

SASO 2692

(DRAFT)

**ENERGY LABELLING REQUIREMENTS OF
HOUSEHOLD ELECTRICAL CLOTHES
WASHING MACHINES**

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**ENERGY LABELLING REQUIREMENTS OF
HOUSEHOLD ELECTRICAL CLOTHES
WASHING MACHINES**

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ENERGY LABELLING REQUIREMENTS OF HOUSEHOLD ELECTRICAL CLOTHES WASHING MACHINES

Energy Labeling Requirements

1. SCOPE AND GENERAL

1.1 Scope

This Saudi standard specifies the performance and energy labeling requirements for electric clothes washing machines intended for household and similar use, in order that it may carry a valid energy efficiency label.

In particular, this standard specifies the following:

- (a) Projected annual energy consumption.
- (b) Comparative energy consumption.
- (c) Energy efficiency rating.
- (d) Star rating.
- (e) Some of the requirements for energy label validity.
- (f) Performance criteria for energy labeling approval.
- (g) Test report format and printing requirements for clothes washing machines energy labels.

Note: This standard does not specify safety requirements which is covered by SASO 2025:2002

1.2 Complementary References

1.2.1 SASO standard 2683/2007 concerned with “Clothes washing machines for household use – Methods for measuring the performance”.*

1.2.2 SASO standard 2693/2007 concerned with “clothes washing machines for household use – performance requirements “

1.3 Definitions

For the purposes of this standard, the definitions given in the relevant SASO standard* and those below apply:

1.3.1 Check test – a full or part test in accordance with SASO 2693/2007 to verify the performance and energy consumption of an individual brand and model registered for energy labeling.

* This standard based on IEC 60456:2003.

- 1.3.2 Tested energy consumption (E_t)** – the measured energy consumption of a single unit when tested in accordance with SASO 2693/2007. (Units: kilowatt-hours.)
- 1.3.3 Projected annual energy consumption (PAEC)** – the estimate of energy used by a model or single unit during one year’s use. It assumes a particular number of uses in one year. (See also Clause 2.3.) (Units: kilowatt-hours/year.)
- 1.3.4 Comparative energy consumption (CEC)** – the nominal energy consumption of a model of clothes washing machine. It is based on the PAEC estimated for the model. (See also Clause 2.4.) The CEC appears on the energy label. (Units: kilowatt-hours/year.)
- 1.3.5 Energy efficiency rating (EER)** – an indication of the claimed energy efficiency of a model. A higher EER indicates a higher energy efficiency. It is derived from the CED. (See also Clause 2.6.) The EER appears as a continuous red band on the energy label. (Dimensionless.)
- 1.3.6 Star rating** – the number of stars displayed on the energy label. It is calculated by rounding the EER down to the nearest whole number. (See also Clause 2.7.) (Dimensionless.)
- 1.3.7 Family of models** – a range of models of the one brand, registered under one application, where each of the models on the application has the same relevant physical characteristics, comparative energy consumption, energy efficiency rating and performance characteristics. The term ‘model’ is synonymous with ‘family of models’.
- 1.3.8 Variant** – a product variant is an alternative version of a product or family of products that has the same specifications and the same model number or other form of designation as another registered version of the product except that it has a different average PAEC ($PAEC_{av}$). (See also Clause 2.4.2.)
- 1.4 MEASURED QUANTITIES** Quantities used in conjunction with this standard shall be measured in accordance with the standard mentioned in 1.2.1.

2. MEPS AND CALCULATIONS FOR THE ENERGY LABEL

- 2.1 GENERAL** This Section sets out the equations and procedures for calculating values of the CEC, EER and the star rating, which appear on an energy label and in the application for registration of an appliance for energy labeling.

The process consists of measuring the tested energy consumption (E_t) of each unit tested, then calculating the projected annual energy consumption (PAEC) of the unit. The values of PAEC for the units tested for registration are used to calculate the comparative energy consumption (CEC) for the model. The CEC, the spin performance and the rated capacity are then used to calculate the energy efficiency rating (EER) and the star rating.

Note: For a complete example of calculations carried out on a typical set of test results, refer to Appendix A.

2.2 Number of tests and processing of data

2.2.1 Number of units required For the purpose of determining the CEC of a model for registration, three separate units of the nominated model shall be tested for energy consumption in accordance with the standard mentioned in 1.2.1. At the supplier's discretion, more than three units may be tested.

2.2.2 Number of tests per unit Each unit shall be subjected to at least one test run to obtain a valid value for each of E_t and WEI for that unit. This determination shall be documented in a test report containing the test results. (Refer to Appendices D, E and L of the standard mentioned in 1.2.1.

