

الهيئة العامة للصناعة

PUBLIC AUTHORITY FOR INDUSTRY (PAI)

KWS -----: 2022

نشافات الملابس الكهربائية - متطلبات أداء الطاقة والبطاقات
Electrical Clothes Dryers -

Energy Performance Requirements and Labeling

FOREWARD

The Standard and Metrology Department represents the National Standardization Body in the State of Kuwait, and it is a founding member of the GCC Standardization Organization, which is a regional body that its membership includes the national standardization bodies of the member states.

One of the department's tasks is to prepare Kuwaiti standards and technical regulations by specialized technical committees.

The technical sub-committee for Energy Efficiency of Refrigeration Devices, Washing Machines and Dryers emanating from the National Committee for the Electrical and Electronic Standards Sector has prepared this Kuwaiti technical regulation within the work program of the National Committee for the Electrical and Electronic Standards Sector, in accordance with the ministerial decision issued in this regard.

This technical regulation "Electrical Clothes Dryers - Energy Performance Requirements and Labeling" was based on Saudi technical regulation SASO 2883.

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1. Scope

This Standard specifies the performance and energy labeling requirements for clothes dryers with capacity up to 25 kg in order to carry a valid energy efficiency label.

Combined washer - dryers are excluded from this standard.

Spin extractors are excluded from this standard.

The standard shall apply to clothes dryers that operate in AC single-phase/three phases of 240/415V with a frequency of 50 Hz according to KWS GSO 1899:2017.

Note: This standard does not specify safety requirements, which are covered by KWS GSO IEC 60335-2-11 or KWS GSO IEC 60335-2-43

2. Normative references

The following normative reference standard apply. However, this standard supersedes the below reference standards in case of conflicting requirements. For undated references, the latest published version applies.

- EN 61121: 2013 Tumble dryers for household – Methods for measuring the performance
- KWS GSO 1899:2017 GCC Standard Voltages and Frequencies for Alternating Current Distribution
- SASO 2883:2017 Electrical Clothes Dryers - Energy Performance Requirements and Labelling

3. Terms and definitions

For the purposes of this Standard, the following terms and definitions shall apply.

3.1 Clothes tumble dryer: appliance in which textiles are dried by tumbling in a rotating drum, through which heated air is passed

3.1.1 Air-vented tumble dryer: tumble dryer that draws in fresh air, passes it over the textiles and vents the resulting moist air into the room or outside

3.1.2 Automatic tumble dryer: tumble dryer, which switches off the drying process when a certain moisture content of the load is detected, for example through conductivity or temperature sensing

3.1.3 Built-in tumble dryer: tumble dryer intended to be installed in a cabinet, a prepared recess in a wall or a similar location, requiring furniture finishing

3.1.4 Condenser tumble dryer: tumble dryer which includes a device (either using condensation or any other means) for removing moisture from the air used for the drying process

3.1.5 Combined washer-dryer: means a washing machine which includes both a spin extraction function and also a means for drying the textiles, usually by heating and tumbling

3.1.6 Non-automatic tumble dryer: tumble dryer which switches off the drying process after a predefined period, usually controlled by a timer, but which may also be manually switched off

3.1.7 Spin-extractor (also known commercially as 'spin-dryer'): appliance in which water is removed from the textiles by centrifugal action in a rotating drum and drained through an automatic pump and which is designed to be used principally for non- professional purposes

3.2 Condensation efficiency: ratio between the mass of moisture condensed by a condenser tumble dryer and the mass of moisture removed from the load at the end of a cycle

3.3 Cycle: complete drying process, as defined for the selected program

3.4 Equivalent tumble dryer: model of tumble dryer placed on the market with the same rated capacity, technical and performance characteristics, energy consumption, condensation efficiency where relevant, standard cotton program time and airborne acoustical noise emissions during drying as another model of tumble dryer placed on the market under a different commercial code number by the same supplier

