machine	57		
8	Instru	uctions f	or use	57		
9	Infori	nation a	at the point of sale	58		
Anı			ative) Information on materials			
			ative) Information at the point of sale			
			ative) Information on materials			
		•	alive) illioillation on materials			
טוט	ilogra	рпу		00		
_		_	angled T			
_			ta curves			
Figure 3a – Connecting tube openings						
Figure 4 – Test dust for loading dust receptacle						
Fig	ure 5	– Dust s	spread uniformly on surface	25		
Fig	ure 6	– Inserti	on depth	32		
_			on of test object and cross-section for measurement of deformation			

Figure 8a – Profile of threshold	35
Figure 8b – Arrangements for bump test	35
Figure 9 – Preparation of hoses for testing flexibility	37
Figure 10 – Equipment for repeated bending of hoses	38
Figure 11 – Grain size diagram for test dust	44
Figure 12 – Carpet-beating machine	46
Figure 13 – Carpet hold-downs and guides	46
Figure 14 – Dust spreader and roller for embedding dust into carpets	47
Figure 15a – Alternative A equipment for air data measurements	48
Figure 15b – Measuring box for alternative A	49
Figure 15c – Alternative B equipment for air data measurements	50
Figure 15 – Alternative A and B	50
Figure 16 – Drum for impact test	55
Figure 17 – Device for testing deformation of hoses and connecting tubes	56
Figure 18 – Mechanical operator for the measurement of dust removal from carpets and of motion resistance	57
Table 1 – Confidence limits of a Poisson distribution for 95 % – confidence range	29