



Astma- och Allergiförbundets

Kriterier för tvättmaskiner

Bakgrund

Astma- och Allergiförbundet har under många år fått återkommande frågor om hjälp inför köp av tvättmaskin: Hur effektiva är maskinerna, finns risk för överlevande kvalster, går det att få bort kvarvarande smuts i maskinen? Detta dokument vill ge svar på några av dessa frågor.

Samtidigt är våra kriterier en uppmaning till fabrikanterna att utveckla maskinerna så att de klarar känsliga personers krav.

Dokumentet är ett viktigt underlag för Granskningsrådet vid bedömning av vilka maskiner som ska rekommenderas av förbundet.

Sammanfattning

Kriterierna fokuserar på maskinens prestanda avseende rengöring och sköljning av tvättgods samt extra rengöring av maskinen i samband med användning.

Sammanställningen av krav beskriver hur en tillverkare av tvättmaskiner kan optimera sin produkt så att produkten kan tillfredställa de särskilda behov som personer med allergi och annan överkänslighet har. Den innehåller också Astma- och Allergiförbundets krav på tvätt- och sköljefekt. Ett särskilt avsnitt ägnas åt förbundets specifika krav på rengöring av maskinen. En bruksanvisning ska finnas med tydliga anvisningar om hur man kan optimera och rengöra maskinen.

Kriterier

För att kunna få en rekommendation av Astma- och Allergiförbundet ska en tvättmaskin klara av att hålla produkten ren samt tvätta och skölja ur tvättgods på ett optimalt vis. Det finns också krav på att ytorna ska vara fria från nickel och andra allergen. Bruksanvisningen ses som en del i produkten. Därför ingår också krav på en beskrivning av optimal användning avseende till exempel mängd av tvättgods.

Tvätteffekt

Lägst \geq index 1,03 för allergiprogram bomull 60°C med reducerad kapacitet, enligt provningsmetod i EN 60456:2005.

Det ska verifieras att programmen håller inställd temperatur med en maximal avvikelse av $\pm 3^\circ\text{C}$ på tvättvattnet. För bomulls- och syntetprogram ska vald temperatur hållas under minst 5 min av tvättfasen.

Centrifugering

Högst 50% restfukt efter centrifugering vid allergiprogram bomull 60°C med reducerad kapacitet, enligt provningsmetod i EN 60456:2005.

Sköljefekt

Vattenlösliga rester/alkali \leq index 1,0 vid allergiprogram bomull 60°C med reducerad kapacitet. Provningsmetoden finns beskriven i IEC 60456.

Vattenlösliga rester \leq index 1,0 vid allergiprogram bomull 60°C med reducerad kapacitet, ska genomföras i ”mjukt vatten”, max 7°dH. Se bilaga 1.

Maskinrengöring

Ett särskilt tillvalsprogram för tom maskin ska kunna initieras innan maskinen används.

Programmet ska kunna användas när brukaren är osäker om hur maskinen har använts tidigare, till exempel om det finns gammalt vatten eller tvättmedelsrester kvar.

Detta maskintvättprogram ska ha en förhöjd vattennivå för att säkerställa effektiv rengöring och sköljning. Under rengöringsfasen ska vattentemperaturen i "vattenbadet" vara minst 72°C under en period av minst 5 minuter. Möjlighet ska finnas att pumpa runt detta "tvättvatten" i det slutna system som en tvättmaskin är.

Efter utpumpning ska minst två sköljningar göras med mellanliggande utpumpning.

Kapacitet och trumvolym

Utöver att maskinerna ska uppfylla krav enligt energideklarationen, ska det tydligt framgå att maskinens kapacitet är minskad för de av Astma- och Allergiförbundet rekommenderade programmen och att produkten ska användas med denna lägre mängd tvättgods för dessa allergiprogram.

Rekommenderad mängd tvättgods för användning enligt dessa kriterier får vara maximalt 1 kg torrt tvättgods per 13 liter trumvolym för bomullstextilier och 1 kg torrt tvättgods per 26 liters trumvolym för syntettvätt.

