



Swan labelling of

Washing machines

Version 4.0 • 18 March 2004 – 17 June 2009



Nordic Ecolabelling

Content

What is a Swan labelled washing machine?	3
What machines can be Swan labelled?	3
How to apply?	3
Documentation	4
1 Requirements	4
1.1 Environmental requirements	4
1.2 Requirements of efficiency and performance	6
1.3 Other requirements	7
2 Analyses and checks	10
2.1 Requirements concerning testing institute/analysis laboratory	10
2.2 Analysis and test methods	10
2.2 Follow-up inspection	10
Registration	11
The design of the ecolabel	11
Validity of the criteria document	11
Future criteria	12

Appendix 1: Certificate from the manufacturer

Appendix 2: Marketing of ecolabelled products for which a licence is sought

Appendix 3: Rinsing performance, alkalinity

Appendix 4: Test Method, Rinsing efficiency - Solid Particles Zeolite

This is a translation of the criteria document in Swedish.

In any case of dispute, the original document should be taken as authoritative.

Addresses

In 1989, the Nordic Council of Ministers decided to introduce a voluntary official ecolabel, the Swan. These organisations/companies operate the Swan ecolabelling system on behalf of their own country's government. For more information, see the websites.

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What is a Swan labelled washing machine?

The greatest environmental impact caused by a washing machine comes from its use. These Swan criteria focus therefore on requirements regarding the use of the machine. To be awarded a Swan licence, a machine must meet environmental requirements without compromising performance.

A Swan labelled washing machine fulfils requirements in a number of areas, such as:

- electricity and water consumption
- the reduced use of certain materials that are hazardous to health and the environment
- the recycling of materials
- washing and rinsing performance.

What machines can be Swan labelled?

The definition of the term washing machine in this document includes washing machines with spin function and a capacity not exceeding 10 kg, but excludes washer-dryers.

How to apply?

Application and written documentation (marked with ☒ in the document), that shows that the washing machine fulfils all the requirements posed in this document, shall be sent to Nordic Ecolabelling. The application must include a list of contents that shows which documentation that is enclosed for each individual requirement. The applicant should study the "Regulations for Nordic Ecolabelling of Products" as well as the requirements in this document.

In order for a washing machine to be awarded a Swan label, all requirements in the document must be fulfilled.

Documentation

The following documentation must be kept on record by the licence holder during the licence period and presented to Nordic Ecolabelling if required:

- Copy of the entire application.
- Facts/calculation data for the documentation submitted in conjunction with the administration of the application, e.g. test results.
- Records of planned production changes and unexpected deviations in the production of the washing machines in relation to the requirements in this document.
- All complaints about the Swan labelled machines.

The methods to be used for testing washing machines are described in Chapter 2.2. Where it is required that documented test results be appended, the laboratory that has carried out the test must be specified and certification provided that the laboratory fulfils the requirements set out in Chapter 2.1.

1 Requirements

1.1 Environmental requirements

R1 Energy efficiency

Machines comprised by the mandatory Energy Labelling Scheme must fulfil two requirements of energy consumption: one specific requirement for the standard 60°C cotton programme and one for the mean value of four different operating modes. Other machines must only meet one requirement. Energy consumption must not exceed the limit values specified below in Table 1:

Table 1

Type of machine	Energy consumption, washing, 60°C, cotton (kWh/kg washing)	Mean value of four different operating modes * (kWh/kg washing)
Machines comprised by the mandatory Energy Labelling Scheme	0,19	0,23
Other machines	-	0,23

* mean value of four operating modes: the standard 60°C cotton programme at full load and 2 kg load, and the standard 40°C cotton programme at full load and 2 kg load. Energy efficiency (E) is calculated as: $E = (e_1 + e_2 + e_3 + e_4) / (m_1 + m_2 + m_3 + m_4)$

e is electricity consumption in kWh and *m* is the mass of washing in kilograms, for each of the four individual operating modes

- ☒ Report containing the results of the energy efficiency test, performed according to the methods specified.

R2 Water consumption

The machine must not consume more than 16 litres of water per kilogram of wash load, measured in accordance with the test method specified and using the same standard 60°C cotton programme as used for measuring energy efficiency.

- ☒ Report containing the results of the water consumption test, performed according to the method specified.

