

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology
(ESMA)



إعداد)
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الجزء 2: غسالات الملابس و المجففات

*Labeling – Energy efficiency label for electrical appliances
Part 2: Washing Machines and Dryers*

الإمارات العربية المتحدة
UNITED ARAB EMIRATES

**The UAE Energy Efficiency Labeling Standard
For Washing Machines and Dryers**

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INTRODUCTION

With the UAEs commitment to consumer safety and environment protection, this regulation is developed to ensure that products are monitored and registered for their continuous compliance to the set specifications.

Electrical Safety

The requirements set are based on accepted international specifications. These requirements are aligned with what other countries are implementing in order for the manufacturer to easily comply with the star rating of lamps and luminaires.

Performance : Energy Efficiency

In order to identify the energy efficient products, a star rating is introduced in this regulation.

1. Scope

This UAE regulation deals with methods for measuring the energy and water consumption of clothes washing machines for household use, with or without heating devices and for cold and/or hot water supply. It also deals with appliances for water extraction by centrifugal force and is applicable to appliances for both washing and drying textiles (called washer-dryers). and applicable to household electric tumble dryers of the automatic and non-automatic type, with or without a cold water supply and incorporating a heating device. The object is to state and define the principal performance characteristics and to describe the standard methods for measuring these characteristics.

NOTE 1 This standard applies also to washing machines for communal use in blocks of flats or in launderettes up to 20 Kg capacity, but washing machines for commercial laundries is not included.

A test report required to be submitted to ESMA shall contain the results of these tests:

- 1- Energy consumption;
- 2- Water consumption;
- 3- Spin extraction performance for washing machine.
- 4- The Condensation efficiency for condenser dryers
- 5- Off mode power

2. Definition of Terms

For the purpose of this document, the following terms and definitions apply.

- 2.1. ESMA – Emirates Authority for Standardization & Metrology, also known as the Regulating Body, is the UAE's national standards body mandated to implement this regulation.
- 2.2. Conformity Assessment Body – a competent body recognized by ESMA to carry out testing and/or evaluation of products.
- 2.3. Washing machine : appliance for cleaning and rinsing of textiles using water which may also have a means of extracting excess water from the textiles
- 2.4. Agitator washing machine: washing machine in which the textiles are substantially immersed in the washing water, the mechanical action being produced by a device moving about or along its vertical axis with a reciprocating motion (an agitator). This device usually extends above the maximum water level
- 2.5. Horizontal drum washing machine : washing machine in which the textiles are placed in a horizontal or inclined 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
- 2.6. Impeller washing machine : washing machine in which the textiles are substantially immersed in the washing water, the mechanical action being produced by a device rotating about its axis continuously or which reverses after a number of revolutions (an impeller). The uppermost point of this device is substantially below the minimum water level

- 2.7. Twin tub type :
- 2.8. Washer-dryer : washing machine which includes both a water extraction (spin) function and also a means for drying the textiles, usually by heating and tumbling
- 2.9. Spin extractor : water-extracting appliance in which water is removed from textiles by centrifugal action
- 2.10. Spin extraction: water-extracting function by which water is removed from textiles by centrifugal action. This is usually included as a function of a washing machine but may also be performed in a spin extractor
- 2.11. Tumble dryer : appliance in which textiles are dried by tumbling in a rotating drum, through which air is passed
- 2.12. Air vented tumble dryer : tumble dryer that draws in fresh air which is passed over the textiles and where the resulting moist air is exhausted into the room or vented outside
- 2.13. Condenser tumble dryer : tumble dryer which includes a device for removing moisture from the air used for the drying process
- 2.14. Automatic tumble dryer : tumble dryer which switches off the drying process when a certain moisture content of the load is reached
- Note: This may include systems that use conductivity or temperature sensing
- 2.15. Non-automatic tumble dryer : tumble dryer which does not switch off the drying process when a certain moisture content of the load is reached, usually controlled by a timer, but may also be controlled manually
- 2.16. Off-mode : means a condition where unit is switched off using appliance controls or switches accessible to and intended for operation by the end-user during normal use to attain the lowest power consumption that may persist for an indefinite time while the unit is connected to a power source and used in accordance with the supplier's instructions; where there is no control or switch accessible to the end-user, 'off-mode' means the condition reached after the unit reverts to a steady-state power consumption on its own;
- 2.17. Base load : textile load without soiled test strips
- 2.18. test load : base load plus soiled test strips or wool shrinkage specimens
- 2.19. programme : series of operations which are pre-defined within the washing machine and which are declared as suitable for washing certain textile types
- 2.20. cycle : complete washing process, as defined by the programme selected, consisting of a series of different operations (wash, rinse, spin, etc.)
- 2.21. rated capacity : maximum mass in kg of dry textiles of a particular defined type, declared by the manufacturer that can be treated in a programme

