

Electric clothes washing machines for household use — Methods for measuring the performance

The European Standard EN 60456 : 1994 with the incorporation of
Amendments A11 : 1995 and A12 : 1997 has the status of a British Standard

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The following table identifies the current issue of each page. Issue 1 indicates that a page has been introduced for the first time by amendment. Subsequent issue numbers indicate an updated page. Vertical sidelining on replacement pages indicates the most recent changes (amendment, addition, deletion).

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English version

Electric clothes washing machines for household use — Methods for measuring the performance

(includes amendments A11 : 1995 and A12 : 1997)

(IEC 456 : 1994, mod.)

Machines électriques à laver le linge pour usage
domestique
Méthodes de mesure de l'aptitude à la fonction
(inclut les amendements A11 : 1995 et A12 : 1997)
(CEI 456 : 1994, modifié)

Elektrische Waschmaschinen für den
Haushaltsgebrauch Prüfverfahren zur Bestimmung
der Gebrauchseigenschaften
(enthält Änderungen A11 : 1995 und A12 : 1997)
(IEC 456 : 1994, modifiziert)

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This European Standard exists 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
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 59D(CO)37, as prepared by Subcommittee 59D: Home laundry appliances, of IEC Technical Committee 59: Performance of household electrical appliances, was submitted to the IEC-CENELEC parallel vote in May 1992.

The reference document was approved by CENELEC as EN 60456 on 8 March 1994.

This European Standard replaces HD 584 S1 : 1991.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1995-03-15
- latest date of withdrawal
of conflicting national
standards (dow) 1995-03-15

Annexes designated 'normative' are part of the body of the standard. Annexes designated 'informative' are given only for information. In this standard, annexes A, B, C and D are informative and annexes E and ZA are normative.

Foreword of amendment A11

This amendment was prepared by WG 1 of the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 60456 : 1994 on 1995-03-06.

The following dates were fixed:

- latest date by which the
amendment has to be
implemented at national
level by publication of an
identical national standard
or by endorsement (dop) 1996-03-15
- latest date by which the
national standards
conflicting with the
amendment have to be
withdrawn (dow) 1996-03-15

This amendment deals with those test and control procedures that are required for the Commission Directive on energy labelling and standard product information of household washing machines 92/75/EEC

and is based on the latest work of IEC/TC 59D WG 7. It also adds permitted tolerances to values declared by the manufacturer and control procedures for checking these declared values.

The modifications described in this amendment specify an improved test method for the performance of the 60 °C washing cycle and some linked criteria to ensure test results which are sufficiently reproducible.

Clauses, subclauses and figures which are in addition to those in EN 60456 : 1994 are numbered starting with 101.

Foreword of amendment A12

This amendment was prepared by the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A12 to EN 60456 : 1994 on 1996-12-09.

The standard EN 60456 : 1994, subclause 4.2.4.2, correctly allows the use of hot water supply for testing where manufacturers want to test such appliances. This amendment shall ensure that all appliances for the Commission Directive of implementing Control Directive No 92/75/EEC with regard to energy labelling of household washing machines are tested with cold water supply even if they have the capability of hot and cold fill.

The following dates were fixed:

- latest date by which the
amendment has to be
implemented at national
level by publication of an
identical national standard
or by endorsement (dop) 1997-09-01
- latest date by which the
national standards
conflicting with the
amendment have to be
withdrawn (dow) 1997-09-01

The modification described in this amendment specifies that all appliances for the Commission Directive on energy labelling of washing machines are tested only with cold water supply.

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INTRODUCTION

IEC 456 (1974) and its amendments 1 (1980) and 2 (1987) concern exclusively the performance of the cotton programme of electric clothes machines.

Ulteriorly, IEC 985 (1989) described a method of measurement of the felting severity of the wool wash programme of these machines.

At the time of issue of these publications, one important point of controversy concerned the nature of the soiled clothing to be used during the measurements and in particular whether the textile material should be artificially or naturally soiled.

Since then, a great lot of work and many ring tests have been done within sub-committee 59D and its working groups in order to:

- compare the results obtained with the different soiling techniques;
- improve the reproducibility of the prescribed methods of measurement;
- evaluate the performance of other cycles than the cycles for white cotton;
- introduce a method for measuring the cleaning performance of easy care textiles;
- take into account the technical evolution of detergents.