3.5 Left-on mode: lowest power consumption mode that may persist for an indefinite time after completion of the program without any further intervention by the end-user besides unloading of the tumble dryer

3.6 Off-mode: condition where the tumble dryer 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 tumble dryer 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 tumble dryer reverts to a steady-state power consumption on its own

3.7 Partial load: half of the rated capacity of a tumble dryer for a given program

3.8 Program: series of predefined operations declared by the supplier as suitable for drying certain types of textile

3.9 Program time: time that elapses from the initiation of the program until the completion of the program, excluding any end-user program delay

3.10 Rated capacity (C_{rated}): maximum mass in kilograms, indicated by the supplier in 0.5 kilogram increments of dry textiles of a particular type, which can be treated in a tumble dryer with the selected program, when loaded in accordance with the supplier's instructions

3.11 Rated frequency (f_{rated}): the number of cycles per second through which an alternating electric current passes as claimed by the manufacturer of a clothes dryer model

3.12 Rated power (P_{rated}): effective power input of the clothes dryer model as claimed by the manufacturer

3.13 Rated voltage (V_{rated}): the voltage needed to operate the product, as claimed by the manufacturer

3.14 Remaining moisture content means the amount of moisture contained in the load at the end of the spinning phase

3.15 "Shall": where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed

3.16 Standard cotton program: cycle that dries cotton laundry with an initial moisture content of the load of 60% up to a remaining moisture content of the load of 0%

4. Criteria for applying the Minimum Efficiency Performance Standard (MEPS)

4.1 – Declaration of rated values

The declaration of the rated capacity shall be expressed only in terms of weight (kg) as multiples of 0.5 kg.

The declaration of the rated power shall be expressed only in terms of watt (W) as multiples of 50 W.

The declaration of the rated energy efficiency index as an integer value.

The declaration of the rated condensation efficiency as a multiple of 1%.

The declaration of the rated program times as multiples of 1 minute.

The declaration for rated 'off mode' power and rated 'left-on' power in Watt (W) as multiples of 0.01 W.

The declaration of the rated annual energy consumption is expressed in kWh as an integer value.

4.2 - Determining the minimum energy performance (MEPS)

The minimum energy performance standard (MEPS) requirements for clothes dryers are based on the limitation of the Energy Efficiency Index (EEI) (see Annex A) according to table 1.

Table 1: MINIMUM ENERGY EFFICIENCY INDEX

Designation	Limit values for the energy efficiency
Air-vented tumble dryer	EEI < 85
Condenser tumble dryer	EEI < 76

- The minimum condensation efficiency (C_t): $C_t \geq 70\%$

4.3 – Acceptance criteria for Labelling and market surveillance

The energy label shall be accepted when a sample unit(s) tested meets the following criteria:

- Measured power..... $\geq 0.90 \times$ rated power
- Measured power..... $\leq 1.05 \times$ rated power
- Measured energy..... $\leq 1.06 \times$ rated energy
- Measured weighted program time $\leq 1.06 \times$ rated weighted program time
- Measured condensation efficiency (if applicable)..... $\geq 0.94 \times$ rated value
- Measured duration of the left-on mode..... $\leq 1.06 \times$ rated value
- Measured power consumption in left-on mode (P_l) and in off-mode (P_o):

The measured value of power consumption in off-mode (P_o) and left-on mode (P_l):

- More than 1.00 W $\leq 110 \%$ x rated power
- Less than or equal to 1.00 W ≤ 0.10 W + rated power

5. Label and Classification

5.1 - Determining the Energy Efficiency Class

The energy efficiency class for each type of product is based on the rated value of the energy efficiency index (EEI) and shall be determined as outlined in Table 2, see Annex A.

