



BSI Standards Publication

Tumble dryers for household use — Methods for measuring the performance

National foreword

This British Standard is the UK implementation of EN 61121:2013+A12:2025. It is derived from IEC 61121:2012. It supersedes BS EN 61121:2013+A11:2019, which will be withdrawn on 5 September 2025.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **[C]** **[C]**.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by **[A11]** **[A11]**.

The UK participation in its preparation was entrusted to Technical Committee CPL/59, Performance of household electrical appliances.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Amendments/corrigenda issued since publication

Date	Text affected
31 October 2019	Implementation of CENELEC amendment A11:2019
31 March 2025	Implementation of CENELEC amendment A12:2025

**Tumble dryers for household use -
Methods for measuring the performance
(IEC 61121:2012, modified)**

Sèche-linge à tambour à usage
domestique -
Méthodes de mesure de l'aptitude à la
fonction
(CEI 61121:2012, modifiée)

Wäschetrockner für den Hausgebrauch -
Verfahren zur Messung der
Gebrauchseigenschaften
(IEC 61121:2012, modifiziert)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

European foreword

This document (EN 61121:2013) consists of the text of IEC 61121:2012 prepared by IEC/SC 59D "Home laundry appliances" of IEC/TC 59 "Performance of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2013-12-31
at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting (dow) 2015-12-31
with this document have to be withdrawn

This document supersedes EN 61121:2005.

EN 61121:2013 includes the following significant technical changes with respect to EN 61121:2005:

- a) a test procedure for a combined test sequence of full and **partial load** was introduced;
- b) a test procedure for measuring power consumption in low power modes is introduced;
- c) a formula to calculate the energy consumption of **tumble dryers** including low power modes was added;
- d) control procedures for checking measured values in comparison to values declared by the manufacturer under consideration of permitted tolerances are updated.

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 61121:2012 are prefixed "Z".

Words in **bold** in the text are defined in Clause 3.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This European Standard specifies, as far as necessary, the test methods which shall be applied in accordance with the COMMISSION DELEGATED REGULATION (EU) No 392/2012 implementing Directive 2010/30/EU the European Parliament and of the Council with regard to energy labelling of household **tumble dryers** and in accordance with the COMMISSION REGULATION (EU) No 932/2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household **tumble dryers**.

The procedures described in this European Standard were modified substantially compared to the previous version, e.g. with regard to **partial load**. Therefore, results of tests according to this standard cannot and shall not be directly compared to results of similar procedures of previous versions. In addition, results based on a specific reference **programme** shall not be compared to results based on other reference programs.

Annex ZA sets out the procedure to be applied for testing according to Commission Regulations with regard to energy labelling and ecodesign and provides all necessary links to all relevant clauses of this European Standard.

Annex ZB provides control procedures for checking measured values in comparison to values declared by the manufacturer under consideration of permitted tolerances.

Annex ZC lists normative references.

Endorsement notice

The text of the International Standard IEC 61121:2012 was approved by CENELEC as a European Standard with agreed common modifications

Foreword to amendment A11

This document (EN 61121:2013/A11:2019) has been prepared by CLC/TC 59X " Performance of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-02-23
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2022-08-23

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annexes ZZA and ZZB, which are integral parts of this document.

European foreword to amendment A12

This document (EN 61121:2013/A12:2025) has been prepared by CLC/TC 59X “Performance of household and similar electrical appliances”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-02-28
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-02-28

This document supersedes the amendment EN 61121:2013/A11:2019 and corrigenda (if any).

This document is read in conjunction with EN 61121:2013.

EN 61121:2013/A12:2025 includes the following significant technical changes with respect to EN 61121:2013:

- a) the **programme** to be tested for the **combined test series** is the new introduced **eco programme**;
- b) the maximum time of the phase without pre-conditioning of the **tumble dryer** between two **test runs** is extended to 96 h;
- c) the requirement to adjust the water used to the pH-value is omitted;
- d) a loading procedure for the **tumble dryer** is introduced;
- e) addition of an alternative ambient air climate for **conditioning** the **test load**;
- f) the validity of a **test run** and the validity of a **test series** has been revised;
- g) the method to pre-age **test load** items for creation of a new **test load** is modified;
- h) the method to calculate a pooled standard deviation has been deleted;
- i) a calculation method for the average final moisture content has been added;
- j) specific weighting factors are introduced for the calculation of the weighted average value of the **combined test series**;
- k) Annex ZB Tolerances and control procedures is deleted and replaced by a new Annex ZB which defines the testing procedure for **multi-drum tumble dryers**;
- l) the procedure to measure low power modes is modified (see Annex ZD).

Annex ZA sets out the procedure to be applied for testing in accordance with Commission Regulations with regard to energy labelling and ecodesign and provides all necessary links to all relevant clauses of this European Standard.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annexes ZZA and ZZB, which are an integral part of this document.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Annex ZA (normative)

▣^{A12} Test procedure for a combined test sequence of the eco programme with full load and partial load ▣^{A12}

ZA.1 General

This annex sets out the procedure for the determination of performance and related parameters for **full load** and for **partial load** for a **▣^{A12} eco programme ▣^{A12}** of the **tumble dryer**.