Trumvolymen ska uppges i bruksanvisningen och användas för beräkning av denna lägre kapacitet .

Exempel: för en maskin med en trumvolym på 50 liter och där deklarationen föreskriver 5-7 kg, blir rekommenderad maximal mängd vid användning enligt denna beräkning 3,8 kg för bomullstvätt ($=50/13$) och 1,9 kg för syntettvätt ($=50/26$).

Nickel

Ytor på produkten som en användare måste beröra under användningen får inte avge nickel.

Buller

Luftburet akustiskt buller från maskinen, räknat som ljudeffekt, får inte överstiga LWAd 56 dB(A) under tvättprogrammet eller LWAd 76 dB(A) under centrifugeringen mätt enligt angiven testmetod, EN 60704-2-4 och EN 60704-3.

Bruksanvisning

Extra information måste skrivas in i befintlig bruksanvisning, där det tydligt ska anges hur beskrivna konsumentgrupp enkelt kan optimera tvättningen efter sina behov.

- ❖ Rekommendation av tvättmedel som möter krav ställda av Astma- och Allergiförbundet
- ❖ Tydliggörande av att tvättmedelsmängden måste anpassas till vattnets hårdhetsgrad
- ❖ Anvisningar om sortering av tvätt på lämpligt sätt med hänsyn till material och tvättemperatur.
- ❖ Information om tvättmaskinens förbrukning av energi och vatten för de modifierade programmen med reducerad tvättmängd
- ❖ Anvisningar om rengöring med maskinens speciella tvättprogram samt information om vikten av regelbunden rengöring av filter, tvättmedelsfack

Provningsmetoder och kontroll

Provningsinstitutet/analyslaboratoriet ska uppfylla de allmänna kraven enligt svensk standard (ISO/IEC 17025:2005) eller vara ett ackrediterat analyslaboratorium.

Energieffektivitet, vattenåtgång, centrifugeringseffekt samt tvätteffekt provas enligt gällande EN 60456 för allergiprogram vid bomull 60°C.

För allergiprogram mäts sköljeffekt enligt alkalimetoden, testmetod enligt gällande IEC 60456.

Sköljeffekt vattenolösligt, testmetod se bilaga men ska genomföras i ”mjukt vatten” max 7°dH.

Kontroll av rengöringsprogrammet utförs så att vattenprover tas i utpumpningsvattnet under den sista sköljningen. Partikelmängden mäts enligt metod EN ISO 7027:1999. Slutresultatet ska vara i nivå med inkommande vatten (max + 1.5 FNU) för att rengöringsprogrammet ska få godkänt.

Buller provas enligt gällande EN 60704-2-4.

Standardtermer

ISO betyder International Organization for Standards

IEC betyder International Electrotechnical Commission

EN betyder Europa Norm

FNU betyder Formazine Nephelometric Units

Hur ansöker man

Ansökan och skriftlig dokumentation som visar att tvättmaskinen uppfyller alla krav som ställs i detta dokument ska skickas in till Astma- och Allergiförbundet, Rekommenderade produkter, Box 17069, 104 62 Stockholm.

Bilaga 1.

CLOTHES WASHING MACHINES FOR HOUSEHOLD USE – METHOD FOR MEASURING THE RINSING PERFORMANCE - INSOLUBLE PARTS

Scope

This method specifies a method for measuring the rinsing performance of insoluble components of detergent that are retained on the clothes load after treatment by a washing machine for household use on a nominated program.

NOTE This method is also applicable to **washing machines** for communal use in blocks of flats or in launderettes, but **washing machines** for commercial laundries are not included.

The object is to state and define a method for quantifying the rinsing performance through measurement of retained particle residues on load items at the completion of the program on the test machine. The result for the test machines is compared to the result on a reference machine to provide a performance benchmark.

This method is concerned neither with safety requirements and does not set minimum performance requirements for rinsing.