Table 2: ENERGY EFFICIENCY CLASSES			
Bar color	Energy efficiency class (Arabic)	Equivalent energy efficiency class (English)	EEI
Dark green	أ	A	$EEI < 24$
Green	ب	B	$24 \leq EEI < 32$
Light green	ج	C	$32 \leq EEI < 42$
Yellow	د	D	$42 \leq EEI < 65$
Orange	هـ	E	$65 \leq EEI < 76$
Red	و	F	$76 \leq EEI < 85$
Dark red	ز	G	$85 \leq EEI$

5.2 – Condensation Efficiency Class for condenser dryers

For condenser tumble dryers only, the condensation efficiency class is based on the rated value of the condensation efficiency (C_t) and shall be determined as outlined in Table 3, see Annex B.

Table 3: CONDENSATION EFFICIENCY CLASSES		
Condensation Efficiency class (Arabic)	Condensation Equivalent Efficiency class (English)	C_t
أ	A	$90\% \leq C_t$
ب	B	$80\% \leq C_t < 90\%$
ج	C	$70\% \leq C_t < 80\%$

5.3 - Design and placement of the Label

The label shall be printed as illustrated in Figure 1. It shall be fixed and non-removable on the packaging and another label shall be available inside the packaging to be posted on the product. It is the responsibility of the retailer to place the label on the most prominent part of the product to be easily visible to the consumer at the point of sale.

The energy efficiency classes shall each be represented with a visible letter and color-coded bars as outlined in Table 1 and illustrated for information in Figure 1. Different labels are automatically generated by the applicable application (see Clause 7) depending on the type of clothes dryers (air-vented or condenser) once the registration of the product has been completed.

The label must be 100 mm wide and 170 mm high.

5.4 - Information and values contained on the label

The fields (a) to (k) outlined in Figure 2 shall comply with the following requirements:

- **Field (a):** This field shall display the logo of the PAI, Metrology and Quality Organization (PAI).
- **Field (b):** this field shall reflect the energy efficiency class, which the product attained.
- **Field (c):** this field shall reflect the annual energy use in kWh per year
- **Field (d):** this field shall reflect the capacity of the appliance
- **Field (e):** this field shall reflect the duration of the cycle at full load
- **Field (f):** this field shall reflect the efficiency of the condenser (for condensing dryer only) in a relative Arabic letter scale
- **Field (g):** this field shall reflect the type of clothes dryer
- **Field (h):** this field shall have a QR code representing the main characteristics of the clothes dryer, this may include the following items based on the data provided in the registration form:
 - Manufacturer name
 - Model number
 - Brand name
 - Country of origin
 - Rated power (W)
 - Rated voltage (V)
 - Rated capacity (kg)
 - Energy Classification (unit-less)
 - Condenser classification when relevant (unit-less)
 - Annual Energy consumption - AEC (kWh)
 - Condensation efficiency when relevant – C_t (%)
- **Field (i):** this field shall reflect the identification of the product
- **Field (j):** this field shall reflect the registration number and standard reference number.
- **Field (k):** this field shall reflect the legal statement attached to energy efficiency labels **Field (h):** this field shall reflect the identification of the product.

بطاقة كفاءة الطاقة
Energy Efficiency Label

مجفف ملابس | Clothes Dryer

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الاستهلاك السنوي للطاقة Annual Energy Consumption	كفاءة التكثيف Condensing Efficiency	وقت التجفيف Drying Time	السعة Capacity
KWH كيلوواط / ساعة	أ ب ج د هـ و ز	دقيقة / دورة Minute / Cycle	Kg كجم

Type : بالتكثيف Condensing بالهواء Air Vented النوع :

MADE IN بلد الصنع	BRAND NAME العلامة التجارية
MODEL NUMBER رقم الطراز	
Standard Reference Number	رقم التسجيل Registration NO الرقم المرجعي للمواصفة



إزالة أو تغطية أو العبث بهذه البطاقة قبل البيع يجعلك عرضة للمسؤولية النظامية
The Removal, covering, or damaging of this Label before sale is punishable by Law