- 2.22. rated voltage : means the voltage shown on the nameplate of the equipment.
- 2.23. Volume of a drum type washing machine or spin extractor : means the inside volume, in liters, of the drum in which the textiles are placed, after subtraction of ribs of other inward forms, etc
- 2.24. Volume of an agitator or impeller-type washing machine : means the inside volume, in liters, of the tub available for the movement of the textiles up to the nominal water level as determined by the machine controls or the manufacturer instructions

For other definitions and technical terms, details mentioned in specific UAE standards .

3. Product Requirements

3.1. Electrical Safety Requirements

In addition to the energy efficiency performance requirements, all washing machines and driers shall comply with ECAS (Safety) Regulation and the safety standards specified under the Regulation,

3.2. Performance: Energy Efficiency Requirements

3.2.1. Specific products (washing machines, washer- driers and driers) shall comply with the requirements mentioned in this regulation.

3.3. UAE National Deviations

3.3.1. Voltage and Frequency Ratings

Table 1

VOLTAGE RATING	FREQUENCY RATING
230V	50HZ

3.3.2. Plug Requirements

Appliance, equipment or part of included under this regulation, if supplied with an electrical plug, shall supply an electrical plug of BS 1363 type design and complies with the IEC 60884-1 technical specifications.

3.3.2.1. For Class I Electrical Appliances

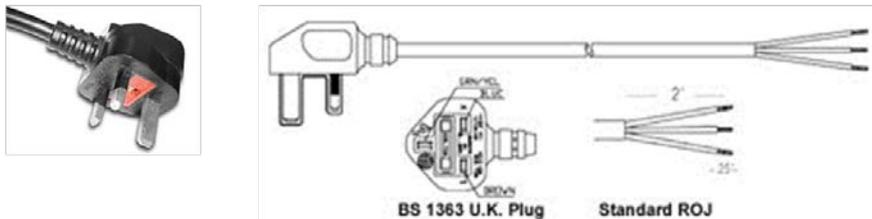


Figure 1

3.3.3. Arabic Instruction Manual and Markings

Instruction manuals and energy efficiency labels supplied with products should include the Arabic language. Cautionary and/or any safety warnings for the direct user or consumer should be in Arabic language. Products shall not contain any material or descriptive images or definitions which may be regarded offensive to the Islamic religion.

4. rated capacity

The manufacturer shall declare the rated capacity at 0,5 kg intervals for each relevant textile type. Relevant textile types are cotton and synthetic/blends.

The rated capacity for any textile type shall not exceed the maximum mass of dry laundry, in kilograms, to be used in the appliance in accordance IEC 60335-2-11:2008.

maximum load capacity

The maximum capacity of a washing machine or dryer declared by the manufacturer is limited by the drum volume.

Determination of the washing machine drum volume or dryer and maximum capacity is done pursuant to the specifications of this standard.

The maximum capacity of the washing machine declared by the manufacturer must be equal to the capacity declared in kg, in accordance with the safety regulations for electrical household appliances of IEC 60335-2-7, section

If the rated capacity is not declared by the manufacturer, the rated capacity shall be deduced from the clothes container volume as described in IEC60456 /2010 for washing machine and washer driers and IEC61121/2012 for tumble driers

Where the manufacturer gives a range of values for the rated capacity for a particular textile type, the maximum value shall be used.

5. Test conditions and Standards

1 .Test conditions

- In carrying out the tests as specified above, the washing machine shall be tested at a voltage of $240\text{ V} \pm 2\%$ and a frequency of $50\text{ Hz} \pm 1\%$.

Moreover, the following test conditions shall be followed.

the 60 °C cotton programme shall be used without pre-wash in accordance with the manufacturer's instruction, if it's not there the manufacturer can declare it . And the cold water temperature should be 30 °C

In cases of washing machines without any programmes, the recommended times for

Washing, rinsing, and spin extracting operations shall be in accordance with the manufacturer's instructions for the rated washing capacity to be tested.

2- Test Methodology and Standard

The tests specified in this regulation are required to be carried out, in accordance with IEC to find out the energy efficiency and performance characteristics of a washing machine and drier.