Normative references

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

IEC 60456:2003, *Clothes washing machines for household use - Methods for measuring the performance*

IEC 60734: *Household electrical appliances – Performance – Hard water for testing*
IEC ISO

ISO 2060:1994, *Textiles – Yarn from packages – Determination of linear density (mass per unit length) by the skein method*

ISO 2061:1994, *Textiles – Determination of twist in yarns – Direct counting method*

ISO 3801:1997, *Textiles – Woven fabrics – Determination of mass per unit length and mass per unit area*

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

Terms, definitions, symbols and dimensions

Terms and definitions

For the purposes of this method, the definitions for terms, definitions and dimensions apply to be found in IEC 60456.

Symbols

Z_m	light absorbance measured on water remaining in the textiles
$Z_{m,test}$	light absorbance measured of the liquor rinsed from the textiles washing machine under test on the selected programme
$Z_{m,ref}$	light absorbance measured of the liquor rinsed from the textiles reference washing machine on the 60 °C cotton programme
Z	rinsing index
\bar{Z}	the mean of rinse indices for all cycles , excluding the result of the first test cycle
Z_i	the rinsing index from i^{th} test cycle

Rated capacity

This chapter shall be changed according to 5th ed 60456

If the **rated capacity** is not declared, the **rated capacity** for a cotton load shall be deduced from the volume of the drum according to the following ratios:

- **horizontal drum washing machine** 1 kg / 13 l;
- **agitator washing machine** 1 kg / 15 l;
- **impeller washing machine** 1 kg / 20 l;
- **nutator washing machine** 1 kg / 10 l;
- **spin extractor** 1 kg / 4,6 l.

Where the manufacturer gives different values for the **rated capacity**, the highest value shall be used.

NOTE For different textiles the rated capacity of an appliance may be different.

General conditions for measurements

General

The measurements shall be carried out on a new machine installed and used in accordance with the manufacturer's instructions, except as required by this standard.

Before commencing test cycles to determine the rinse performance of insoluble components, the machine shall be run for two complete test **cycles** at maximum temperature, the first without load and with 50 g of the reference detergent and the second without load and detergent.

Resources and ambient conditions

Electricity supply

The supply voltage shall be maintained at the rated voltage ± 2 % throughout the test. If a voltage range is indicated, then the supply voltage shall be the nominal voltage of the country in which the appliance is intended to be used.

The supply frequency shall be maintained at the rated frequency ± 1 % throughout the test. If a frequency range is indicated, the test frequency shall be the nominal frequency of the country in which the machine is intended to be used.

NOTE Voltage stabilisers should be designed such that the normal operation of the washing machine does not cause undue distortion of the voltage waveform.

Water supply

For all processes on the **base load** a water hardness of $0,5 \pm 0,5$ mmol/l shall be used for all programmes. If water hardness needs to be adjusted, it shall be prepared according to IEC 60734.

The temperature of the water supply shall be cold water (15 ± 2) °C;

The static (gauge) pressure of the water supply at each water inlet shall be maintained at (240 ± 50) kPa throughout the test, including during all fill operations on the test machine and the reference machine.

The measured water temperature and pressure shall be reported.

Ambient temperature

The ambient temperature of the room shall be maintained within the range 23 ± 2 °C throughout the test. The measured ambient temperature shall be reported.

Reference washing machine

A **reference washing machine** shall run in parallel with the **washing machine** under test, applying the same procedure to both machines to provide a measure of relative performance and reproducible results. Specifications for the reference **washing machine** are given in IEC 60456.

Materials

Rinse load

Cotton rinse load

The cotton **rinse load** shall consist of load items specified in Annex A1.

The **rinse load** is adjusted so that it corresponds to the **rated capacity** for the specified program of the test machine. The **rinse load** shall be adjusted so that it is as close as possible to the **rated capacity**, using the mass determined during the conditioning of the textiles at the commencement of the present series of cycles.

Usage

Each load item shall not be used more than 80 test **cycles** not counting pre-treatment and the normalization **cycles** between test series.