Figure 1 – Label for clothes dryers

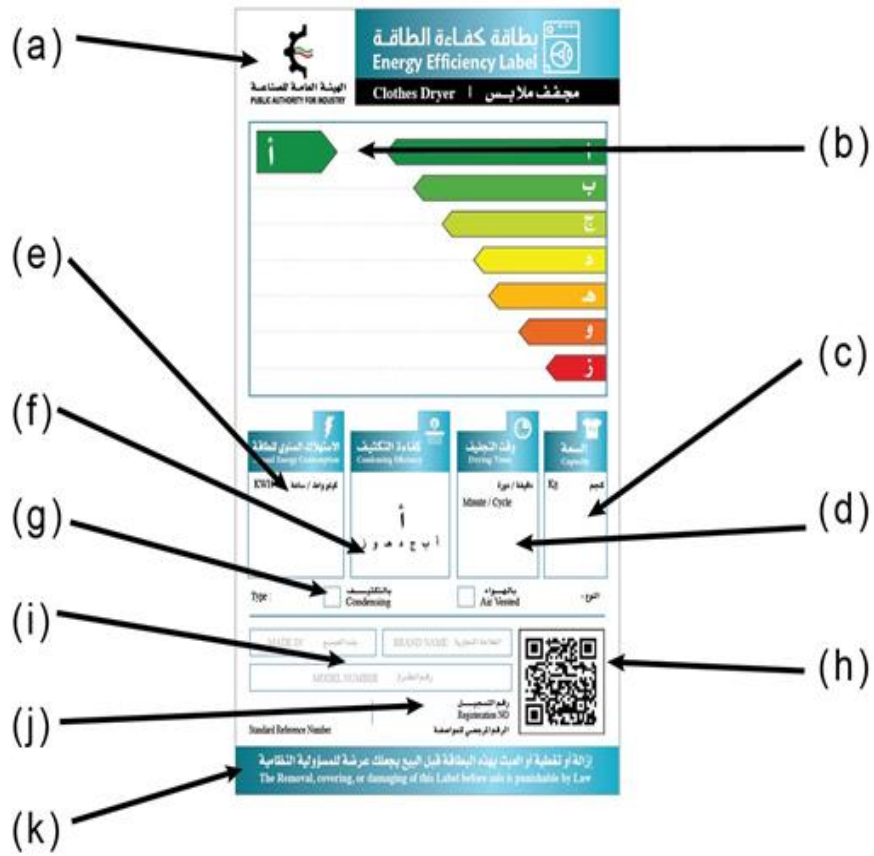


Figure 2 – Position for display of information

6. Marking and instructions

6.1 - General information

The following information shall be marked on the nameplate of the clothes dryer in English or Arabic and English, in addition to any other mandatory marking requirements (e.g. compliance safety). The marking shall not be on a detachable part of the unit and shall be indelible, durable and easily legible.

Any information related to energy performance added on any part of the unit or packaging shall not have any ambiguity or lead to misunderstanding of the performance of the unit.

6.2 - Nameplate information

The nameplate information shall include, for conformity to this standard, the following information:

- Manufacturer's name and/or trademark.
- Country of origin.
- Model number
- Rated voltage or rated voltage range in volts (V).
- Rated frequency in hertz (Hz).
- Rated power input in Watt (W) or kiloWatts (kW)
- Rated Capacity (kg)
- Annual Energy Consumption (kWh/year or kWh)

6.3 - Instruction sheet

An instruction sheet or manual in both Arabic and English shall be delivered with each product. Tables, drawings and circuit diagrams may be depicted in English only.

The instruction sheet or manual shall include the following information as a minimum:

- The information specified in clause 6.2
- Dimensions of the unit
- Instruction for mounting and connection to the pipes
- Instruction for connection to the mains
- Instructions necessary for the correct operation of the unit and any special precautions to be observed to ensure its safe use and maintenance
- Instruction for packing and unpacking the unit
- Instructions on unit handling and rigging
- Net weight of the unit (empty)

7- Registration Requirements

7.1 General

Product registration is mandatory, whereby information about registration requirements will be available in the information center of the kuwaiti Standards, Metrology, and Quality Organization (PAI), and reference shall be made to the separate PAI registration forms and requirements.