The tests are required to be carried out, in accordance with

- IEC 60456/ 2010 "Clothes washing machines for household use – Methods for measuring the Performance "
- IEC 61121/2012 "electrical tumble dryers for household use "

6. Measurements :

.1 Measurement of Energy Consumption

The methodology for measuring energy consumption (kWh) shall be based on IEC 60456/2010, and IEC 61121/ 2012 .

This measured energy consumption (E) shall be shown on the energy label after it is calculated to annual energy consumption based on 260 washes / year operation. And 160 dryers/year

In cases of washing machines combined with built-in dryers for drying textiles by means of heating, the energy consumption (E) of the washing machine and the drying function shall be measured

.2 Measurement of Water Consumption

The water consumption (liters/cycle) shall be measured during the energy consumption test in accordance with IEC 60456/ 2010 .

The water consumption **shall not be more than** the value from the following formulas:

For drum types : $WC \leq 5 \times C / 2 + 35$ Liters

For top loading types : $WC \leq 20 \times C / 2 + 35$ Liters

.3 Measurement of Spin Extraction Performance

The spin extraction performance shall be measured and evaluated during the test period in accordance with IEC 60456, and IEC 61121

.4 Measurement of Off mode power

7. Energy efficiency classes and spin-drying efficiency classes for washing machine

1. ENERGY EFFICIENCY CLASSES

The energy efficiency class of a household washing machine shall be determined in accordance with its Energy Efficiency ratio (EER) as set out in Table 1 and Table 2.

The Energy Efficiency ratio (EER) of a household washing machine shall be determined in accordance with IEC 60456 / 2010 and calculate as :

$$EER = E / CR$$

E: average of energy consumption for two units for average of three cycles for each unit.

$$E = (W_{total\ 1} + W_{total\ 2}) / 2$$

Wtotal (Wtotal is the average of the 3 cycles) : is the energy consumed over a programme, it's the sum of the electrical energy plus any cold water correction plus the energy embodied in any hot water. Its calculate according IEC60456/2010 based on (30o c) for cold water.

CR: rated capacity for the unit.

Table 1: Energy efficiency classes for drum type washing machine

Energy Efficiency Class	Energy Efficiency ratio Wh / Kg
5 Star (most efficient)	EER < 45
4 Star	45 ≤ EER < 55
3 Star	55 ≤ EER < 65
2 Star	65 ≤ EER < 75
1 Star	75 ≤ EER < 85

Table 2: Energy efficiency classes for other (top load and twin tub type) washing machine

Energy Efficiency Class	Energy Efficiency ratio Wh / Kg
5 Star (most efficient)	EER < 45
4 Star	13 ≤ EER < 15
3 Star	15 ≤ EER < 17
2 Star	17 ≤ EER < 19
1 Star	19 ≤ EER < 22

2. SPIN-DRYING EFFICIENCY CLASSES

The spin-drying efficiency class of a household washing machine shall be determined in accordance with the remaining moisture content (RMC) as set out in Table 3. Accordance with IEC 60456 /2010:

Table 3: Spin-drying efficiency classes

Spin-drying efficiency class	Remaining Moisture Content (%)
5 Star (most efficient)	$RMC < 50$
4 Star	$50 \leq RMC < 60$
3 Star	$60 \leq RMC < 70$
2 Star	$70 \leq RMC < 80$
1 Star	$80 \leq RMC < 90$

Note: The payment for a label fee will be based on the lower grad from the energy grad or spin-drying grad.

8. Energy labelling of household combined washer-driers

1. The energy efficiency class of an appliance shall be determined in accordance with

Number of stars	Energy efficiency Ratio in Wh per kg of load complete operating (washing, spinning and drying) cycle using declared program.
5	$EER < 700$
4	$700 \leq EER < 850$
3	$850 \leq EER < 1000$
2	$1000 \leq EER < 1150$
1	$1150 \leq EER < 1300$

Determination of the water and energy consumption for washer-driers

General

This clause specifies the procedure and evaluation for the determination of water and energy consumption during washing, spin extraction and drying. It also specifies the method for the determination of the duration of these cycles and of the complete operating cycle.

1- Washing cycle

The measurement shall be carried out in accordance of IEC 60456/ 2010 for two units for average of three cycles for each unit.

2- Drying cycle

General

The mass of the conditioned base load is recorded as W_0 . The number of valid drying cycles shall be three.