R3 Spin performance

Machines with a capacity greater than 3.5 kg must achieve a residual moisture content of less than 54% when tested according to the stated test method using the same standard 60°C cotton programme as used for testing energy efficiency.

Machines with a capacity less than, or equal to, 3.5 kg must achieve a residual moisture content of less than 60% when tested according to the stated test method using the same standard 60°C cotton programme as used for testing energy efficiency.

- ☒ Report containing the results of the spin performance test, performed according to the method specified.

R4 Noise

Airborne acoustic noise from the machine, in terms of sound power level, must not exceed $L_{WA,d}$ 56 dB(A) during the washing cycle, or $L_{WA,d}$ 76 dB(A) during the spin cycle, measured in accordance with the test method specified and using the same standard 60°C cotton programme as used for measuring energy efficiency.

- ☒ Report containing the results of the noise test, performed according to the method specified.

R5 Marking of plastic parts

Plastic parts weighing more than 50 grams must be provided with permanent markings specifying the material, in accordance with ISO 11 469.

- ☒ The manufacturer must certify that the requirement is fulfilled in accordance with Appendix 1.

R6 Plastic parts

No substances based on cadmium, lead mercury or their compounds may be added to plastic materials.

Cables are excepted from this requirement.

- ☒ The manufacturer must certify that the requirement is fulfilled in accordance with Appendix 1.

R7 Flame retardants

The following flame retardants may not be added to plastic materials: Polybrominated biphenyls (PBB), polybrominated biphenyl ethers (PBDE) or chloroparaffins with chain length 10-13 carbon atoms and chlorine content >50% by weight (CAS no 85535-84-8).

Plastic parts heavier than 25 grams shall not contain flame retardant substances that are assigned at the time of applying for the ecolabel any of the risk phrases, as defined in Council Directive 67/548/EEC as last amended by commission Directive 98/98/EEC:

R45 (may cause cancer), R46 (may cause heritable genetic damage), R60 (may impair fertility) and R61 (may cause harm to the unborn child).

This requirement does not apply to flame retardants that on application change their chemical nature to no longer warrant classification under any of the risk phrases listed above, and where less than 0,1% of the flame retardants in the treated part remains in the form as before application.

All flame retardants used in plastic parts heavier than 25 grams shall be identified by name and CAS no.

- The manufacturer must certify that the requirement is fulfilled in accordance with Appendix 1.

The manufacturer must append a list of flame retardants, used in plastic parts heavier than 25 grams, and their CAS numbers.

R8 Recycling

The product must be designed so that at least 75% by weight of the components, materials and substances of the apparatus can be reused or recycled in accordance with the WEEE directive. According to Article 4 of the WEEE directive, this type of product must be simple to reuse and the materials must be simple to recycle. This means that joints must be easy to find and access, electronic components must be easy to find and remove, the product must be easy to disassemble using common standard tools, and it must be possible to separate out incompatible and hazardous materials.

WEEE: Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste of electrical and electronic equipment.

- Certification by the manufacturer that the requirement is fulfilled, see Appendix 1.

1.2 Requirements of efficiency and performance

R9 Washing performance

The machine must have a washing performance index greater than 1.00 when tested according to the specified test method and using the same standard 60°C cotton programme as used for testing energy efficiency.

- Report containing the results of the washing performance test, performed according to the method specified.

R10 Rinsing performance, alkali method

The machine must pass a rinsing performance test using the alkali method with a score ≥ 5 .

- Report containing the results of the rinsing performance test, performed according to the method specified.

R11 Rinsing performance, zeolite method

The machine must pass a rinsing performance test using the zeolite method with a score ≥ 3 .

- ☒ Report containing the results of the rinsing performance test, performed according to the method specified.

1.3 Other requirements**R12 Requirements from the authorities regarding safety, the working environment and the external environment**

The manufacture of Swan labelled washing machines must follow the legislation in force in each country of manufacture regarding recycling systems for products and packaging, as well as safety, the working environment, occupational safety and conditions/concessions specific to production facilities. Failure to comply with legislation may result in the withdrawal of the licence.