The product's information shall be submitted through the registration system electronically via PAI website. The applicant shall fulfill all updated requirements of the electronic registration system and any new requirements, procedures, and regulations required by PAI. A draft of the registration form is provided in Annex C (the final version is the one present on the Public Authority for Industry website).

The label of the product will be automatically published by PAI website after the final registration.

7.2 Type of documents needed for registration under the scope of this standard

For registration, a test report covering the product submitted shall be attached. Test report shall comply with PAI policy.

Note: this test report is not exclusive from other documents required by PAI (e.g. Electro Magnetic Compatibility, safety,...) for registration.

Annex A - Determination of Energy Efficiency

A.1 - Calculation of the Energy Efficiency Index - General

To calculate the Energy Efficiency Index (EEI) of a tumble dryer model, the weighted Annual Energy Consumption of a tumble dryer for the standard cotton program at full and partial load is compared to its Standard Annual Energy Consumption.

The Energy Efficiency Index (EEI) is calculated as follows and rounded to one decimal place:

$$EEI = 100 \frac{AEC}{SAEC} \quad \text{Formula (A.1)}$$

Where:

AEC: annual energy consumption of the tumble dryer (kWh);

SAEC: standard Annual Energy Consumption of the tumble dryer (kWh).

The Standard Annual Energy Consumption (SAEC) is calculated in kWh as follows and rounded to two decimal places:

- For all tumble dryers that are not air-vented

$$SAEC = 140 X C_{rated}^{0.8} \quad \text{Formula (A.2)}$$

For air-vented tumble dryers

$$SAEC = 140 X C_{rated}^{0.8} - (30 x \frac{T_t}{60}) \quad \text{Formula (A.3)}$$

Where

C_{rated} : rated capacity of the tumble dryer for the standard cotton program (kg) T_t
weighted program time for the standard cotton program (minutes).

A.2 - Calculation of the annual energy consumption

A.2.1 - Annual energy calculation

AEC is calculated in kWh as follows and is rounded to two decimal place

$$AEC = E_t \times 160 + \left[\frac{P_o \times \frac{525600 - (T_t \times 160)}{2} + P_l \times \frac{525600 - (T_t \times 160)}{2}}{60 \times 1000} \right] \quad \text{Formula (A.4)}$$

Where:

E_t = weighted energy consumption, in kWh and rounded to two decimal places

P_o = power in 'off-mode' for the standard cotton program at full load, in W and rounded to two decimal places.

P_l = power in 'left-on mode' for the standard cotton program at full load, in W and rounded to two decimal places.

T_t = weighted program time, in minutes and rounded to the nearest minute.

160 = total number of drying cycles per year.

525600 = constant (time)

A.2.2 - Annual energy consumption for tumble dryers equipped with power management system

When the tumble dryer is equipped with a power management system, with the tumble dryer reverting automatically to 'off-mode' after the end of the program, the weighted Annual Energy Consumption (AEC) is calculated taking into consideration the effective duration of the 'left-on mode', according to the following formula, and rounded to two decimal places:

$$AEC = E_t \times 160 + \left[\frac{P_l \times T_l \times 160 + P_o \times [525600 - (T_t \times 160) - (T_l \times 160)]}{60 \times 1000} \right] \quad \text{Formula (A.5)}$$

Where:

T_l = time in 'left-on mode'

A.3 - Calculation of the weighted program time

The weighted program time (T_t) is calculated in minutes as follows and rounded to the nearest minute:

$$T_t = (3 \times T_{\text{dry}} + 4 \times T_{\text{dry};\frac{1}{2}}) / 7 \quad \text{Formula (A.6)}$$