The combined test sequence to measure performance parameters is defined as a **test series** consisting of **7 test runs** with two different **treatments** as follows:

- **Treatment full: 3 test runs**
- **Treatment half: 4 test runs**

▣^{A12} The measurement of the airborne acoustical noise shall follow Clause 6 of EN 60704-2-6:2012⁴ considering the following conditions:

- Measurement shall be executed using:
 - the eco programme instead of the programme “cotton dry”;
 - a cotton test load of full rated capacity in accordance with this standard but huckaback towels replacing the sheets and pillow cases. **▣^{A12}**

ZA.2 Preparation for testing – Test loads

Subclause 6.5 sets out requirements for the preparation of the **test loads** used in the **tumble dryer**.

All requirements of 6.4 shall be applied to define the **full load** for a **test series**. For the **test runs** with **partial load**, a full **test load** shall be split into two parts. This clause defines the splitting of a **full load** into the two **partial loads** (part A and part B) as detailed in Table ZA.1.

⁴ As amended by EN 60704-2-6:2012/A11:2025.

Table ZA.1 – Partial loads: number of items in part A and part B of the cotton test load

Nominal mass of full load kg		Nominal mass of half the full load kg	Number of sheets	Number of pillowcases	Number of towels	Mass of half load kg
1	Part A	0,5	0	1	2	0,46
	Part B	0,5	0	1	3	0,57
1,5	Part A	0,75	0	1	5	0,79
	Part B	0,75	0	2	2	0,70
2	Part A	1	0	2	5	1,03
	Part B	1	0	2	4	0,92
2,5	Part A	1,25	0	2	7	1,25
	Part B	1,25	0	3	5	1,27
3	Part A	1,5	1	2	3	1,54
	Part B	1,5	1	2	2	1,43
3,5	Part A	1,75	1	2	5	1,76
	Part B	1,75	1	2	5	1,76
4	Part A	2	1	2	7	1,98
	Part B	2	1	2	7	1,98
4,5	Part A	2,25	1	3	7	2,22
	Part B	2,25	1	3	8	2,33
5	Part A	2,5	1	3	10	2,55
	Part B	2,5	1	3	9	2,44
5,5	Part A	2,75	1	4	10	2,79
	Part B	2,75	1	4	9	2,68
6	Part A	3	1	4	12	3,01
	Part B	3	1	4	12	3,01
6,5	Part A	3,25	1	5	12	3,25
	Part B	3,25	1	5	12	3,25
7	Part A	3,5	1	6	12	3,49
	Part B	3,5	1	6	12	3,49
7,5	Part A	3,75	2	6	8	3,77
	Part B	3,75	1	6	14	3,71
8	Part A	4	2	6	10	3,99
	Part B	4	1	6	17	4,04
8,5	Part A	4,25	2	7	10	4,23
	Part B	4,25	1	7	17	4,28
9	Part A	4,5	2	7	12	4,45
	Part B	4,5	2	7	13	4,56
9,5	Part A	4,75	2	7	15	4,78
	Part B	4,75	2	7	14	4,67
10	Part A	5	2	8	15	5,02
	Part B	5	2	8	15	5,02
10,5	Part A	5,25	3	7	13	5,29
	Part B	5,25	2	8	17	5,24

Nominal mass of full load kg		Nominal mass of half the full load kg	Number of sheets	Number of pillowcases	Number of towels	Mass of half load kg
11	Part A	5,5	3	7	15	5,51
	Part B	5,5	2	8	19	5,46
11,5	Part A	5,75	3	8	15	5,75
	Part B	5,75	2	8	22	5,79
12	Part A	6	3	8	17	5,97
	Part B	6	3	9	15	5,99
12,5	Part A	6,25	3	8	20	6,30
	Part B	6,25	3	9	17	6,21
13	Part A	6,5	3	9	20	6,54
	Part B	6,5	3	9	19	6,43
13,5	Part A	6,75	3	9	22	6,76
	Part B	6,75	3	10	20	6,78
14	Part A	7	3	9	24	6,98
	Part B	7	3	10	22	7,00
14,5	Part A	7,25	4	10	18	7,28
	Part B	7,25	3	10	24	7,22
15	Part A	7,5	4	10	20	7,50
	Part B	7,5	3	11	24	7,46

NOTE The number of towels in each half load A and B may differ from the number indicated above. In this case the formulas below shall be used to evaluate the number of towels in each test load.

Part A and Part B shall be made entirely from the **full load** without adding or subtracting any towels. For each **partial load**, the conditioned **test load mass** shall be recorded.

The requirement for **test load mass** to be within ± 60 g of the **nominal test load mass** shall not apply to **partial loads**.

For **test load masses** which are greater than those specified in the Table 3 (> 15 kg), the number of items for part A and part B is defined as follows:

Part A:

Number of sheets: is the half of the number of sheets at rated **test load mass** rounded to the next whole sheet (always round up)

$$n_{A,SH} = \left\lceil \frac{n_{SH}}{2} \right\rceil$$

where

n_{SH} is the number of sheets at rated **test load mass**.

Number of pillowcases: is half the number of pillowcases at rated **test load mass** rounded to the next whole pillowcase (always round down).

$$n_{A,PC} = \left\lfloor \frac{n_{PC}}{2} \right\rfloor$$

where

n_{PC} is the number of pillowcases at rated **test load mass**.