This second edition of IEC 456 gives the present result of this work.

It replaces not only IEC 456 and its amendments 1 and 2, but also IEC 985, which has been included within it.

Concerning the choice of soilings for the determination of washing performance, both methods have been kept:

- the use of artificially soiled textile material, which was selected for the method given in 5.1.1, reduces the problems of reproducibility; to some extent such a technique ensures correlation with practical use;
- the method given in annex C describes how the washing performance can be determined by judging the soil and stain removal of naturally soiled articles. This method has a high correlation with practice but its execution is rather complicated.

Concerning the detergent to be used for the tests, a new formula has been prepared by IEC/SC 59D/WG 4. So, it has been introduced as an alternative to the formula in IEC 456 - Amendment 1 (1980).

The other differences with IEC 456 (1974) and its amendments 1 (1980) and 2 (1987) are:

- Possibility of using other cycles than the cycle for white cotton.
- Inclusion of a method for measuring the cleaning performance of easy care textiles;

- Modifications of the method of determination of the washing performance (5.1.1), aiming to provide better reproducibility: precisions for the way of loading of the machine, more accurate control of the tolerances of the reference machine or use of the microprocessor Wascator FOM 71.

ELECTRIC CLOTHES WASHING MACHINES FOR HOUSEHOLD USE – METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This International Standard deals with the methods for measuring the performance of electric clothes washing machines, of water-extracting machines and of washing and water-extracting machines, either with or without heating devices, for household use.

This standard is concerned neither with safety nor with performance requirements.

It also applies to combinations of these machines with heated dryers; for the drying performance of these combined machines (called washer-dryers), the application of IEC 1121 is under consideration.

NOTE - Washing machines for communal use in blocks of flats or in launderettes are within the scope of this recommendation, but machines for commercial laundries are not included.

2 Normative references

The following normative documents contain provisions which through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 704-1: 1982, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances - Part 1: General requirements*

IEC 704-2-4: 1989, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances - Part 2: Particular requirements for washing machines and spin extractors*

IEC 704-2-6: *Test code for the determination of airborne acoustical noise emitted by household and similar appliances. - Part 2: Particular requirements for tumbler dryers. Project 59D(Secretariat)90, under consideration*

IEC 734: 1993, *Hard water to be used for testing the performance of some household electrical appliances*

IEC 1121: 1991, *Method for measuring the performance of tumbler dryers for household use*

ISO 2267: 1986, *Surface active agents - Evaluation of certain effects of laundering – Methods of preparation and use of unsoiled cotton control cloth*

ISO 3758: 1991, *Textiles - Care labelling code using symbols*

ISO 3801: 1977, *Textiles – Woven fabrics – Determination of mass per unit length and mass per unit area*

ISO 4319: 1977, *Surface active agents - Detergents for washing fabrics - Guide for comparative testing of performance*

ISO 6330: 1984, *Textiles - Domestic washing and drying procedures for textile testing*

ISO 7211-2: 1984, *Textiles – Woven fabrics – Construction – Methods of analysis – Part 2: Determination of number of threads per unit length*

ISO 7768: 1985, *Textiles - Methods for assessing the appearance of durable press fabrics after domestic washing and drying*

3 Definitions

For the purpose of this International Standard, the following definitions apply:

3.1 Terms used to designate the appliances

agitator-type washing machine: A machine in which the textile material is substantially immersed in the washing water; in which the mechanical action is produced by a device moving about or along its vertical axis with a reciprocating motion.

horizontal drum type electric washing machine: An electric washing machine in which the textile material is placed in a horizontal drum and partially immersed in the washing water, the mechanical action being produced by rotation of the drum about its axis, the movement being either continuous or periodically reversed.

impeller-type washing machine: A machine in which the textile material is substantially immersed in the washing water; in which the mechanical action is produced by a device rotating about its axis with a motion which may be continuous or may reverse after a number of revolutions.

spin extractor: A water-extracting machine in which water is removed from textile material by centrifugal force.

washing and spinning machine: A horizontal drum-type electric washing machine in which, at the end of the wash cycle the water is removed from the textile material, by centrifugal force, with or without heating device.

washer-dryer: A washing and spinning machine which also incorporates a means of tumble drying the wash load.