To minimise the influence of ageing of the textiles, the **cotton rinse load** shall consist of items that are well distributed in age to give a weighted average age of the load between 30 and 50 test cycles.

Average age of the load shall be calculated and reported.

Preparation of the rinse load

Pre-treatment of new load items

New textile items shall be treated prior to their first use by undergoing 5 cycles using the 60 °C cotton reference programme (without prewash but including rinsing and spinning) without intermediate drying. Using 15g /kg of the reference detergent A*. This is followed by normalization cycle according to 6.3.2 and by conditioning of the load according to 6.3.3 at rated capacity. Normalization between test series

After each test series run of 6 or more 5 cycles, the rinse load shall be normalized with a single cycle in the reference machine at rated capacity using the 60°C cotton reference programme (without prewash but including rinsing and spinning) and

without detergent *and then dry to a final moisture content of approximately 0 % in a tumble dryer.* This shall be followed by a load conditioning in accordance with 6.3.3.

Conditioning

All textiles shall be stretched or flattened by hand before conditioning.

The textiles shall be left separately hung for not less than 15 h in an ambient temperature of (20 ± 2) °C and relative humidity (65 ± 5) % [I assume this is an alternative to 15 h – needs to be written as such] Alternatively, a shorter conditioning period is permitted where it can be demonstrated that the mass of the load has changed by less than 0,5 % for two successive measurements undertaken at intervals of two hours or more.

The conditioning period shall be reported

General Detergents

The detergent dose for tests to this standard is 24 g/kg rated capacity of IEC 60456 reference detergent A* both for the test machine and the reference machine. The specification of the detergent is provided in IEC 60456.

6.4.2

Tetra-sodium pyrophosphate ($\text{Na}_4\text{P}_2\text{O}_7 \times 10\text{H}_2\text{O}$) quality puriss is used to mobilise particles (zeolite) in the final particle extraction in the rinsing machine. Weigh portions of 7,5 g each, the salt should be dissolved in some of the rinse water just before it is used, one portion//extra rinse in the rinsing machine/total 15 l rinse water portion

Instrumentation and accuracy

Instruments having the following accuracy shall be used for tests. For the purposes of this method, the definitions for instrumentation and accuracy apply to IEC 60456.

Spectrophotometer for determination of light absorbance

Measuring instrument A photometer that can provide a light absorbance at 685nm or a spectrophotometer that can measure turbidity at wave length 860nm.

Measuring cuvette 50mm cell

Calibration frequency each time the instrument is switched on, or at least once per working day during periods of continuous use.

The instrument calibration should be tested at least once a year for its operating efficiency by a third party

The operation and calibration of the photometer or spectrophotometer shall be in accordance with the supplier instructions for use.

Rinse Performance Test - Insoluble's

Any **programme** and capacity of interest may be selected for investigation on the test machine with operation in general accordance with the manufacturer's instructions.

In parallel to the test machine the reference **washing machine** is operated using the 60°C cotton reference **programme** in all cases.

A series of at least six test cycles shall be carried out on the test machine with parallel test cycles on the reference machine. Up to two additional test cycles under identical conditions may be added to a test series if evidence is provided that one or two of the test cycles in the test series give differing rinse results, where the data exhibit discontinuous or unexpected results and the likely reason for such a result. For rejected test cycles the data are excluded from the evaluation. The first cycle shall be tested with a normalized base load as specified in 6.3.2. The first cycle is always excluded from the evaluation. Normalization is done only after the last test cycle of the test series.

Initial test procedure

Initial test procedure:

"At the completion of the programme the rinse load is removed from the test machine. 2 bundles of 14 rinse cloths are separated. Each bundle of 14 rinse cloths is equal to about 1,5kg conditioned weight of dry clothes. The wet weight of the first bundle is determined by weighing it. Deionised water is filled in the rinsing machine so that the total quantity of water is 15kg including the water remaining in the bundle of rinse cloths.

In addition, one portion (7.5 g) of sodium pyrophosphate is pre-dissolved in some of the deionised water and also added to the water in the rinsing machine, mix.