Number of towels: is the nominal partial **test load mass** minus the number of pillowcases from part A multiplied by 0,240 minus the number of sheets from part A multiplied by 0,725 and divided by 0,109 rounded to the nearest whole towel.

$$n_{A,T} = \left\lfloor \frac{W_{n,part} - (n_{A,PC} \times 0,240) - (n_{A,SH} \times 0,725)}{0,109} \right\rfloor$$

where

$W_{n,part}$ is the nominal partial **test load mass**;

$n_{A,PC}$ is the number of pillowcases in part A;

$n_{A,SH}$ is the number of sheets in part A.

Part B:

Number of sheets: is the number of sheets at rated **test load mass** minus the number of sheets from part A.

$$n_{B,SH} = n_{SH} - n_{A,SH}$$

where

n_{SH} is the number of sheets at rated **test load mass**;

$n_{A,SH}$ is the number of sheets in part A.

Number of pillowcases: is the number of pillowcases at rated **test load mass** minus the number of pillowcases from part A.

$$n_{B,PC} = n_{PC} - n_{A,PC}$$

where

n_{PC} is the number of pillowcases at rated **test load mass**;

$n_{A,PC}$ is the number of pillowcases in part A.

Number of towels: is the number of towels at rated **test load mass** minus the number of towels from part A.

$$n_{B,T} = n_T - n_{A,T}$$

where

n_T is the number of towels at rated **test load mass**;

$n_{A,T}$ is the number of towels in part A.

ZA.3 Performance measurements – general requirements

Performance parameters shall be measured for the **tumble dryer** using a common single **test series** consisting of a total of 7 runs as set out in ZA.4. The evaluation of these parameters for the **tumble dryer** is specified in ZA.5.

ZA.4 Procedure for performance tests

ZA.4.1 General

This sub-clause sets out the additional requirements for the test procedure as defined in Clause 8 for the determination of the following parameters for a cotton load related to the combined test sequence for the **tumble dryer**:

- Final moisture content;
- Energy consumption;
- **Programme time**;
- Condensation efficiency.

A12 The procedure for the measurement of the low power mode consumption is set out in Annex ZD. **A12**

ZA.4.2 Test load

Prior to a **test series**, the following **test loads** shall be prepared for the **tumble dryer**.

- A treatment full load having a conditioned mass equal to the rated capacity of the tumble dryer.
- A treatment half part A load as specified in Table ZA.1 for the nominal mass of the treatment full load of the tumble dryer.
- A treatment half part B load as specified in Table ZA.1 for the nominal mass of the treatment full load of the tumble dryer.

NOTE 1 Part A and part B may be made from the load used for treatment full tests or from other treatment full loads having the same nominal mass.

NOTE 2 For a test series one or more test loads each fulfilling the specifications above may be used.

A12 *Text deleted* **A12**

A12 ZA.4.4 Test runs to be carried out on the tumble dryer

The following 7 **test runs** shall be carried out on the **tumble dryer**:

- 3 **test runs** with **treatment full**;
- 2 **test runs** with **treatment half using part A of a load**;
- 2 **test runs** with **treatment half using part B of a load**.

Care is required to ensure that the temperature of the **tumble dryer** is within the range specified in 6.4 before the start of every test.

Care is required to ensure that **test load** part A and part B are not mixed up and no items are lost, gained or exchanged between **test runs**.

All **treatment half** from a **test series** shall be performed splitting a full **test load** into the part A and part B. The validity of **test runs** shall be evaluated in accordance with 8.2.5.

The validity of **test series** shall be evaluated in accordance with 8.2.6. A12

A12 Text deleted A12

ZA.5 Assessment of performance

ZA.5.1 General

ZA.5 sets out the additional requirements for the assessment of performance as defined in Clause 9 for the determination of the following parameters for a cotton load related to the combined test sequence for the **tumble dryer**:

- evaluation of data (see ZA.5.2);
- evaluation of condensation efficiency (see ZA.5.3);
- evaluation of water consumption (see ZA 5.4);
- evaluation of **programme** time (see ZA.5.5);
- evaluation of energy consumption of the **programme** (see ZA.5.6);
- A12 Text deleted A12;
- calculation of the Energy Efficiency Index (EEI) (see ZA.5.9).

In case of an invalid **test run**, the **test run** result for the **tumble dryer** shall not be used for any evaluation of that **tumble dryer** within the **test series**.

A12 NOTE Z1 Requirements on assessment of power and energy consumption in **off mode**, **standby mode** and **delay start** mode are set out in Annex ZD. A12

ZA.5.2 Evaluation of data

Test data from 7 **test runs** shall be evaluated. It is required that the results from these 7 **test runs** are then averaged to yield a single test result. ZA.5.2 describes how the average value shall be calculated for each performance parameter.

A12 The confidence interval per **treatment** is described by the standard deviation. For both **treatments** the average values, the standard deviations and the residuals are calculated out of the **test runs**. For the **test series** the value is calculated out of the **treatment** values. A12

a) The formulae in Clause 5 use the following abbreviations:

dry means **treatment full**;
dry1/2 means **treatment half**.

b) The average value per **treatment** x is calculated as follows:

$$\bar{x} = \frac{\sum_{j=1}^n x_j}{n}$$

where

x_j is the value for each measured **test run**;
 n is the number of **test runs** per **treatment**.

c) The standard deviation per **treatment** s_{treat} is calculated as follows:

$$s_{treat} = \sqrt{\frac{1}{n-1} \sum_{j=1}^n (x_j - \bar{x})^2}$$

where

$\bar{x}$ is the average value per **treatment**;
 x_j is the value for each **test run**;
 n is the number of **test runs** per **treatment**.