R13 Instructions

The machine must be sold with instructions that include descriptions of correct use with regard to environmental impact and recommendations for the optimum use of energy, water and detergent when using the machine. These instructions must include the following:

- a) The cover or first page must display the following text: "More information on how to avoid impact on the environment is provided in these instructions".
- b) If the machine is connected to a hot water supply, information must be provided that primary energy can be saved and emissions to air reduced if the water is heated using solar energy, district heating, natural gas or an oil-heated system. Information must be provided to the user that the pipe between the hot water source and the washing machine should be short and well insulated.
- c) Information on the availability of environmentally suitable detergents, e.g. compact detergent.
- d) Instructions that the amount of detergent should be adjusted to the hardness of the water, what is to be washed, the quantity of washing and how soiled the washing is (e.g. a half-full machine requires less detergent than a full machine).
- e) Instructions on sorting washing in a suitable way with regard to materials and fabrics, and how to set the temperature accordingly. Information that, in the majority of cases, it is no longer necessary to wash at high temperature when using a modern washing machine and modern detergent, such as compact detergent.
- f) Information on the washing machine's consumption of energy and water at different temperatures and quantities of washing, so that the consumer can select a suitable programme to minimise energy and water consumption.
- g) Instructions that the washing machine should be switched off when the programme has finished to avoid any energy losses. The instructions must specify how long the different programmes take.
- h) The power requirement in the following modes: off, timer (programmed) and end of programme.
- i) Directions that one should if possible avoid using the machine's prewash cycle.

- j) Maintenance instructions for the washing machine including the regular cleaning of filters and pumps and the removal of deposits.
- k) Instructions on how to install the machine to minimise noise.
- l) Information that the failure to observe the above advice can lead to a greater consumption of energy, water and/or detergent, which can result in higher running costs and impaired washing performance.
- m) Information on how the consumer can take advantage of the manufacturer's take-back scheme.

Instructions.

R14 Design, settings

The machine must be clearly marked so that suitable settings can be selected for different materials and washing instructions.

The applicant must, for example by providing pictures of the product, demonstrate that the requirement is fulfilled.

R15 Design, programme markings

All programmes, must be clearly marked on the machine.

See R14.

R16 Warranty

The manufacturer must provide a warranty that the washing machine will work without fault for at least two years. The period of warranty shall start on the date of delivery to the customer.

The applicant must certify that the requirement is fulfilled.

R17 Spare parts

The availability of spare parts must be guaranteed for ten years after production of the machine has ceased.

The applicant must certify that the requirement is fulfilled.

R18 Environment and quality control

The manufacturer of a Swan labelled washing machine must himself or through a reseller/importer have documented procedures and instructions to ensure:

- that the requirements of this document are met
- that the requirements can be checked during the validity of the licence
- the quality level as regards function and performance for the products covered by the licence
- that there is an organisational structure which can guarantee that the requirements of the ecolabelling criteria are met
- that there is a contact person for Nordic Ecolabelling
- the licence holder shall have a written permission from Nordic Ecolabelling before carrying out any changes that may be of relevance for the fulfilment of the ecolabelling requirements.

- ☒ Details on how the ecolabelling requirements are followed up, documented and reported on in day-to-day production, i.e.:
- a) organisation, person responsible for quality, contact person and other people with specific responsibility, as well as their fields of responsibility-
 - b) internal procedures for processing and reporting unexpected deviations related to the ecolabelling requirements-
 - c) internal procedures for documentation and reporting of planned production changes regarding the Swan labelled washing machine-
 - d) the contact person's procedures for reporting of items b) and c) above to the ecolabelling organisation (external procedures for reporting to the ecolabelling organisation),-
 - e) procedures for documentation, reporting and handling of complaints about the Swan labelled machines,-
 - f) procedures for traceability of the Swan labelled machines in production.

R19 Marketing

Marketing of Swan labelled washing machines must be performed in accordance with "Regulations for Nordic ecolabelling of products".

- ☒ Details of how the marketing of ecolabelled products is organised and who is responsible for what and a certificate that the Head of marketing has knowledge of "Regulations for Nordic Ecolabelling of Products", see appendix 2.

2 Analyses and checks

2.1 Requirements concerning testing institute/analysis laboratory

The testing institute/analysis laboratory must be impartial and competent and fulfil the general requirements in accordance with standard ISO/IEC 17025, or be an accredited analysis laboratory.