3.2 *Terms used for textiles*

easy care textiles: Textiles which are specified or labelled by the manufacturer as being in conformity with ISO 3758 and carry the relevant symbol.

ballast: Machine load without strips of standardized soiling.

wash load: Machine load consisting of ballast, soiled standard strips and any added test specimens.

3.3 *Terms used to designate the characteristics of appliances*

rated capacity: The maximum mass of dry textile material, in kilogrammes, which the manufacturer declares can be treated for washing in a single operation or cycle of operations.

NOTES

1 If the rated capacity is not specified by the manufacturer it can be deduced from the volume according to the following ratios:

- drum type machine: 13 l of volume per kg of dry material;
- spin extractor: 4,6 l of volume per kg of dry material.

2 If the rated capacity for easy care textiles and woollens is not specified by the manufacturer, the load should be respectively 40 % and 20 % of that for cotton.

3 In case the manufacturer gives two limits for the rated capacity, e.g. 4,5 kg-5 kg, the greater will be chosen for the measurements.

volume of an agitator or impeller-type washing machine: The inside volume, in litres, of the tub available for the movement of the textile material up to the nominal water level as determined by the machine controls or the manufacturer's instructions.

volume of a drum type washing machine or spin extractor: The inside volume, in litres, of the drum in which the textile material is placed, after subtraction of ribs or other inward forms, etc.

4 **General notes on measurements**

4.1 *List of measurements*

Performance is determined by carrying out the measurements indicated in table 1.

Table 1 – Measurements to determine performance

Measurements	Subclause	Washing machines	Spin extractors	Washing and spinning machines
Washing performance	5.1	X		X
Rinsing efficiency	5.2	X		X
Water extracting efficiency	5.3		X	X
Water and energy consumption	5.4	X	X ¹⁾	X
Mechanical detergent loss	5.5	X		X
Felting severity of the wool wash programme	5.6	X		X
Wrinkling	5.7	X	X	X
Wear suffered by textile	5.8	X	X	X
Airborne acoustical noise	5.9	X	X	X
¹⁾ For spin extractors only the measurement of energy consumption is performed.				

4.2 General conditions for measurements

All tests shall be in line with the manufacturer's instructions.

Unless otherwise specified measurements are conducted under the following conditions:

4.2.1 State of machine

Measurements shall be carried out on a new machine installed for use in accordance with the manufacturer's instructions. Before commencing measurements the machine shall be run for two complete cycles, at maximum temperature; the first without load and with 50 g of the reference detergent, the second without load or detergent.

4.2.2 Supply voltage and frequency

The supply voltage shall be maintained at the rated voltage of the machine ± 2 %. When the appliance is specified by a rated voltage range, the measurements are to be carried out at a voltage equal to the mean value of the range ± 2 %.

The supply frequency shall not differ by more than 1 % from the rated frequency of the machine.

NOTE - If the rated voltage of the machine differs from the system voltage of the country of sale, measurements shall be carried out at the voltage of the country of sale ± 2 %.

4.2.3 *Ambient temperature*

The ambient temperature of the room shall be maintained at (20 ± 5) °C throughout the measurements. The temperature shall be stated in the measurement report.

4.2.4 *Characteristics of water used*

4.2.4.1 A water hardness of $(2,50 \pm 0,20)$ mmol/litre shall be used for the whole of all programmes. The water shall be prepared according to IEC 734 - Method B.

NOTE - In some countries, it may be permissible to use local natural water supplies if the water hardness complies with this standard.

4.2.4.2 The temperature of supply water shall be:

- for cold water feed: (15 ± 2) °C;
- for hot water feed: temperature as indicated by the manufacturer or (55 ± 2) °C if instructions are not given.

When the measurement is carried out with a water temperature different from the limits above, that supply water temperature shall be stated in the measurement report.

When carrying out measurements to determine values to be declared for the 60 °C cotton cycle to the Commission Directive on energy labelling the temperature of the water supply shall be (15 ± 2) °C.