Then load the bundle with wet clothes to the rinse machine.

The rinsing machine is then operated for a period of 4 minutes. (this will normally require manual starting and stopping of the rinse machine and reference to a stop-watch) or until the equilibrium between the rinse water and the remaining insoluble in the clothes are reached.

A sample (approximately 500ml) of the liquor from the rinse machine is taken when draining off after the rinse. This should be done in a consistent manner and at a specific point of time each time the rinse machine is drained.

The process is used to obtain a sample from the second bundled of rinse clothes in the same manner. Rinse the rinse-machine between the bundles with deionised water

Measurement

A water sample of the deionised water is used to zero the absorption value on the spectrophotometer for the supply water prior to measuring the light absorbance of the rinse drain water from the rinsing machine.

The light absorption of the sample of rinse water drained from the rinsing machine for the test machine(s) and reference machine is measured at 695nm through a 50 mm cuvette. Three measurements per rinse bundle are carried out (total of six reading per machine) and the average value per machine is calculated.

Note: The six readings obtained for the 2 bundled should all provide consistent readings. If there are significant differences, then the process should be checked before proceeding.

To prepare the **rinse machine** for subsequent use, the inner and outer tubs are rinsed with tap water and then with deionised water after use.

The complete rinse load is collected and dried in a dryer after use.

Evaluation

The rinse performance of the test machine is evaluated as by the measurement of the light absorbance of the water drained from the rinsing machine (Z_m);

The result Z_m of the first test **cycle** after normalizing on the test machine and the reference machine shall not be used for the assessment of the average rinsing efficiency. The five **cycles** which are selected for evaluation (see Clause 8) are averaged to determination of the rinsing efficiency of the test machine and the reference machine.

The Z rinsing index for the test machine, R , is determined by:

$$R = \frac{Z_{m,\text{test}}}{Z_{m,\text{ref}}}$$

where

$Z_{m,\text{test}}$ is average light absorbance for the test **washing machine** for the 5 test cycles;

$Z_{m,\text{ref}}$ is light absorbance for the reference **washing machine** on the Cotton 60°C programme for the 5 test cycles.

The standard deviation of the 5 test cycles may also be calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^k (R_i - \bar{R})^2}{k - 1}}$$

where

R_i is the rinsing index for each of the (5) test cycles 1 to k selected for evaluation;

\bar{R} is the mean of rinse indices for all (5) test **cycles** selected for evaluation;

k is the number of test **cycles**. (usually 5)

Reference machines	IEC 60456, fourth edition.
Reference programme 60°C	IEC 60456, fourth edition. Programme cotton
Other with length	Light absorbing equipment wave length 695 mm a 50mm cuvette or measure turbidity at wave 860nm.
Calculate the index by 60°C	Test machine light absorbtion/reference Cotton light absorbtion = index

Water and energy consumption and programme time

Instruments having the following accuracy shall be used for tests for the purposes of this method, the definitions for water, energy consumption and time apply to be found in IEC 60456.

Data to be reported

NOTE The form of reporting is under consideration. Annex C may be used as a guideline.

Annex A Specifications for base loads

A.1.1.1 Cotton base load

The cotton **rinse load** shall consist of rinse cloths conforming with the specifications set out in the table below (measured at 20 °C ± 2 K, 65 % ± 5 % RH and certified by the supplier):

Table A.1 – Specification of the cotton base load textiles

Criterion for conditioned new textiles	Rinse cloths
Substrate	Long staple pure cotton
Yarn	Ring spun
Yarn twist (T/m)	
Warp	600 ± 20
Weft	500 ± 15
Yarn Count (tex)	
Warp	33 ± 1
Weft	33 ± 1
Weave	Plain Weave Linen 1/1
Pick count (pick/cm)	24 ± 1
Warp	24 ± 1
Weft	185 ± 10
Mass per unit area (g/m ²)	750 ± 50
Dimensions (mm)	750 ± 20
Length	110 ± 5
Width	
Weight per piece (g)	
Finish	Desizing, boiling off, singeing, bleaching, no filling or stiffening size

Rinse cloths: Short edges (cut edges) are double hemmed, hem size 10 mm, the long edges are not hemmed. Sewing material is polyester cotton, single seam, lock stitch, distance of seam from edge is 9 mm, stitch length 3 mm.