2.2 Analysis and test methods

Energy efficiency, water consumption, spin performance and washing performance with a full load using the standard 60°C programme shall be tested in accordance with IEC 60456 Fourth Edition, the final draft due in 2003 (IEC 60456 Third edition 1998 as well as SS-EN 60456 A11, SS-EN 60456 A12: 2001 and SS-EN 60456 A13).

Energy efficiency is also measured as a mean value of four different tests using two programmes: standard 60°C cotton and 40°C, at full load and 2 kg load for each temperature. The manufacturer determines the particular settings for these programmes. Full load is defined as the declared capacity of the machine.

For the alkali test method for rinsing performance, see Appendix 3.

For the zeolite test method for rinsing performance, see Appendix 4.

Noise shall be tested in accordance with EN 60704-2-4 Second Edition and EN 60704-3.

2.3 Follow-up inspections

Follow-up inspections of Swan licenses may be initiated by Nordic Ecolabelling. Such an inspection can be performed in a number of ways. For example, a machine may be chosen at random from a retail outlet and tested by an independent test institution. Nordic Ecolabel pay the costs for such test. If the machine does not comply with the details on which the Swan license is based, the licensee is liable to the costs.

Registration

Where the licence is registered in another participating Nordic country, the following documentation must be submitted to Nordic Ecolabelling in the relevant country:

- application form for registration,
- copy of the licence,
- instructions in the relevant language,
- information on marketing in the relevant country, declared according to appendix 2.

The design of the ecolabel

The ecolabel and the allocated licence number (shown as 000-000) shall have the following design:



”Washing machine”

The ecolabel shall be placed on the packaging and/or the washing machine.

See ”Regulations for Nordic ecolabelling of Products” for more detailed information about the design of the ecolabel.

Validity of the criteria document

This criteria document has been ratified by the Nordic Ecolabelling Board on 18 March 2004 and applies until 17 June 2009.

During the validity period, the Nordic Ecolabelling Board may decide on adjustments, clarifications and/or extensions of the criteria, and a new version will then be issued. This does not normally involve any re-appraisal of licences that have been granted.

One year prior to the expiry date of this criteria document at the latest the Nordic Ecolabelling Board will provide information on future ecolabelling criteria.

Future criteria

The following requirements will be assessed in future criteria:

- Requirement regarding the automatic dosage of detergent.
- Requirement regarding heavy metals used in alloys and surface treatment.
- Requirement regarding flame retardants in plastics and electronic components.
- Requirement regarding provisions to connect the machine directly to a hot water source.

Appendix 1 – Certificate from the washing machine manufacturer

- R5** Are all plastic components that weigh more than 50 grams permanently marked in accordance with ISO 11469? Yes No
- R6** Have cadmium, lead, mercury or their compounds been added to the plastic? Yes No
- R7** Does the plastic contain one of the following flame retardant agents: Polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE) or highly-chlorinated short-chain chlorinated paraffin's with chain length 10-13 carbon atoms and chlorine content > 50% by weight (CAS no 85535-84-8)? Yes No
- R7** Is a list providing the names and CAS numbers of used flame retardants enclosed? Yes No
- R7** Are flame retardants used, which at the time of applying for the ecolabel have been assigned any of the risk phrases, as defined in Council Directive 67/548/EEC as last amended by commission Directive 98/98/EEC: R45 (may cause cancer), R46 (may cause heritable genetic damage), R60 (may impair fertility) and R61 (may cause harm to the unborn child). Yes No
- R8** Is the proportion of recyclable materials in the machine, defined according to the WEEE directive, at least 75% by weight? Yes No

Location and date

Company Name

Signature of the washing machine manufacturer

Clarification of signature

Appendix 2 – Marketing of ecolabelled products for which a licence is sought,

Certificate from the licence applicant

We hereby confirm that we are aware of the rules governing the rules of the Nordic ecolabel as described in "Regulations for Nordic Ecolabelling of Products".

We hereby undertake that the marketing of the product will comply with these regulations.

We hereby confirm that we have knowledge about the requirements in the criteria document for ecolabelling of Washing machines.

We undertake to ensure that the persons marketing the ecolabelled products within our company will receive information on the criteria governing the ecolabelling of Washing machines and "Regulations for Nordic Ecolabelling of Products".