4.2.4.3 The dynamic pressure of the water supply at each water inlet shall be within the range indicated by the manufacturer and shall be stated in the measurement report.

4.2.5 *Detergent*

Measurements requiring a detergent are carried out with one of the two reference detergents, which are given in subclauses 4.2.5.1 and 4.2.5.2. In the report it has to be stated which reference detergent (A or B) has been used.

Subclause 4.2.5.1 specifies the formulation of the updated non-phosphate detergent, IEC reference detergent A, and instructions for the amount of detergent to be used. Subclause 4.2.5.2 specifies the formulation of the old phosphate containing reference detergent, IEC reference detergent B, and instructions for the amount of detergent to be used.

NOTE - After an appropriate time of experimental work with the new formulation it is planned to withdraw the phosphate-containing formulation of the reference detergent.

4.2.5.1 Reference detergent A

Table 2 – Composition of IEC reference detergent A

Linear sodium alkyl benzène sulfonate (mean length of alkane chain C ₁₁₋₅)		7,5 %
Ethoxylated fatty alcohol	C ₁₂₋₁₈ (7 EO)	4,0 %
Sodium soap (chain length	C ₁₂₋₁₈ : 65 % C ₂₀₋₂₂ : 35 %)	2,8 %
SIK (foam inhibitor concentrate, 8 % silicon or inorganic carrier)		5,0 %
Sodium aluminium silicate zeolite 4 A		25,0 %
Sodium carbonate		9,1 %
Sodium salt of a copolymer form acrylic and maleic acid (Sokalan CP 5/BASF)		4,0 %
Sodium silicate (SiO ₂ :Na ₂ O = 3,3:1)		2,6 %
Carboxymethylcellulose		1,0 %
Sodium ethylenediaminetetraacetate		0,2 %
Optical whitener for cotton (stilbene type)		0,2 %
Sodium sulfate (as accompanying substance or added)		5,7 %
Water		9,4 %
Proteolyte enzyme prills (activity = 11 mAU/g)		0,5 %
Sodium perborate tetrahydrate		20,0 %
Tetraacetylenediamine		3,0 %

NOTES

1 The new reference detergent will be distributed in three separate parts:

- 1) Basic powder with enzyme prills and SIK
- 2) Sodium perborate tetrahydrate
- 3) Bleach activator tetraacetylenediamine

The proportion of ingredients of the ready detergent are:

- | | |
|------|---|
| 77 % | Spray dried powder with enzyme prills and SIK |
| 20 % | Sodium perborate tetrahydrate |
| 3 % | Bleach activator tetraacetylenediamine |

2 Due to the variability which may result from the manufacturing procedure of the detergent or of its ageing, for comparative measurements, it is recommended to use a reference detergent supplied by one definite manufacturer from one definite production batch recently supplied. It is also recommended to keep the detergent and perborate separately in small quantities (e.g. 1 kg) and to use it within a limited time.

3 It is recommended that the detergent manufacturer should indicate the pH of the product supplied.

The amount of detergent shall be in accordance with table 3.

Table 3 – Amount of reference detergent A (water hardness 2,5 mmol/l)

Wash load (kg)	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0
Mass of detergent in main wash (g)	70	78	86	94	102	110	118	126	134	142	150

NOTES

- 1 Reference detergent consists of the various components supplied mixed together immediately before use in the recommended proportions, i.e. 77 parts base, 20 parts perborate and 3 parts TAED
- 2 If prewash is to be included the total quantity of detergent used should be increased by a factor of 1,25. The total detergent quantity has to be split between prewash and main wash in accordance with the washing machine manufacturer's instructions. If there are no instructions, the split shall be 1:2.
- 3 A different detergent dosage has to be applied in agitator- and impeller-type machines.