Where:

T_{dry} : program time for the standard cotton program at full load, in minutes and rounded to the nearest minute,

$T_{\text{dry};\frac{1}{2}}$: program time for the standard cotton program at partial load, in minutes and rounded to the nearest minute

A.4 - Calculation of the weighted energy efficiency

The weighted energy consumption (E_t) is calculated in kWh as follows and rounded to three decimal places:

$$E_t = (3 \times E_{\text{dry}} + 4 \times E_{\text{dry};\frac{1}{2}}) / 7 \quad \text{Formula (A.7)}$$

Where:

E_{dry} : energy consumption of the standard cotton program at full load, rounded at two decimal places;

$E_{\text{dry};\frac{1}{2}}$: energy consumption of the standard cotton program at partial load, rounded at two decimal places.

Annex B - Calculation of the condensation efficiency

B.1 – Calculation of the condensation efficiency index (C_t)

The condensation efficiency of a program is the ratio between the mass of moisture condensed and collected in the container of a condenser tumble dryer and the mass of moisture removed from the load by the program, the latter being the difference between the mass of the wet test load before drying and the mass of the test load after drying. For calculating the weighted condensation efficiency, the average condensation efficiency for the standard cotton program at both full and partial load is considered.

The weighted condensation efficiency (C_t) of a program is calculated as a percentage and rounded to the nearest whole percent as:

$$C_t = (3 \times C_{dry} + 4 \times C_{dry;1/2}) / 7 \quad \text{Formula (B.1)}$$

Where:

C_{dry} : average condensation efficiency of the standard cotton program at full load;

$C_{dry;1/2}$: average condensation efficient of the standard cotton program at partial load.

B.2 – Calculation of the condensation efficiency (C_{dry})

The average condensation efficiency C_{dry} (and $C_{dry;1/2}$) is calculated from the condensation efficiencies of test runs and expressed as a percentage:

$$C_{dry} = \frac{1}{n-1} \times \sum_{j=2}^n \left(\frac{W_{wj}}{W_t - W_f} \times 100 \right) \quad \text{Formula (B.2)}$$

Where:

n : is the number of test runs, comprising at least three valid test runs for the selected program.

j : is the test run number.

W_{wj} : is the mass of water collected in the condenser reservoir during test run j .

W_i : is the mass of the wet test load before drying.

W_f : is the mass of the test load after drying

Annex C – Clothes dryers registration application/renewal sample form (informative)

I hereby apply for the registration of a clothes dryer(s) for the purpose of energy efficiency.