Text deleted

h) The two-sided confidence interval per **treatment** CI is calculated as follows:

$$CI = \bar{x} \pm s_{treat} \times t_{f,0.05}$$

where

$\bar{x}$ is the average value per **treatment**;
 s_{treat} is the pooled standard deviation per **treatment**;
 $t_{f,0.05}$ is the “Student T” factor for a confidence level of 95 %;

- for 3 degrees of freedom f (4 **test runs**) at **treatment half** the value is 3,182;
- for 2 degrees of freedom f (3 **test runs**) at **treatment full** the value is 4,303.

ZA.5.3 Evaluation of condensation efficiency

- a) The overall condensation efficiency shall be calculated by the non weighted average of the condensation efficiency of all 7 **test runs** in **treatment full** and in **treatment half**.
- b) All **test runs** shall be used for evaluation of the condensation efficiency unless condition in 8.4.2 is fulfilled.
- c) The average value for the condensation efficiency values $\overline{C_{dry}}$ for the **treatment full** is calculated as follows:

$$\overline{C_{dry}} = \frac{1}{n} \times \sum_{j=1}^n C_{dryj}$$

where

C_{dryj} is the condensation efficiency value per **treatment full** in each **test run**, as calculated in 9.6;
 n is the number of **test runs** per **treatment full** ($n = 3$);
 j is the **test run**.

- d) The average value for the condensation efficiency value $\overline{C_{dry1/2}}$ for the **treatment half** is calculated as follows:

$$\overline{C_{dry1/2}} = \frac{1}{n} \times \sum_{j=1}^n C_{dry1/2j} \quad \text{A12}$$

where

- $\overline{C_{dry1/2j}}$ is the condensation efficiency value per **treatment half** in each **test run**, as calculated in 9.6;
 n is the number of **test runs** per **treatment half** (n = 4);
 j is the **test run**.

- e) The average value for the Condensation Efficiency C_t for the combined **test series** is calculated as follows and rounded to one decimal place:

$$\overline{C_t} = \left(0,24 \times \overline{C_{dry}} + 0,76 \times \overline{C_{dry1/2}} \right) \quad \text{A12}$$

where

- $\overline{C_{dry}}$ is the Condensation Efficiency for **treatment full**;
 $\overline{C_{dry1/2}}$ is the Condensation Efficiency for **treatment half**.

ZA.5.4 Evaluation of water consumption

- a) The total **water consumption** of the **programme** for each single **test run** is determined according to 8.3 and corrected according to 9.4.
- b) The average value for the total water consumption $\overline{L_{dry}}$ for the **treatment full** is expressed in litres and calculated as follows:

$$\overline{L_{dry}} = \frac{1}{n} \times \sum_{j=1}^n L_{dryj} \quad \text{A12}$$

where

- $\overline{L_{dryj}}$ is the total water consumption for **test run j** with **treatment full** in litre, as calculated in 9.4;
 n is the number of **test runs** per **treatment full** (n = 3).

- c) The average value for the total water consumption $\overline{L_{dry1/2}}$ for the **treatment half** is expressed in litres and calculated as follows:

$$\overline{L_{dry1/2}} = \frac{1}{n} \times \sum_{j=1}^n L_{dry1/2j} \quad \text{A12}$$

where

- $\overline{L_{dry1/2j}}$ is the total water consumption for **test run j** with **treatment half** in litre, as calculated in 9.4;
 n is the number of **test runs** per **treatment half** (n = 4).

- d) The average value for the total water consumption L_t for the combined **test series** is expressed in litres, calculated as follows and rounded to the nearest whole litre:

$$\boxed{A_{12}} \quad L_t = \left(0,24 \times \overline{L_{dry}} + 0,76 \times \overline{L_{dry1/2}} \right) \quad \boxed{A_{12}}$$

where

$\overline{L_{dry}}$ is the average water consumption for **treatment full** in l;

$\overline{L_{dry1/2}}$ is the average water consumption for **treatment half** in l.

ZA.5.5 Evaluation of programme time

- a) The total **programme time** for each single **test run** is determined according to 8.3 and corrected according to 9.5.

- b) The average value for the **programme time** $\overline{t_{dry}}$ for the **treatment full** is expressed in minutes and calculated as follows:

$$\boxed{A_{12}} \quad \overline{t_{dry}} = \frac{1}{n} \times \sum_{j=1}^n t_{dryj} \quad \boxed{A_{12}}$$

where

$\boxed{A_{12}} \quad t_{dryj} \quad \boxed{A_{12}}$ is the **programme time** for **test run j** with **treatment full** in min, as calculated in 9.5;

n is the number of **test runs** per **treatment full** ($n = 3$).

- c) The average value for the **programme time** $\overline{t_{dry1/2}}$ for the **treatment half** is expressed in minutes and calculated as follows:

$$\boxed{A_{12}} \quad \overline{t_{dry1/2}} = \frac{1}{n} \times \sum_{j=1}^n t_{dry1/2j} \quad \boxed{A_{12}}$$

where

$\boxed{A_{12}} \quad t_{dry1/2j} \quad \boxed{A_{12}}$ is the **programme time** for **test run j** with **treatment half** in min, as calculated in 9.5;

n is the number of **test runs** per **treatment half** ($n = 4$).