4.2.5.2 Reference detergent B

Table 4 – Composition of IEC reference detergent B

Linear sodium alkyl benzene sulfonate (mean length of alkane chain: C ₁₁₋₅)	6,4 %	
Ethoxylated tallow alcohol (14 EO)	2,3 %	
Sodium soap (chain length C ₁₂₋₁₆ : 13-26 % C ₁₈₋₂₂ : 74-87 %)	2,8 %	
Sodium tripolyphosphate	35,0 %	
Sodium silicate (SiO ₂ :Na ₂ O = 3,3:1)	6,0 %	
Magnesium silicate	1,5 %	
Carboxy-methyl-cellulose	1,0 %	
Ethylenediamine-tetra-acetic-sodium-salt	0,2 %	
Optical whitener for cotton (dimorphostilbene type)	0,2 %	
Sodium sulfate (as accompanying substance or added)	16,8 %	
Water	7,8 %	
Basic powder	80,0 %	80,0 %
Sodium perborate tetrahydrate		20,0 %
IEC reference detergent with perborate, type I		100,0 %

NOTES

- 1 The perborate is supplied separately.

2 Due to the variability which may result from the manufacturing procedure of the detergent or of its ageing, the use is recommended, for comparative measurements, of a reference detergent supplied by one definite manufacturer from one definite production batch and of recent supply. It is also recommended to keep the detergent and perborate separately in small quantities (e.g. 1 kg) and to use it within a limited time.

3 It is recommended that the detergent manufacturer should indicate the pH of the product supplied.

The amount of detergent shall be in accordance with table 5.

Table 5 – Amount of reference detergent B (water hardness 2,5 mmol/l)

Wash load (kg)	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0
Mass of detergent in main wash (g)	96	106	116	126	136	146	156	166	176

NOTES

1 Reference detergent consists of the various components supplied mixed together immediately before use in the recommended proportion i.e. 80 parts base, 20 parts perborate.

2 If pre-wash is to be included the total quantity of detergent used should be increased by a factor of 1,25. The total detergent quantity has to be split between pre-wash and main wash in accordance with the washing machine manufacturer's instructions. If there are none, the split shall be 1:2.

3 A different detergent dosage has to be applied in agitator- and impeller-type.

4.2.6 Ballast

Measurements requiring the use of a wash load are carried out with a load of textile material consisting of ballast and standard soiled strips and/or any test specimens approximately equal to the rated capacity as defined in 3.3.

The mass of this ballast only is determined after it has been left for 24 h exposed to the air, with a relative humidity equal to $(65 \pm 5) \%$ at a temperature of $(20 \pm 2) ^\circ\text{C}$. This procedure may be done after using the ballast for 10 wash cycles.

The mass of the wash load is determined after the ambient temperature defined in 4.2.3 has been reached.

NOTE - If it is not possible to carry out the above conditioning, it can be replaced by the following treatment (so-called "bone dry"):

Place dry load in a drier and dry for 10 min to 40 min depending upon the load size. Remove and weigh before cool down. Repeat these operations with 10 min drying periods until the final mass change is 1 % or less.

The so obtained "bone dry" mass increased by 8 % is taken as the mass of the load. This procedure is only suitable for clean cloth as soils tend to be "fixed" by heating. After every washing cycle the ballast will be dried with an electric household tumbler dryer near to $(\pm 2 \%)$ the conditioned mass of that load.

4.2.6.1 Ballast for cotton

The standard load A shall consist of cotton sheets, cotton pillowcases and cotton huckaback hand-towels conforming with the following specifications. Pieces used for a test should be selected within a tolerance of ± 10 g.

Sheets and pillowcases:

Bleached cotton

Weave in plain: 1/1

Mass per unit area: $185 \text{ g/m}^2 \pm 5 \%$ (of finished fabric)

Warp: 23 threads/cm of 36 tex

Weft: 23 threads/cm of 36 tex

Sheet size: 1 500 mm x 2 600 mm

Pillowcases size: pieces of 1 600 mm x 800 mm approximately folded in half and sewn along the three open edges so as to form a double thickness of fabric (finished size: 800 mm x 800 mm).

Hand-towels:

Bleached cotton

Weave-huckaback

Mass per unit area: $230 \text{ g/m}^2 \pm 5 \%$ (of finished fabric)

Warp: 19 threads/cm of 36 tex

Weft: 13 threads/cm of 90 tex

Size: 1 000 mm x 460 mm approximately.

The proportion of sheets, pillowcases and hand-towels in the standard load for various rated capacities is given in table 6.