Procedure

- a) A washing cycle shall be performed according to .1.
- b) Immediately when the washing cycle is finished the strips are removed from the test load and the initial mass of the base load is recorded in kg as W_i . The actual initial moisture content is calculated as:

$$\mu I = \frac{W_i - W_0}{W_0} \times 100$$

where

- μI is the actual initial moisture content,
 W_i is the actual initial mass of the base load after the washing cycle,
 W_0 is the mass of the conditioned base load.

- c) The base load W_i shall be dried under the conditions specified below (dry cotton) to nominal final moisture content $\mu_{fo} = 0\%$, allowable range for μ_{fo} : -3% to $+3\%$.
 - 1) The base load shall be divided according to the instruction of the manufacturer. If no instruction is given and the rated drying capacity is lower than the rated washing capacity, the base load is divided in nearly equal partial loads each part not being above the rated drying capacity. The division of the base load shall be according to IEC 60456 / 2010 .
 - 2) Within 5 min after finishing the washing cycle the drying of the first partial load has to be started. The other partial load(s) shall be kept in (a) closed plastic bag(s).
For washer-dryers with automatic drying the programme under test is selected and the washer dryer is started. For washer-dryers without automatic drying the timer is set to obtain the final moisture given above under c). The time required for this is determined by monitoring the drying process. This can be done by either having the washer dryer placed on a platform scale or by pre-testing.
 - 3) When the programme has terminated and the washer-dryer has stopped, the partial load is then removed within 5 min and immediately weighed. This weight is recorded as W_{fp1} .
 - 4) Within 5 min after finishing the drying of the first partial load the drying of the second partial load shall be started. Immediately after drying its weight is recorded as W_{fp2} .
 - 5) The remaining partial load(s), if any, shall be dried as described in 4), the weight recorded as W_{fp3} , etc.
 - d) After drying of all partial loads the following measurements shall be carried out:
 - 1) Drying time
The drying time in min is the sum of the drying times of all partial loads including the cool down period(s) measured during the tests according to 9.4.3.2 c). If the washer-dryer has no cool down period, it shall be reported.
The drying time does not include the 5 min preparation time as specified in item 2) and item 4) of 9.4.3.2 c).
 - 2) Energy consumption of the drying cycle
The energy consumption is the sum of the energy consumption of the partial loads measured during the tests according to 9.4.3.2 c) and reported in kWh.
 - 3) Water consumption of the drying cycle
The water consumption, if any, is the sum of the water consumption of the partial loads measured during the tests according to 9.4.3.2 c) and reported in litres [l].
 - 4) Calculation of the mass of the base load
The mass of the base load after drying, the final mass W_f , is calculated according to the following formula:

$$W_f = \sum_1^n W_{fpn}$$

where

W_f is the final mass of the base load in kg after drying,
 W_{fpn} are the mass of the partial loads 1 to n in kg after drying.

5) The final moisture content

The moisture content μ_f is calculated as follows:

$$\mu_f = \frac{W_f - W_0}{W_0} \times 100$$

i) Washer-dryer without automatic drying:

If μ_f , calculated according to formula, is within the allowable range as specified above under c), the test cycle is valid and the values are corrected as described under 9.4.3.3.

If μ_f is not within the limits, the data shall not be used for evaluation. Such a test cycle can be considered to be a trial or pre-testing cycle.

When the washer-dryer does not reach the required moisture content after its maximum drying time the fact is reported and the test is stopped.

ii) Washer-dryer with automatic drying:

When the final moisture content μ_f of a drying cycle is below the upper limit of the allowable range given above under c) the drying cycle is valid and the values are corrected as described.

When the final moisture content μ_f is above the upper limit of the allowable range the drying cycle is not valid and has to be retested using a program which has the next lower final moisture content (e.g. use "extra dry" instead of "dry cotton"). This shall be stated in the report.

If there is no program available which gives a lower final moisture content the fact is reported and the test is stopped.

When the final moisture content μ_f is below the lower limit of the allowable range given above under c) the values are not corrected.

Evaluation

Drying time

The drying time is corrected by the following formula:

$$t_D = t_m \frac{(\mu_i - \mu_{f0})}{(\mu_i - \mu_f)} \times \frac{W}{W_0}$$

where

t_D is the corrected drying time in min,
 t_m is the measured drying time in min,
 μ_{f0} is the nominal final moisture content without tolerances,
 μ_f is the final moisture content calculated according to formula
 W is the rated washing capacity in kg,
 W_0 is the mass of the conditioned base load in kg.