- d) The average value for the **programme time** t_t for the combined **test series** is expressed in minutes, calculated as follows and rounded to nearest whole minute:

$$\boxed{A_{12}} \quad t_t = \left(0,24 \times \overline{t_{dry}} + 0,76 \times \overline{t_{dry1/2}} \right) \quad \boxed{A_{12}}$$

where

$\overline{t_{dry}}$ is the average **programme time** for **treatment full** in min;

$\overline{t_{dry1/2}}$ is the average **programme time** for **treatment half** in min.

ZA.5.6 Evaluation of energy consumption of the programme

- a) The total energy consumption of the **programme** for each single **test run** is determined according to 8.3 and corrected according to 9.3.
- b) The average value for the total energy consumption $\overline{E_{dry}}$ for the **treatment full** is expressed in kWh and calculated as follows:

$$\overline{E_{dry}} = \frac{1}{n} \times \sum_{j=1}^n E_{dryj}$$

where

- E_{dryj} is the total energy consumption for **test run** j with **treatment full** in kWh, as calculated in 9.3;
n is the number of **test runs** per **treatment full** (n = 3).

- c) The average value for the total energy consumption $\overline{E_{dry1/2}}$ for the **treatment half** is expressed in kWh and calculated as follows:

$$\overline{E_{dry1/2}} = \frac{1}{n} \times \sum_{j=1}^n E_{dry1/2j}$$

where

- $E_{dry1/2j}$ is the total energy consumption for **test run** j with **treatment half** in kWh, as calculated in 9.3;
n is the number of **test runs** per **treatment half** (n = 4).

- d) The weighted energy consumption E_{tC} for the combined **test series** is expressed in kWh, calculated as follows and rounded to two decimal places:

$$E_{tC} = \left(0,24 \times \overline{E_{dry}} + 0,76 \times \overline{E_{dry1/2}} \right)$$

where

$\overline{E_{dry}}$ is the average energy consumption for **treatment full** in kWh;

$\overline{E_{dry1/2}}$ is the average energy consumption for **treatment half** in kWh

Text deleted

ZA.5.9 Calculation of the Energy Efficiency Index (EEI)

A12 For the calculation of the **Energy Efficiency Index (EEI)** of a **tumble dryer**, the weighted energy consumption per **cycle** E_{tC} for the combined **test series** of a **tumble dryer** as calculated in accordance with ZA.5.6 is compared to its standard energy consumption SE_C .

- a) The Standard Energy Consumption per **cycle** (SE_C) for **air vented tumble dryers** is calculated in kWh as follows and rounded to two decimal places:

$$SE_C = 0,46 \times c^{0,63} \times \left(1 - \frac{t_t}{60} \times 0,083\right)$$

where

- c is the **rated capacity** as declared by the manufacturer for the **eco programme** at **full load**;
 t_t is the average value for the **programme time**.

- b) For **condenser tumble dryers** the Standard Energy Consumption per **cycle** (SE_C) is calculated in kWh as follows and rounded to two decimal places:

$$SE_C = 0,46 \times c^{0,63}$$

where

- c is the **rated capacity** as declared by the manufacturer for the **eco programme** at **full load**.
 c) The **Energy Efficiency Index (EEI)** is calculated as follows and rounded to one decimal place:

$$EEI = \frac{E_{tC}}{SE_C} \times 100$$

where

- E_{tC} is the weighted energy consumption per **cycle** of the **tumble dryer**;
 SE_C is the standard energy consumption per **cycle** of the **tumble dryer**. **A12**

A12 ZA.5.10 Evaluation of the final moisture content

- a) The **final moisture content** of the **programme** for each single **test run** is determined in accordance with 8.2.4.
 b) The average value for **final moisture content** $\overline{\mu_{fdry}}$ for the **treatment full** is expressed in percent and calculated as follows:

$$\overline{\mu_{fdry}} = \frac{1}{n} \times \sum_{j=1}^n \mu_{fdryj}$$

where

μ_{fdryj} is the **final moisture content** for **test run j** with **treatment full** in percent, as calculated in 8.2.4;

n is the number of **test runs** per **treatment full** ($n = 3$).

- c) The average value for the **final moisture content** $\overline{\mu_{fdry1/2}}$ for the **treatment half** is expressed in percent and calculated as follows:

$$\overline{\mu_{fdry1/2}} = \frac{1}{n} \times \sum_{j=1}^n \mu_{fdry1/2j}$$

where

$\mu_{fdry1/2j}$ is the **final moisture content** for **test run j** with **treatment half** in percent, as calculated in 8.2.4;

n is the number of **test runs** per **treatment half** ($n = 4$).

- d) The average value for the **final moisture content** $\mu_{f,ave}$ for the combined **test series** is expressed in percent, calculated as follows and rounded to one decimal place:

$$\mu_{f,ave} = (3 \times \overline{\mu_{fdry}} + 4 \times \overline{\mu_{fdry1/2}}) / 7$$

where

$\overline{\mu_{fdry}}$ is the average **final moisture content** for **treatment full** in %;

$\overline{\mu_{fdry1/2}}$ is the average **final moisture content** for **treatment half** in %. $\overline{A_{12}}$

ZA.6 Data to be reported

ZA.6.1 General

ZA.6 presents the data to be reported for the **tumble dryer**.

The layout of Tables ZA.2 to ZA.5 is only a recommendation.