2.2.3 Results from multiple test runs Where more than one test run is performed on a unit, the value of E_t and WEI shall be recorded for each run. For subsequent calculations, the values of E_t and WEI shall be averaged and treated as the result for that unit.

2.2.4 Results from more than one unit After testing three or more separate units in accordance with Clause 2.2.1, the separate values of PAEC and WEI shall be averaged and referred to as $PAEC_{av}$ and WEI_{av} respectively. These values shall not be rounded.

2.3 Projected Annual Energy Consumption (PAEC) The PAEC of a single clothes washing machine shall be given by the following equation:

$$PAEC = E_t \times 365 \text{ (kWh/y)}$$

where:

E_t = tested energy consumption expressed in kilowatt-hours as per the standard mentioned in 1.2.1, rounded to the nearest 0.001 kWh, when tested under the following conditions:

- (a) On the program nominated by the manufacturer in accordance with Clause 5.4 of the standard mentioned in 1.2.1 except that, if that program results in a test wash water temperature of less than 35°C, alternative settings as necessary shall be used to achieve a maximum warm wash temperature (i.e. minimum 35°C).
- (b) At the rated load capacity of the clothes washer for a cotton load.

The value of PAEC yielded by this calculation shall not be rounded.

2.4 Comparative Energy Consumption (CEC)

2.4.1 General The CEC for a model is the average of the PAEC values (i.e. $PAEC_{av}$) for the three (or more) units which are tested for its registration application (refer to Clause 2.2). The CEC shall be rounded to the nearest whole kilowatt-hour/year.

2.4.2 Variant Where there are a number of variants of a single model with different values of $PAEC_{av}$, each variant may be registered and an applicant for registration may, with the written approval of the registering authority, use the highest of these values of $PAEC_{av}$ as the CEC on the labels of any of the registered variants of that model.

2.5 Energy Equivalent of Residual Moisture (E_m) The energy equivalent of moisture remaining in the clothes at the end of the program shall be calculated as follows:

$$E_m = \frac{0.21 \times WEI_{av} \times RLC}{1.08}$$

where:

0.21 = an empirical factor used to account for energy used in clothes dryers

WEI_{av} = the average water extraction index determined from the standard mentioned in 1.2.1 for the three or more machines tested for energy labeling

RLC = the rated load capacity claimed by the manufacturer for a normally soiled cotton load

1.08 = the nominal moisture content of a cotton load.

2.6 Energy Efficiency Rating (EER) The EER shall be calculated by the following equation and rounded to the nearest 0.1:

$$EER = 6.9 - \left[6.9 \times \frac{1.08}{RLC} \left(\frac{CEC}{365} + E_m \right) \right]$$

Note: EER is dimensionless.

2.7 MEPS The Minimum Energy Performance Standard (MEPS) value for washing machines in the scope of this standard shall be greater than or equal to an EER value of 4.0.

2.8 Star Rating The star rating shall be in accordance with Table 2.3.

Table 2.3
Derivation Of Star Rating

| Energy efficiency rating | Star rating |
|--------------------------|-------------|
| < 2.0 | 1 |
| 2.0 to 2.9 | 2 |
| 3.0 to 3.9 | 3 |
| 4.0 to 4.9 | 4 |
| 5.0 to 5.9 | 5 |
| ≥ 6.0 | 6 |

Note: The star rating has to be applied starting with an EER of 4.0 and above only.

2.9 Energy Label Validity: The CEC value shall be accepted as valid if, when a single sample of a registered model is tested for an initial screening test, its PAEC is such that —

$$PAEC \leq 1.1 \times CEC$$

If this is not the case, the CEC shall be accepted as valid if three additional units are tested and the average PAEC of these additional units is such that —

$$PAEC \leq 1.1 \times CEC$$

3. PERFORMANCE CRITERIA

3.1 General: The performance criteria set out in Clauses 3.2 to 3.4 shall be met by each individual unit tested, for the clothes washing machine model to comply with energy labeling requirements.

3.2 Soil Removal and Standard Deviation: The appliance shall meet the requirements for soil removal set out in Clause 4.3 of the standard mentioned in 1.2.1.

3.3 Water extraction index: The appliance shall meet the requirements for water extraction index set out in Clause 4.5 of the standard mentioned in 1.2.1.

3.4 Severity of washing index: The appliance shall meet the requirements for severity of washing index set out in Clause 4.6 of the standard mentioned in 1.2.1.

4. APPLICATION AND TEST RESULT FORMATS

4.1 Application for registration

Registration An application for registration, in the format shown in Appendix C of this Standard, shall be submitted to the relevant SASO authority for energy labeling approval of the clothes washing machine brand and model, or type.