Place/date

Company name

Contact person

Phone

Marketing manager

Phone

In the event of a change of personnel, a new confirmation must be sent to Nordic Ecolabelling.

Appendix3 – Rinsing performance, alkalinity

This method replace chapter 9 Rinsing performance in IEC 60456 Fourth edition, coming final draft 2003. Water hardness shall be adjusted to 0.5 ± 0.2 mmol/l.

General

This clause contains specifications for a test using the residual alkalinity of the detergent solution in a base load after spin extraction as a measure of the rinsing performance.

The purpose is to evaluate how well a typical textile load is rinsed.

Note: The test in this clause may be combined with the cleaning test in Clause 8, the spin extraction test in Clause 10 and the measurements in Clause 11.

Spin extractor

A spin extractor shall be used. It shall have an inner drum diameter between 250 mm and 300 mm and a rotational frequency of about 2 800 r/min. The diameter and spin speed shall be reported.

If other spin extractors are used, it has to be proven that the same spinning efficiency is achieved.

Note: The specification of the spin extractor is under consideration.

Procedure

Initial test procedure

The test is conducted in accordance with Clause 8. At least five complete test cycles shall be carried out using the selected programme. For each test cycle new soiled test strips shall be used. After the completion of the washing programme, the spin extraction and sampling is carried out in accordance with 9.3.2.

Spin extraction and sampling

A water sample of one litre is taken from the washing machine water supply (tap water) in connection with the performance of a rinsing test.

After a complete programme of washing, rinsing and, if possible, spin extraction operations, the test load is removed immediately and only the base load (with any soiled test strips removed) is weighed (noting that the mass of the load is also required for determination of the water extraction index in Clause 10 prior to further spinning in the extractor). If there is no spin extraction operation at the completion of the washing programme, weighing is not necessary.

The base load is transferred, if necessary in two or more similar parts consisting of the same number of sheets, pillowcases and towels if possible, to the spin extractor and spun for 5 min. All the extracted water is collected, the last amount by tilting the spin extractor towards the outlet, and thoroughly mixed. These steps are carried out quickly, without any pause.

The whole base load after the last spin is weighed and reported.

To prepare the spin extractor for subsequent use, the inner and outer tubs are

rinsed with tap water and completely emptied as described above.

Alkalinity measurements

Carry out the following procedure to check the alkalinity of both the sample of water taken from the spin extractor and the sample of tap water.

Weigh in 100g of water (or 50 g, if the extraction amount is small) on a scale. Bubble the sample with nitrogen gas 1 min before titration starts and then during titration (about 100ml/min) Titrate in an automatic programmed titrator-device. The programme should be set to an end point titration and the endpoint is fixed to pH 4,5. Titration speed in the beginning of the programme is set to about 1,5 ml/min and near the end point (~pH4,7) the titration's speed has to be very slow about 25µl/min. Delay at 10 s to be sure that the end point is reached. All samples shall be tested at $23\pm 2^{\circ}\text{C}$, total titration time/sample will then be 6-7 min for the tap water test and longer for the rinse samples. Record the amount of acid used (in ml to two decimal places).

The alkalinity of the water is expressed in milliequivalents per litre.

Evaluation

The increased alkalinity concentration of spin extracted water relative to tap water is calculated as:

$$A_r = W_r - W_t \text{ [milliequivalents per litre]}$$

where

A_r is the increased concentration of alkalinity in extracted water

W_r is the concentration of alkalinity in extracted water

W_t is the concentration of alkalinity in tap water.

The amount of wash alkali remaining in the textiles in milliequivalents per kg of base load is calculated by:

$$A_m = A_r \frac{M_r M}{M}$$

where

A_m is the amount of wash alkali remaining in the textiles;

A_r is the increased concentration of alkalinity in extracted water;

M is the mass of the conditioned base load;

M_r is the mass of base load after spin extraction.

A rinsing index, R , is determined by:

$$R = \frac{A_{m, test}}{A_{m, ref}}$$

where

$A_{m, test}$ is measured in the washing machine under test;

$A_{m, ref}$ is measured in the reference washing machine with the relevant programme as described in Annex A.

Note: It is only possible to determine a value for A_m and R where there is a spin extraction operation at the completion of the selected programme.

The result of the first test cycle after normalizing shall not be used for the assessment of the rinsing efficiency, thus only the last four cycles will be used for the determination of the rinsing efficiency.