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

SECTION (1) – APPLICANT DETAILS

Name of applicant

Business address

P.O Box

Post code

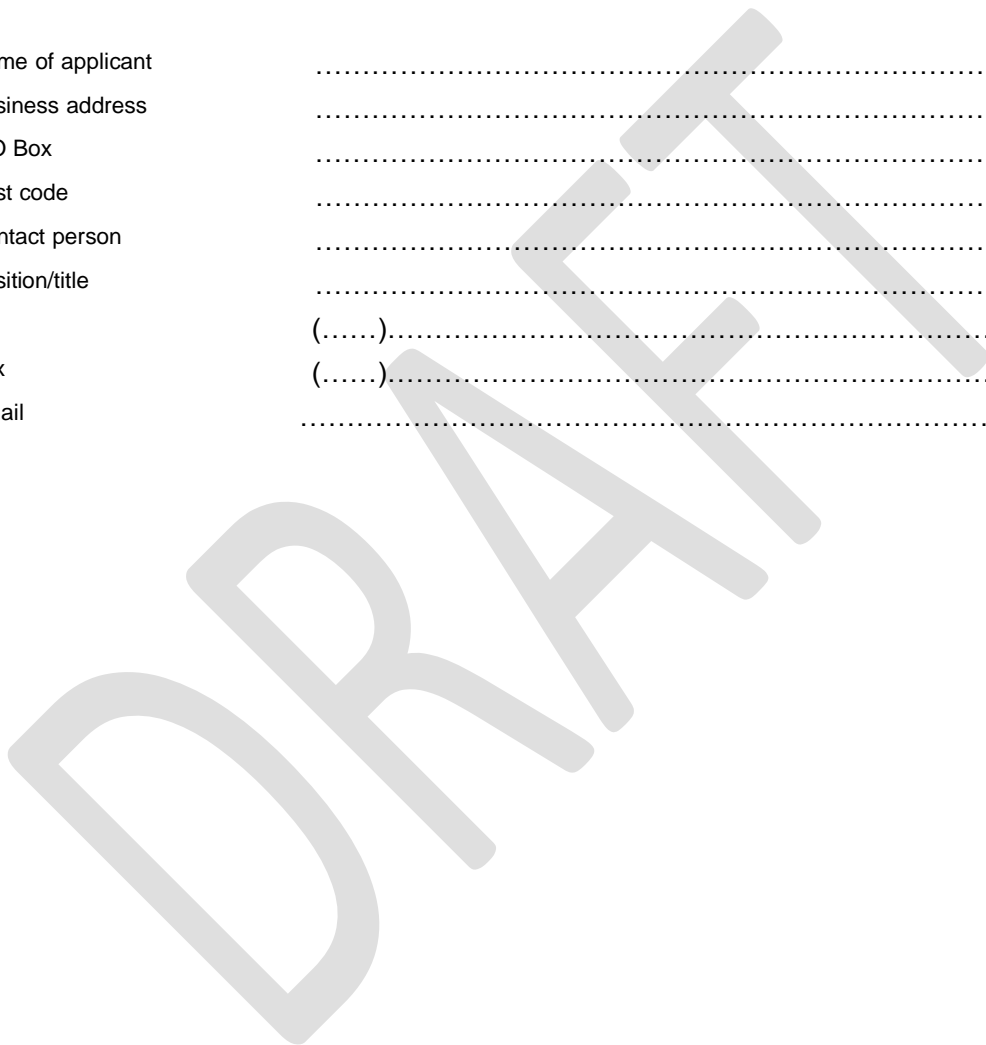
Contact person

Position/title

Tel (.....)

Fax (.....)

Email



SECTION (3) – TESTING AND TEST REPORT

Name of laboratory	.....
Test date	.....
Tested unit brand name	.....
Tested unit model number	.....
Type of test	Test conducted by third party (As Per PAI Requirements)
Testing method	Note: test can be done in the manufacturer's laboratory only if the laboratory is recognised by a PAI notified body to operate according to ISO 17025 – see Clause 8) IEC 61121
Test report	The test report shall include all results used to calculate AEC, Ct and related classification for energy, water and spinning efficiency; this means the values for each cycle at full and partial load used in the formulas presented in Annex A to C Application requires to register all tested values at full load and half load used to calculate the EEI
Testing results:	
Power (W)	.....
Voltage (V)	.....
Energy at full load E_{dry}	.....
Energy at half load $E_{dry;1/2}$	.....
Moisture at full load T_{dry}	.....
Moisture time at half load $T_{dry;1/2}$	.....
Program time at full load T_{dry}	.....
Program time at half load $T_{dry;1/2}$	.....
Power in 'Left-on mode' (W)	.....
Power in 'Off-mode' (W)	.....
Tested EEI (-)	Autocalculated from tested values
Tested Annual Energy Consumption – AEC (kWh)	Autocalculated from testred values
Tested Condensation efficiency C_t (%) when relevant	.....

SECTION (4) – ATTACHMENTS

List of the following shall be attached to the registration:

- ✓ Test report not older than 3 years
- ✓ laboratory accreditation and scope of accreditation
- ✓ Name plate design
- ✓ Image of the appliance
- ✓ Brand logo