Table 6 – Test load

Rated capacity kg	Number of sheets	Number of pillowcases	Number of hand-towels
2	1	2	Number required to make up total mass
2,5	1	3	
3	1	4	
3,5	2	3	
4	2	4	
4,5	2	6	
5	2	6	
5,5	2	8	
6	2	8	

The material comprising the ballast shall have been submitted to at least five washing cycles and not more than 60 washing cycles.

Before the tests are carried out, the textile shall have been normalized to avoid a rapid change of the initial conditioned mass during the test series.

The normalizing is three cycles of the following process:

Wash with a programme designed for white cotton, without pre-wash but including rinsing and spinning, using 15 g/kg of reference detergent A or B in soft water with a hardness not greater than 0,50 mmol/l (see 2.4 of IEC 734) followed by a spin drying cycle.

After each five washing cycles the load has to be washed in the reference machines programme P2 without detergent (to avoid detergent accumulation).

Way of loading the machine:

For the determination of the washing performance (see 5.1.1) the machines will be loaded with the ballast and soiled strips (see 5.1.1.2) in the following order:

- First: 2 pillowcases
- Then: half the amount of soiled strips **fixed on hand-towels** (see figure 101)
- Then: 1 sheet
1 pillowcase (if there is still one)
half of the amount of hand-towels
- Then: half of amount of soiled strips **fixed on hand-towels** (see figure 101)
- Then: rest of the pillowcases, sheets and hand-towels.

4.2.6.2 Ballast for easy care textiles

– Men's shirts:

Shirts size 40/42, long arm, white coloured.

Polyester/cotton blended textile with the proportion of polyester of $(65 \pm 3) \%$.

Mass: from 180 g to 250 g (mass per unit area approx. 115 g/m^2).

– Pillowcases: Finished size 800 x 800 mm.

White cross-linked polyester/cotton blended textile with the proportion of polyester of $(65 \pm 3) \%$.

Mass per unit area: 100 g/m^2 to 150 g/m^2 .

Made in one piece 1 600 mm x 800 mm. These are then folded in half, and sewn around the open edges, thus forming double thickness size 800 mm x 800 mm.

These specimens can be used for evaluation of crease resistance (wrinkling).

Before any tests are carried out the new textile for ballast must be normalized to avoid a rapid change of the initial conditioned weight during a test series.

The normalizing is five cycles of the following process:

Wash the textile with a programme designed for easy care fabrics (wash programme 3A), in the reference washing machine (see annex B) using 15 g/kg of the reference detergent. The ballast is then dried by an electric tumbler dryer in preparation for conditioning.

The wash load means the total mass according to the rated capacity, made up by adding an equal number of shirts and pillowcases including standard soils. Final adjustment of the load is made by adding one shirt or one pillowcase, whichever adjusts the load closest to rated capacity.

For wrinkling tests the ballast has to be prepared (see 5.7).

5 Methods of measurements

5.1 Determination of washing performance

5.1.1 Measurement of specimens with standardized soiling, washed with a clean ballast load

5.1.1.1 Principle of measurement

The washing performance of a washing machine is characterized by the reflectance, measured with a photocolormeter, of different types of specimens with standardized soilings washed in the machine under test, together with a ballast load of clean textiles, such as described in 4.2.6. For the purpose of declaration of the washing performance only reference detergent "A" according to 4.2.5.1 shall be used.

NOTE - These standardized soilings may also be used with standardized loads of naturally soiled articles, such as those described in annex C.

The different types of soiling enable the following characteristics to be measured:

5.1.1.1.1 The scouring effect chiefly due to mechanical and thermal action, the specimen used being soiled with a mixture of carbon black and mineral oil.

5.1.1.1.2 The removal of protein pigments, the specimen used being soiled with blood.

5.1.1.1.3 The removal of organic pigments, the specimen used being soiled with chocolate and milk.

5.1.1.1.4 The bleaching effect, the specimen used being soiled with red wine.

5.1.1.1.5 It is considered valid to use the above soilings also for the evaluation of the performance of "Easy Care" cycles as these cycles in practice contain a high percentage of cotton items. However to assess the cleaning of blended articles, which will again be present in real wash loads, further standard soilings performed on polyester/cotton and