Title: “**Test Report to EN 61121**” (state date of issue and reference the amendments that have been introduced)

ZA.6.2 Data for tumble dryer**Table ZA.2 – Data for tumble dryer**

Laboratory name and address:	
Laboratory test report id:	Laboratory sample id:
Brand:	Model name:
Model number:	Serial number:
Source of appliance:	Country of manufacture:
Purchase date of appliance:	
<u>Appliance dimensions declared (cm)</u>	<u>Appliance dimensions measured (cm)</u>
Height:	Height:
Width:	Width:
Depth:	Depth:
Drum volume (l): ^a	Drum volume (l): ^a
<u>Rated capacity (kg)^a</u>	
Cotton:	Synthetics/blends:
<u>Design</u>	
Axis (vertical / horizontal):	Loading (top / front):
Air vented (yes / no):	Condenser (yes / no):
Automatic (sensor-controlled) (yes / no):	Timer controlled (yes / no):
Cold water connections ^a (yes / no):	
Rated voltage (V):	Rated frequency (Hz):
Additional information (for example, include here if applicable, reasons why the test had to be stopped before completion and state if the nominal test load mass is not equal to the rated capacity):	
Page number:	Number of pages in this report:
^a As applicable	

ZA.6.3 Data, parameters and results for the test series

Table ZA.3, Table ZA.4 and Table ZA.5 shall be reported for a **test** used to determine the performance of a **tumble dryer** when applying the combined test procedure using a cotton **test load**.

Table ZA.3 – Data, parameters and results for the tumble dryer

Laboratory name and address:											
Laboratory test report id:								Laboratory sample id:			
Preparation before the test series		Description of measures of service and cleaning done									
		Number of drying cycles done									
Programme setting											
Treatment	symbol	unit	noted (n) measured (m) calculated (calc)	reported accuracy	half part A		half part B		full part A + part B		
					1	2	3	4	5	6	7
Test runs											
Date of test run		yyyy.mm.dd	n								
Conditioned test load mass	W_0	g	calc	1							
Mass of test load after wetting	W_{ij}	g	n	1							
Nominal initial moisture content	μ_{i0}	%	n	0,1							
Initial moisture content	μ_{ij}	%	calc	0,1							
Final load mass	W_{ff}	g	m	1							
Nominal final moisture content	μ_{f0}	%	n	0,1							
Final moisture content	μ_{ff}	%	calc	0,1							
Measured energy consumption	E_{mj}	kWh	m	0,01							
Corrected energy consumption	E_j	kWh	calc	0,01							
Specific energy consumption	E_{sj}	kWh/kg	calc	0,001							
Measured programme time	t_{mj}	min	m	1							
Corrected programme time	t_j	min	calc	1							
Specific programme time	t_{sj}	min/kg	m	0,1							
Measured water consumption ^a	L_{mj}	l	m	1							
Corrected water consumption ^a	L_j	l	calc	0,1							

Specific water consumption ^a	L_{sj}	l/kg	calc	0,1							
Initial mass of the condenser reservoir ^a		g	m	1							
Final mass of the condenser reservoir		g	m	1							
Mass of water collected ^a	W_{wj}	g	m	1							
Condensation efficiency	C_j	%	calc	0,1							
Ambient temperature		°C	m	0,1							
Ambient humidity		%	m	1							
Page number:							Number of pages in this report:				
^a shall only be declared when applicable $\sqrt{A_{12}}$											

Table ZA.4 – Data, parameters and results for the low power mode measurements

 Laboratory						
Checked / approved by						
Dryer identification						
Internal test identifier						
Programme and options selected						
	Symbol (refer to 3.2)	Symbol as given in regulation	Unit	Noted (n) Measured (m) Calculated (calc)	Reported precision (note 1)	Result
General						
Date of test run	-	-	yyyy.mm.dd	n	-	
Is off mode available?	-	-	-	n	Yes/No	
Is standby mode available?	-	-	-	n	Yes/No	
If standby mode is available, does it include the display of information or status?	-	-	-	n	Yes/No	
Is delay start available?	-	-	-	n	Yes/No	
If delay start is available, is delay start possible for more than 24h?	-	-	-	n	Yes/No	
Is network connection(s) available?	-	-	-	n	Yes/No	
If network connection(s) is available, is activation and deactivation of the network connection(s) possible?	-	-	-	n	Yes/No	

If network connection(s) is available, is network connection(s) deactivated by default?	-	-	-	n	Yes/No	
Is the machine automatically switching to off mode or standby mode within 15 min?	-	-	-	n	Yes/No	
Measurements						
Power consumption in ' off mode ' (if applicable)	P_o	P_o	W	m	0,01	
Power consumption in ' standby mode ' (if applicable)	P_{sm}	P_{sm}	W	m	0,01	
Description of appliance interaction(s) and optional programme run(s)						
— If delay start is available, power consumption in ' delay start '	P_{ds}	P_{ds}	W	m	0,01	
Power consumption in ' standby mode ' in condition of network standby (if applicable)	P_{nsm}	P_{nsm}	W	m	0,01	
Description of delay start setting and selected programme						
NOTE The figures for reported precision specify the rounding and reporting of values. As an example, a reported precision of 0,001 means that the result is reported rounded to 3 decimal places. A12						