Rinse-cloths are hemmed and sewed to size make test pieces which are 800mm x 800 mm. The nominal weight per rinse-cloth approximately 100 g. The base material specified is in accordance with the specification for cotton material IEC 60456, fourth edition (plain weave).

A.2 Determination of the weighted average age

Instruments having the following accuracy shall be used for tests for the purposes of this method; the definitions for determination of the weighted average age apply to be found in IEC 60456.

Annex C Data to be reported

Table C.1 – Data for machine under test

Brand:		Model nomination:	
Product number code:		Serial number:	
Source of machine:		Internal heater (yes/no):	
Appliance dimension meas.:		Appliance dimension decl.:	
Rated capacities	Cotton:	Easy-care:	Wool:
Drum/bowl volume declared:		Drum/bowl volume meas.:	
Washer type (see 3.1.2 to 3.1.7):		Washer loading (top/front):	
Water connection mode (hot, cold, hot/cold):		Rated input power:	
Rated voltage:		Test voltage:	
Rated frequency:		Test frequency:	
Additional information:			

B.2

Cycle data, parameters and results

The same table may be used for the reference machine and the machine under test

Table C.2 – Cycle data, parameters and results

Laboratory:		Internal test identifier:							
Machine identification:		Checked / approved by:							
Programme selected:		Options selected:							
Cycle: (data for individual cycles are recommended) X = optional m = recommended		1	2	3	4	5	6	average	s
		X	X	X	X	X	X	m	m
Date of cycle	m yr.m.d.								
Mass of conditioned load (without test strips):	m g								
Mass of detergent used	m g								
Water consumption during main wash:	m l								
Total water consumption:	m l								
Electrical energy consumption	m kWh								
Total cold water correction	m kWh								
Total energy consumption:	m kWh								
Ambient temperature:	m °C								
Ambient relative humidity	X %								
Water supply pressure	X kPa								
Water hardness:	m mmol/l								
Date of water preparation (if appropriate)	m Yr.m.d								
Cold water inlet temperature:	m °C								
Hot water inlet temperature:	X °C								
Max. temperature during main wash:	X °C								
Min. temperature during main wash:	X °C								
Programme duration main wash:	X min								
Total program duration:	m min								
Spin speed:	X rpm								
Mass of base load after spin extraction:	m g								
Remaining moisture	m %								
Rinsing index	X								
Wool shrinkage rate index	X								
Performance Ratio (identification of reference cycle used):									

The standard deviation s for a measure defined in this list is calculated as

$$s = \sqrt{\frac{\sum_{i=1}^k (R_i - \bar{R})^2}{k - 1}}$$

where

R_i is the measure for cycle i ,

\bar{R} is the arithmetic mean of this measure,

K is the number of cycles,

if not defined elsewhere in this standard.

B.2.1.1 Basic parameters, equipment and materials

Data are recommended to be given.

Table H.3 – Basic parameters, equipment and materials

Cotton rinse load	Supplier		Batch		Number of items used in this load	
Rinse cloths						
Conditioning method						
Detergent	Supplier	Batch	Date of delivery	Storage cond.	Target mass in g for this load	
Base detergent A*						
Perborate						
TAED						
Photometer/Spectral Photometer	Manufacturer		Type		Measuring diameter in mm	
Water hardness preparation	Natural	IEC 60734 Type A	IEC 60734 Type B	IEC 60734 Type C1	IEC 60734 Type C2	Other (specify)

Bibliography

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

61036:1996, Alternating current static watt-hour meters for active energy (Classes 1 and 2)

EN 12127:1997, Textiles – Fabrics – Determination of mass per unit area using small samples