4.2 Test results recording sheets

4.2.1 Report format

The test report format (as applicable) in the form set out in the standard mentioned in 1.2.1 should be completed for each clothes washing machine unit tested and sent with each application for energy labeling registration.

5. PRINTING AND PLACEMENT OF ENERGY LABELS

5.1 Placement: The energy label shall be fixed on the front of the clothes washing machine and on any display front for the clothes washing machine or, where the latter is not possible, in another visible position.

The label shall be attached so that it is not obscured when the unit is displayed.

5.2 Material and shape: The label shall be self-adhesive and cut to one of the outlines shown in Figure 5.1.

If there is no suitable, smooth location on the front of the clothes washing machine for an adhesive label, the label may be printed and attached as a swing tag. In this case the material shall be suitably durable and rigid. Methods of attachment should not disfigure the artwork of the label.

5.3 Colours: The label shall be printed in three colours, on a white background as illustrated in Figure 5.2:

5.4 Colours of elements: The element (a) in Figure 5.1 shall be printed in Green (see also Figure 5.2).

The elements (a), (b₁), (b₂) and (c) shall be printed as shown in Figure 5.1 (see also Figure 5.2).

Note: For general information regarding printing of the label, refer to Appendix B.

5.5 Sample label: An example of a printed energy label for a clothes washing machine is shown in Figure 5.2.

(Under design , will be added in the next stage.)

LEGEND:

- a* = this band is cut off according to the appliance's energy efficiency rating (EER). Note that whole stars appear only when the continuous band of colour reaches the next number.
- b*₁, *b*₂ = the panels contain the comparative energy consumption (CEC). The figures that apply to the manufacturer's recommended program for the particular appliance shall be of the font and size indicated and centred in the panel. The spacing between the figures of a three-figure number shall be the same as that for a four-figure number.
- c* = the panel contains the wording "Energy Efficiency Label".
the fonts to be used on the label shall be all capitals for lettering as indicated in Fig. 5.2.
- = the dotted lines indicate the die cut shape of the label.

FIGURE 5.1
DETAILS OF LABEL COLOURS



FIGURE 5.2
EXAMPLE OF LABEL

Note:

- 1) Brand, model, load capacity and the test program names are to be provided.

- 2) The values mentioned of the power consumption per year and the cost of power consumption are only used as an example.

- 5.6 LABEL QUERIES** Queries regarding the printing of labels should be directed to the relevant SASO authority.

APPENDIX A
EXAMPLE OF ENERGY EFFICIENCY CALCULATIONS
(informative)

This Appendix sets out a typical set of test results. It demonstrates the application of the appropriate procedures required to calculate the tested energy performance for each unit and checks for compliance with the standard mentioned in 1.2.1. The CEC, EER and star rating are also calculated.

Example

This example sets out the energy label calculations required for a hypothetical clothes washer registration.

A 6.5 kg load capacity clothes washer has been tested in order to prepare an energy labeling application. The model has connections for both hot and cold water, so the machine has been tested with dual water connection. Test data for the model are as follows:

| Unit | Soil removal | Standard deviation | Soil removal –2 x SD | Water extraction index | Severity of washing index |
|------|--------------|--------------------|-------------------------|------------------------|---------------------------|
| 1 | 82.1 % | 4.1 % | 73.9 % | 0.845 | 0.16 |
| 2 | 82.3 % | 4.3 % | 73.7 % | 0.851 | 0.15 |
| 3 | 81.8 % | 3.8 % | 74.2 % | 0.839 | 0.16 |

The soil removal is to be assessed against the performance criteria set out in Clause 3.2. The soil removal for each unit is greater than 80% and the soil removal minus twice the standard deviation for each unit is greater than 72% so the model meets this requirement.

The water extraction index for each of the units is to be assessed against the performance criteria set out in Clause 3.3. The water extraction index is less than 1.1 for each unit so the model meets this requirement.

The severity of washing index for each of the units is to be assessed against the performance criteria set out in Clause 3.4. The severity of washing is less than 0.3 for each unit so the model meets this requirement.

The PAEC for each unit is determined using Equation 2(1). (PAEC is the tested energy consumption $E_t \times 365$.) The results of these calculations are summarized as follows:

| Unit | Tested energy consumption | PAEC | Water extraction index |
|---------|---------------------------|----------|------------------------|
| 1 | 1.935 | 706.275 | 0.845 |
| 2 | 1.909 | 696.785 | 0.851 |
| 3 | 1.906 | 695.69 | 0.839 |
| Average | | 699.5833 | 0.845 |

Note that the values for PAEC are not rounded. The CEC is determined from the average of the 3 PAEC values when rounded to the nearest whole kilowatt-hour/year. In this case the CEC is 700 kWh/year.