Table ZA.5 – Performance results of the tumble dryer

A12 Laboratory name and address:					
Laboratory test report id:			Laboratory sample id:		
Programme setting					
Reason for extra test run (if applicable)					
	symbol	unit	reported accuracy	average	standard deviation
Average of the final moisture of all test runs	$\mu_{f,ave}$	%	0,1		
Average of the final moisture of all test runs at treatment full	μ_{fdry}	%	0,1		
Average of the final moisture of all test runs at treatment half	$\mu_{fdry1/2}$	%	0,1		
Weighted energy consumption per cycle of the eco programme	E_{tC}	kWh	0,01		
Average of the corrected energy consumption of all test runs at treatment full	E_{dry}	kWh	0,01		
Average of the corrected energy consumption of all test runs at treatment half	$E_{dry1/2}$	kWh	0,01		
Weighted programme time of the eco programme	t_t	h:mm	1 min		

Average of the programme time of all test runs at treatment full	t_{dry}	h:mm	1 min		
Average of the programme time of all test runs at treatment half	$t_{dry1/2}$	h:mm	1 min		
Weighted corrected water consumption of the eco programme	L_t	l	0,1		
Average of the corrected water consumption of all test runs at treatment full	L_{dry}	l	0,1		
Average of the corrected water consumption of all test runs at treatment half	$L_{dry1/2}$	l	0,1		
Weighted condensation efficiency of the eco programme	C_t	%	0,1		
Average of the condensation efficiency at treatment full	C_{dry}	%	0,1		
Average of the condensation efficiency at treatment half	$C_{dry1/2}$	%	0,1		
Standard energy consumption per cycle	SE_C	kWh	0,01		
Energy Efficiency Index	EEI	-	0,1		

NOTE For single **treatments**, the standard deviation follows ZA.5.2 c). $\sqrt{\frac{A_{12}}{12}}$

ZA.6.4 Additional information to be reported

The number of items included in part A and part B of the **test load** shall be reported.

Test Conditions and materials used for the **test series** shall be reported for the **tumble dryer** according to Table D.3.

The age distribution of the **test load** shall be reported according to Table D.4.

Annex ZB (normative)

Multi-drum tumble dryers

ZB.1 Rated capacity for multi-drum tumble dryer

Where neither the **combined rated capacity** nor the individual drums **rated capacity** information is available, the **test load** shall be determined in accordance with Annex E for each individual drum.

Where information of the **combined rated capacity** is available, but no information of individual drums **rated capacity** is available, the **test load** capacity for each drum shall be calculated based on the **combined rated capacity** and split based on the ratio of drum volumes determined in accordance with Annex E.

ZB.2 Tests for performance

ZB.2.1 General

A **multi-drum tumble dryer** can have drums, that can be operated separately in the **eco programme** and/or drums that can be operated only in **multi-drum mode** in the **eco programme**.

All drums, that can be operated separately in the **eco programme** are tested and assessed separately.

All drums, that can only be operated in **multi-drum mode** in the **eco programme** are tested together in the **multi-drum mode**. For these drums, all requirements of this annex shall be applied.

The assessment of **final moisture content** of a **multi-drum tumble dryer** shall be done for each drum separately using the **simultaneous programme**.

The assessment of **combined programme time**, combined energy consumption, combined water consumption and condensation efficiency shall be done from the initiation of the **simultaneous programme** for two or more drums until the end of the **simultaneous programme**.

ZB.2.2 Test procedure for performance tests

ZB.2.2.1 Preparation of the test multi-drum tumble dryer after installation

For **multi-drum tumble dryer** each individual drum shall be prepared in accordance with 6.2, 6.3 and 6.4.

Pre-conditioning of the **tumble dryer** shall be made in accordance with 8.4.2.

ZB.2.2.2 Test load and loading

The **nominal test load mass** shall be selected for each **test series** and for each drum individually.

Each drum of the **test tumble dryer** shall be loaded in accordance with the requirements of Clause 8.2.4.

ZB.2.2.3 Test procedure

Within 5 min after the completion of the programme at an individual drum, remove the test load. For the evaluation of the final moisture content each drum shall be tested in accordance with the requirements of 8.2.4, and the values for each drum shall be recorded separately.

ZB.2.2.4 Test series

The complete **test run** shall be considered invalid if the run of at least one working drum is invalid. It is permitted to conduct an eighth **test run** in accordance with specifications in 8.2.5 and 8.2.6.

ZB.3 Assessment of performance of a multi-drum tumble dryer

ZB.3.1 General

All assessment shall be done for each drum individually.

The principle for performance evaluation is to measure the parameters for each drum (to ensure compliance with minimum performance requirements if any) and then combine the individual ratings to give an overall appliance performance rating. This will be detailed in each relevant part of this section.

ZB.3.2 Evaluation of the final moisture content

The **final moisture content** is evaluated and reported for each drum.

ZB.3.3 Evaluation of condensation efficiency

The combined **condensation efficiency** within a **combined programme** shall be calculated by the ratio of the sum of collected water from all drums divided by the sum of water evaporated in all drums. The evaluation of the **condensation efficiency** follows the assessments in accordance with 9.6 and ZA.5.3.

ZB.3.4 Evaluation of water and energy consumption and programme time

ZB.3.4.1 General

The combined water and energy consumption and **combined programme time** shall be evaluated using the measurements determined in 8.3.