The standard deviation is calculated as

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

where

R_k is the rinsing index from one test cycle;

\bar{R} is the mean of rinse indices for all test cycles excluding the result of the first test cycle;

w is the number of test cycles used.

Calculate score by

index < 0,71	score 5
0,71 - 1,20	score 4
1,21 - 1,70	score 3
1,71 - 2,20	score 2
2,20 < index	score 1

Appendix4 – Test Method, Rinsing efficiency - Solid Particles Zeolite

The method describes the measuring of particle residues in laundry after the last rinse in test machines in relation to a reference machine, with good and bad rinse programmes, respectively.

WARNING – This method of analyses may involve risks due to the use of hazardous substances, operations and equipment. It is the responsibility of the user of the method to establish proper routines for health and safety and also control the applicability of valid regulations before using the method.

References	Method for measuring the rinsing efficiency in household washing machines (Lecture held at Wfk Referate Tagung, April 1992, Gunilla Rosén). Kaolin method in accordance with SS 433 01 01, edition 1, 1976. IEC 456, second edition. Water hardness shall however be adjusted to 0.5 ± 0.2 mmol/l.
Material	Rinse-cloths, hemmed and sewed to size 75x75 cm. Weight per rinse-cloth approx. 100 g. Material in accordance with the specification for cotton material in draft59D/221/CDVfor IEC 60456, fourth edition (plain weave) Annex B The material is conditioned free hanging in a room with $65 \pm 5\%$ relative air humidity for at least 15 hours before weighing. The loads shall consist of four different ages and average age of 30-50 cycles see Annex C draft59D/221/CDVfor IEC 60456, fourth edition
Quantity of material	Reference machine 5 kg.FOM 71MP-lab Test machines as specified by the machine supplier.
Rinse machine	Asko RM500, top-loader or equivalent Drum, diameter: 450 mm, depth: 285 mm. Drum volume: 43 l. Revs during wash: 55 rpm rythm 12/3.
Reference machine	See draft 59D/221/CDV for IEC 60456, fourth edition.
Reference programme	See SS 433 01 01, edition 1, 1976, programme White fabrics 60oC F 4 rinses and 2 rinses, respectively. (Differs from the IEC 456 programmes mainly by the water quantity per rinse being 50 l instead of 30 l.)
Programme selection	Test machine 60oC white fabrics programme without prewash.
Detergent	Detergent IEC A*, quantity 24 g/kg material in test machines and reference machines no soil.

Other
Tetra-sodium pyrophosphate ($\text{Na}_4\text{P}_2\text{O}_7 \times 10\text{H}_2\text{O}$) quality puriss
7.5 g portions
Deionized water
Light absorbing equipment wave length 695 nm with a 5 cm cuvette.
Or measuring turbidity at wave length 860nm

Method
The test machines are operated in parallel with the reference machine.
After completed programme including spinning, 2 test samples out of each machine. A test sample consists of 1.5 kg of dry material, normally 14 rinse-cloths.
Each test sample is then rinsed once more in the separate rinse machine. The rinsing shall be carried out in deionized water. The total quantity of water shall be 15 kg including the water remaining in the test sample. One portion (7.5 g) of sodium pyrophosphate is solved in some of the deionized water and added to the rinse water.
The extra rinsing shall last for 4 minutes. (Please observe the necessity of a stop-watch.)
A sample is taken from the rinse water when draining off. This should be done in a similar way and at the same point of time for all the samples.
The sample is filtered through a polyamid cloth for removal of possible textile fibres. The light absorption/turbidity of the rinse water of test machines and reference machines is measured. Three measurements per rinse-test are carried out and the average value per rinse-test is calculated.
The reference programme "4 rinses" represents a very good rinsing result and "2 rinses" represents an acceptable rinsing result
Calculate the index by;
$$\frac{\text{Testmachine light absorption}}{\text{reference 2-rinse light absorption}} = \text{index}$$

Calculate score by;

Index < 0,81	score 5
0,81 - 1,20	score 4
1,21 - 1,70	score 3
1,71 - 2,20	score 2
> 2,20	score 1

At least 6 test cycles shall be carried out and the average value of cycle 2-6 shall be calculated., cycle 1 is referred to as normalizing the load