Energy consumption

The energy consumption is corrected by the following formula:

$$E_D = E_m \frac{(\mu_i - \mu_{f0})}{(\mu_i - \mu_f)} \times \frac{W}{W_0}$$

where

E_D is the corrected energy consumption for the drying cycle in kWh,
 E_m is the measured energy consumption in kWh.

Water consumption

The water consumption is corrected by the following formula:

$$L_D = L_m \frac{(\mu_i - \mu_{f0})}{(\mu_i - \mu_f)} \times \frac{W}{W_0}$$

where

L_D is the corrected water consumption for the drying cycle in litres [l],

L_m is the measured water consumption in litres [l].

Complete operation cycle

The water and energy consumption and programme time of the complete operation cycle are the sums of the results of the washing cycle and of the drying cycle

9. Energy labelling of household electric tumble driers

1. CALCULATION OF THE ENERGY EFFICIENCY Ratio

For the calculation of the Energy Efficiency Ratio (EER) of a household tumble drier model, the weighted Annual Energy Consumption of a household tumble drier for declare programme at full load is divided by the rated capacity .

(a) The Energy Efficiency Ratio (EER) is calculated as follows and rounded to one decimal place:

$$EER = E_t / C$$

where:

E_t = weighted energy consumption, in Wh and rounded to two decimal places. Its average of energy consumption for two units for average of three cycles for each unit.

C is the rated capacity of the household tumble drier for the standard cotton programme

The Annual Energy Consumption calculated as :

$$E = E_t \times 160$$

E = weighted Annual Energy Consumption of the household tumble drier .

160 = total number of drying cycles per year.

2 - Condensation efficiency

The condensation efficiency of a programme is the ratio between the mass of moisture condensed and collected in the container of a condenser household tumble drier and the mass of moisture removed from the load by the programme, the latter being the difference between the mass of the wet test load before drying and the mass of the test load after drying

Condensation efficiency C_e is calculated for all valid **test runs** and expressed as a Percentage:

$$C_e = W / (W_i - W_f) \times 100$$

Where:

W is the mass of water collected in the condenser reservoir during **test run**;

W_i is the mass of the **test load** used after wetting but before drying;

W_f is the mass of the **test load** after drying.

The average condensation efficiency C_e is calculated from the condensation efficiencies of at least five valid **test runs** and expressed as a percentage.

3 - Energy Efficiency ratio class (EER) of household electric tumble driers

The energy efficiency class of an appliance shall be defined in accordance with the following table :

Number of stars	Energy efficiency Ratio in Wh/cycle per kg of load
5	$EER < 250$
4	$250 \leq EER < 375$
3	$375 \leq EER < 500$
2	$500 \leq EER < 625$
1	$625 \leq EER < 750$

The Condensation efficiency C_e shall be defined in accordance with the following table

Number of stars	weighted condensation efficiency
5	$C_e > 90$
4	$75 < C_e \leq 90$
3	$60 < C_e \leq 75$
2	$45 < C_e \leq 60$
1	$C_e \leq 45$

10 - Energy labeling requirements :

1-Label Location

- The labels should be self-adhesive to the appliance at a prominent location. The client should ensure that the energy label appears on every registered appliance on display or sale and should be easily visible.

2- Color Scheme & Dimensions

- The energy labels should be printed on white-colored self-adhesive sheet material and should have color schemes and dimensions according ESMA requirements. It should be printed in English and in Arabic.

3-following information shall be included in the label:

- Supplier's trade mark;
- Supplier's model identifier
- The energy efficiency class
- Annual Energy Consumption in kWh per year, rounded up to the nearest integer
- Annual Water Consumption in liters per year for washing machine and wisher- driers, rounded up to the nearest integer
- The Condensation efficiency for condenser dryers, rounded up to the nearest integer.
- The spin-drying efficiency class for a household washing machine
- Rated capacity, in kg, for the declare programme at full load,

11 - surveillance and market monitoring :

- A test report on one sample of the model shall be submitted. However, if the test results of one sample indicate that any of the measured (energy consumption, water consumption , Condensation efficiency, spin-drying efficiency) is greater than the rated value by more than 10%, the test report shall include the tests of two samples of the same model. In such case, for each individual sample all the measured values shall not be greater than the rated values by more than 10 %. Also, the information on the energy label shall be based on the test results of the tested sample with a higher values .