ZB.3.4.2 Combined water volumes

Combined water consumption for the **simultaneous program** shall be expressed in litres, and rounded to the nearest 0,1 l. The evaluation of the **water volume** follows the assessments in accordance with 9.4 and ZA.5.4.

ZB.3.4.3 Combined programme time

Combined programme time for a **test run** is the duration between start of the **simultaneous programme** and the **end of the programme** of the latest finished drum.

For each **treatment** the average **programme time** is calculated. The evaluation of the **programme time** follows the assessments in accordance with 9.5 and ZA.5.5.

ZB.3.4.4 Combined energy consumption

The **combined energy consumption** over a **simultaneous programme** is the sum of the electrical energy. The evaluation of the energy consumption follows the assessments in accordance with 9.3, ZA.5.6 and ZA.5.9. $\overline{A_{12}}$

Annex ZC (normative)

Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
 IEC 60335-2-11 (mod)	2008	Household and similar electrical appliances - Safety - Part 2-11: Particular requirements for tumble dryers	EN 60335-2-11	2010
			+ 11	2012
			+ 1	2015
			+ 2	2018
IEC 60456 (mod)	2010	Clothes washing machines for household use - Methods for measuring the performance	EN 60456	2016
			+ 12	2023
IEC 60734	2012	Household electrical appliances - Performance - Water for testing	EN 60734	2012
IEC 62053-21	2003	Electricity metering equipment (a.c.) - Part 21: Static meters for active energy (classes 1 and 2)	EN IEC 62053-21	2021
			+ 11	2021
IEC 62301 (mod)	2011	Electrical and electronic Household and office equipment - Measurement of low power consumption	EN 50564	2011
ISO 5167-1	2003	Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements	EN ISO 5167-1	2022
ISO 80000-1	2009	Quantities and units – Part 1: General	EN ISO 80000-1	2022 

Annex ZD (normative)

Low power modes for tumble dryers

ZD.1 General

Annex ZD sets out the determination of **off mode**, **standby mode**, **networked standby** and **delay start** mode. The first three are steady-state modes that can persist for an indefinite period, while **delay start** mode is a short duration mode associated with active mode (selection and use of a particular **programme**). These are the only four low power modes considered in this annex. Other low power modes can exist in some **tumble dryers**, but for the current designs of **tumble dryers**, these are not considered important in terms of duration and energy consumption.

Where low power modes are determined, they shall be determined in accordance with Annex ZD.

Ensure that the following conditions remain relevant for the duration of the measurement:

- manufacturer's instructions regarding installation, operating and settings of the **tumble dryer** (as applicable) are followed;
- The appliance shall be connected to mains power for the duration of the test;
- no adverse warning indicators are present (some lights or indicators can be active in this mode);
- follow manufacturer's instructions regarding the configuration of **network** connectivity of the **tumble dryer** (where applicable);
- ensure that the **network** is connected to the **tumble dryer** (when required)
- after each appliance interaction wait at least 15 min before commencing with measurements;
- no interference during measurements by any interaction.

Some **tumble dryers** can require software updates at first time use to ensure secure **network** operations. It is recommended to allow for those updates to be installed and to make a note of it in the test report. Updates can occur or can be requested after activation of **network** capability and can impact energy during measurement.

Power measurements for **off mode**, **standby mode**, **standby mode** in condition of **networked standby** and **delay start** mode shall be made in accordance with the requirements of EN 50564:2011 and EN IEC 63474:2023. However, subclause 5.3. (procedure) and the requirement defining air speed in subclause 4.2 of EN 50564:2011 shall not apply.

Details related to the measurement procedure can be found in Table ZD.1 describing the test procedure for different types of appliances depending on provided functionalities. The average power is measured in watts and rounded to two decimal places.

The required power consumption can be determined either by measuring the power consumption directly for a certain period of time (not less than 10 min). The data shall be recorded at regular intervals of 1 s or less throughout the test using a data logger or computer. The average power is given in watts and rounded to two decimal places.

Alternatively, the energy consumption can be measured for a certain period of time (not less than 10 min) and the power consumption shall be calculated by dividing the measured energy consumption (measured in Wh) by the duration of the measurement (in h). The calculated power is given in watts and rounded to two decimal places.

Manufacturers or suppliers can have information on the design and operation of their **tumble dryers** which would allow an accurate determination of these modes through methods other than the methods specified below. For the purposes of declaration, a manufacturer or supplier can use any method which gives an

equivalent result to the methods specified below. For verification purposes, the methods specified below take precedence over any other determination.

Tumble dryers with a **power management system** switch automatically to **off mode** or **standby mode** after a certain period of time following appliance interaction. Relevant appliance interaction to be considered for measurement are:

- after the household **tumble dryer** has been switched on, or
- at the end of any **programme** and associated activities and after interruption of the **wrinkle guard function** (if applicable), or
- after any interaction, directly (i.e. physical) or indirectly (e.g. remote user interface with the household **tumble dryer**), or
- if no other mode, including emergency measures, is triggered.

Appliance interactions during a **programme** or **cycle** shall not be considered for measurement.

NOTE An interaction with the appliance during a **programme/ cycle** (e.g. interruption, pause) bears the risk that foreseen **operations** of a **programme/ cycle** cannot be completed, resulting in insufficient primary functionalities.

The test report shall contain the description of the used appliance interaction.

The results of the measurements shall be reported in accordance with Table ZA.4 as given in Clause ZA.6.