To determine the energy equivalent of residual moisture (E_m). It is first necessary to calculate the average water extraction index from the data for the three test units. This is 0.845 for these units.

The calculation of E_m is given in Equation 2(2), as follows:

$$\begin{aligned}
 E_m &= 0.21 \times WEI_{av} \times \frac{RLC}{1.08} \\
 &= 0.21 \times 0.845 \times \frac{6.5}{1.08} \\
 &= 1.067986
 \end{aligned}$$

The energy efficiency rating is determined using Equation 2(3), i.e.

$$\begin{aligned}
 EER &= 6.9 - \left[6.9 \times \frac{1.08}{RLC} \times \left(\frac{CEC}{365} + E_m \right) \right] \\
 &= 6.9 - \left[6.9 \times \frac{1.08}{6.5} \times \left(\frac{700}{365} + 1.067986 \right) \right] \\
 &= 3.476902 \\
 &= 3.5 \text{ when rounded to one decimal place.}
 \end{aligned}$$

The star rating is determined from Table 2.3. In this case the star rating is 3.

APPENDIX B
ENERGY LABEL DIMENSIONS
(informative)

Most of the dimensional information required to create a valid energy label is given in Figure B1.

(Under design , will be added in the next stage.)

Dimensions in millimetres

FIGURE B1
ENERGY LABEL DIMENSIONS

APPENDIX C
FORMAT OF APPLICATION FOR REGISTRATION OF ELECTRICAL
APPLIANCE FOR ENERGY EFFICIENCY
(normative)

This Appendix sets out the format for an application for registration.

**APPLICATION FOR REGISTRATION OF
ELECTRICAL APPLIANCE FOR ENERGY EFFICIENCY**

(Please type or print)

SECTION 1 APPLICATION DETAILS

I hereby apply for registration of an electrical appliance/s for the purpose of energy labeling.

In the Country of.....
(specify the country in which this application is made)

SECTION 2 APPLICANT DETAILS

Name of applicant:

Name of company:

Business address:

P.O. Box:..... Post Code:

Contact Person: *(A name, address and place of business in each country of sale)*

Position/Title:

Telephone.:..... Facsimile:

SECTION 3 DESCRIPTION OF APPLIANCE

Appliance type:

Definition:

(Single unit or family of domestic appliances)

Brand name:

Model name/s:.....

Model number/s:

Year model/s first manufactured/imported:

Does this model or family replace or supplement another model or family with identical energy consumption and energy efficiency rating? No Yes

If yes, which model/s?

Model numbers to appear on the label:

SECTION 4 TESTING AND TEST REPORT

Were tests conducted at the applicant’s own facilities? No Yes

Name and address of the laboratory where tests were conducted:
.....
.....

Is a set of test reports in accordance with the standard mentioned in 1.2.1 attached? No Yes

If no, why no?

If no test report attached, indicate source registration (registration number and model number):

Has this model or family been tested for energy consumption in accordance
With the standard mentioned in 1.2.1? No Yes

SECTION 5 DETAILS OF APPLIANCES SUBMITTED FOR AN ENERGY LABELLING APPLICATION

Test program and program settings:.....

Brand, model:.....

Rated Voltage (V):.....

Rated Frequency (Hz):.....

Rated capacity (kg):

Type (drum or other than drum):

If other than drum type, give details:

Loading (top, front):.....

Full load yearly water consumption, (365 times a year) (litters):.....

Summary table for models submitted for registration:

| Serial number | Program duration min | Cold water volume (Q_L) Litre | Hot water volume (Q_L) Litre | Total water volume ($Q_{tot\ pr}$) Litre | $E_{c\ pr}$ kWh | $E_{h\ pr}$ kWh | $E_{e\ pr}$ kWh | E_t kWh | PAEC kWh | WEI |
|----------------|-------------------------|---|--|--|--------------------|--------------------|--------------------|--------------|-------------|-----|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Average values | | | | | | | | | | |

CEC:.....

WEI_{av}:

E_m : [refer to Equation 2(2) in Clause 2.5]:

EER: [see Equation 2(3) in Clause 2.6]:

Star rating (see Clause 2.7):

Does the model comply with the requirements of Clause 3.2 for soil removal and Standard deviation? No Yes

Does the model comply with the requirements of Clause 3.3 for water extraction? No Yes

Does the model comply with the requirements of Clause 3.4 for severity washing? No Yes

DECLARATION

I declare that the details stated above are correct.

Signature of Applicant: Date

Office use only

Date received: Registration number: