



BSI Standards Publication

Electric clothes washer-dryers for household use — Methods for measuring the performance

National foreword

This British Standard is the UK implementation of EN IEC 62512:2020+A11:2020. It is derived from IEC 62512:2012. It supersedes BS EN 50229:2015, which is withdrawn.

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.

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Supersedes EN 50229:2015 and all of its amendments
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English Version

Electric clothes washer-dryers for household use - Methods for
measuring the performance
(IEC 62512:2012 , modified)

Lavantes-séchantes électriques à usage domestique -
Méthodes de mesure de l'aptitude à la fonction
(IEC 62512:2012 , modifiée)

Elektrische Wasch-Trockner für den Hausgebrauch -
Prüfverfahren zur Bestimmung der
Gebrauchseigenschaften
(IEC 62512:2012 , modifiziert)

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European foreword

The text of document 59D/403/FDIS, future edition 1 of IEC 62512, prepared by SC 59D "Performance of household and similar electrical laundry appliances" of IEC/TC 59 "Performance of household and similar electrical appliances" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62512:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-05-13
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-11-13

This document supersedes EN 50229:2015 and all of its amendments and corrigenda (if any).

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 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 Annex ZZ, which is an integral part of EN IEC 62512:2020+A11:2020.

Endorsement notice

The text of the International Standard IEC 62512:2012 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A11

This document (EN IEC 62512:2020/A11:2020) consists of the text of IEC 62512:2012 prepared by IEC/SD 59, "Home laundry appliances", together with the common modifications prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

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implemented at national level by publication of
an identical national standard or by
endorsement
- latest date by which the national standards (dow) 2023-10-21
conflicting with this document have to be
withdrawn

This document supersedes EN 50229:2015.

Significant technical differences are:

- a the definition of the loads to be tested in continuous, segmented and **interrupted operation cycles**;
- b the method for testing automatic and not automatic **operation** of the **drying cycles**;
- c the way to handle the load for **interrupted operation cycles**;
- d the correction to be applied to test results for continuous and **interrupted operation cycles**;
- e the definition of a procedure for a **segmented operation cycle** to simulate a continuous **wash and dry cycle**, if the machine does not offer those **programme** setting;
- f the test procedure for the performance measurements for **multi-drum** washer dryers according to EU energy label regulation.

This document also specifies, as far as necessary, the test method for household washing machines in accordance with the COMMISSION DELEGATED REGULATION (EU) 2019/2014 of 11 March 2019 supplementing Regulation 2017/1369 of the European Parliament and of the Council with regard to energy labelling of household washing machines and household **washer-dryers** and repealing Commission Regulation (EU) No 1061/2010 and Commission Directive 96/60/EC and in accordance with the COMMISSION REGULATION (EU) 2019/2023 of 1 October 2019 laying down ecodesign requirements for household washing machines and household **washer-dryers** pursuant to Directive 2009/125/EC of the European Parliament and of the Council, amending Commission Regulation (EC) No 1275/2008 and repealing Commission regulation (EU) No 1015/2010.

Clauses, notes, tables, figures and annexes which are additional to those in IEC 62512:2012 are prefixed "Z".

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 document.

This document has been prepared in view of the upcoming Standardization Request which will be given to CENELEC by the European Commission and the European Free Trade Association and supports Commission Delegated Regulation (EU) 2019/2014 and Commission Regulation (EU) 2019/2023.

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.

EN IEC 62512:2020+A11:2020 (E)

For the relationship with Commission Delegated Regulation (EU) 2019/2014 and Commission Regulation (EU) 2019/2023 informative Annex ZZA and Annex ZZB will be published following the adoption of the Standardization Request.

Endorsement notice

The text of the International Standard IEC 62512:2012 was approved by CENELEC as a European Standard with agreed common modifications.

Annex ZA (normative)

Test procedure for assessing the performance of a washer-dryer with respect to the eco 40-60 programme and with respect to the wash and dry complete operation cycle

ZA.1 General

ZA.1.1 Intent

The intent of the procedures as set out in this Annex is the determination of performance and related parameters for

- a) **Full load, half load and quarter load** for the **washing cycle** of a **washer-dryer**. Testing of the **washing cycle** of the **washer-dryer** shall be performed according to EN 60456:2016+A11:2020.
- b) **Full load and half load** for the **complete operation cycle** of a **washer-dryer**.

ZA.1.2 Complete operation cycle

ZA.1.2.1 Programme setting

The **programme** setting for the **complete operation cycle** shall be the **wash and dry cycle** as described in chapter 7.

ZA.1.2.2 Treatments

The **test series** to measure the performance and related parameters of the **wash and dry cycle** is defined as a **test series** of the **complete operation cycles** consisting of 2 **treatments** with 7 **test runs** in total, as follows:

- **treatment full: 3 test runs;**
- **treatment half: 4 test runs.**

The **reference washing machine** shall be operated in parallel using the defined load size of 5,00 kg with a **test series** of 5 **test runs** using the IEC Cotton 60 °C **programme**.

NOTE ZA.4.4 describes the parallel **operation** of the reference washing machine and the test **washer-dryer**.

ZA.1.2.3 Rounding

Rounding of calculated values shall be handled according to Clause 9.1.

If a value reported in ZA.6 is an intermediate required for use in the calculation of other values, then rounding shall only apply to the format of the intermediate in ZA.6; the rounding shall not apply prior to its use in subsequent calculations.

ZA.2 Preparation for testing: Test loads

The requirements for the preparation of the **full load** and **half load** used in the test **washer-dryer** and the **test load** used in the **reference machine** shall be in accordance with Clause 6 of EN 60456:2016 + A11:2020. All requirements of Clause 6.4 of EN 60456:2016 + A11:2020 are applied to define the **full load** for a **test series**. For the **test runs** with **half load** the **full load** shall be split into two parts. ZA.2 of EN 60456:2016 + A11:2020 defines the splitting of the **full load** into the two **half loads** (**part A** and **part B**).

ZA.3 Performance measurements – general requirements: Preparation of the test machine for a test series

The complete energy label test consists of 2 **test series**. One is the **eco 40-60 programme** and the other is the **wash and dry cycle**. The preparation of the test **washer-dryer** following Clause 6.2.1.3 of EN 60456:2016 + A11:2020 is applicable for both **test series** regardless which is the first in the performance test. For the **test series** of the **wash and dry cycle** additionally Clause 6.4 of EN 61121:2013 + A11:2019 shall be applied.

Performance parameters shall be measured for the **test machine** using two **test series** consisting of a total of 17 **test runs**.

In one **combined test series** with 3 **treatments** with 10 **test runs**, the performance of the **eco 40-60 programme** with **full load**, **half load** and **quarter load** shall be measured according to ZA.4 of EN 60456:2016 + A11:2020. The evaluation of these parameters for the **test machine** is specified in ZA.5 of EN 60456:2016 + A11:2020. The data to be reported for this **test series** are specified in ZA.6 of EN 60456:2016 + A11:2020.

In another **test series** with 2 **treatments** with 7 **test runs** the performance of the **wash and dry cycle** with full and half of the **rated washing-drying capacity** shall be measured as set out in ZA.4. The data to be reported for this **test series** are specified in ZA.6

For each **test series** performance parameters shall be measured for the **reference washing machine** using a single **test series** consisting of a total of 5 **test runs** as set out in Clause 8 of EN 60456:2016 + A11:2020. The order of **test runs** for the **reference washing machine** and for the test series of the **wash and dry cycle** is set out in clause ZA.4.4.

The evaluation of these parameters for the **reference washing machine** is specified in Clause 9 of EN 60456:2016 + A11:2020.

ZA.4 Procedure for performance tests

ZA.4.1 General

This Clause sets out the additional requirements for the test procedure defined in Clause 8. The following performance parameters (excluding power consumption in low power modes) shall be measured using a cotton load in a single **test series** for the **test machine**:

- washing performance (see ZA.4.5);
- drying performance (see ZA.4.6);
- energy consumption, water consumption and **programme time** (see ZA.4.7);
- power consumption of low power modes (see ZA.4.8);
- rinsing effectiveness (see ZA.4.9);
- temperature inside the load (see ZA.4.10).

For the assessment of the washing performance the results from the **test machine** are compared to the result from the **reference machine** which is operated in parallel.

ZA.4.2 Test load and loading

The test load composition and the loading sequence shall be in accordance to ZA 4.2 of EN 60456:2016 + A11:2020.

ZA.4.3 Programmes to be tested on the test washer-dryer

The **test runs** shall be carried out with a **programme** selection set out in the amendments to Clause 7 of this document.

The **reference programme** to be used on the **reference machine** shall be cotton 60 °C as defined on the **programme** memory card labelled EN 60456:2011, IEC 60456 Ed.5 or higher supplied by the manufacturer of the **reference machine**.

ZA.4.4 Order of test runs for the test washer-dryer and the reference machine

This procedure applies to the test **washer-dryer** and the **reference machine** which shall be run in parallel as explained below.

The following 7 **test runs** are required for the test **washer-dryer**:

- 4 **test runs** with **treatment half**;
- 3 **test runs** with **treatment full**.

For the **reference machine** 5 **test runs** cotton 60 °C (one test per day) with a 5,00 kg **test load** shall be carried out.

For the **test machine**, each part of **full load** and **half load** shall be used for 5 runs as follows:

Part A and **part B** shall be used twice with **treatment half** as shown in Figure ZA.1. **Part A** and **part B** together (i.e. the complete load) shall be used for 3 **test runs** with **treatment full**.

The detailed order of **test runs** is as follows:

Day 6:

- **Test run 11:** test washer dryer with **treatment half** using **part A**
- Test run 1** of the **reference machine** shall be carried out in parallel to **test run 11** of the **test washer dryer**.

Day 7:

- **Test run 12:** test washer dryer with **treatment half** using **part A**

Day 8:

- **Test run 13:** test washer dryer with **treatment half** using **part B**
- Test run 2** of the **reference machine** shall be carried out in parallel to **test run 13** of the **test washer dryer**.

Day 9:

- **Test run 14:** test washer dryer with **treatment half** using **part B**

Day 10:

- **Test run 15:** test washer dryer with **treatment full**
- Test run 3** of the **reference machine** shall be carried out in parallel to **test run 15** of the **test washer dryer**.

Day 11:

- **Test run 16:** test washer dryer with **treatment full**
- Test run 4** of the **reference machine** shall be carried out in parallel to **test run 16** of the **test washer dryer**.

Day 12:

- **Test run 17:** test washer dryer with **treatment full**

Test run 5 of the **reference machine** shall be carried out in parallel to **test run 17** of the test washer-dryer.

A schematic representation of the **test series** is set out in Figure ZA.1.

NOTE The numbering of the days is based on the assumption that the **test series** is started with the washing **test series** first and followed by the wash and dry **test series**. If the **test series** is started with the wash and dry **test series** followed by the washing **test series** then the day numbers should be adapted accordingly.

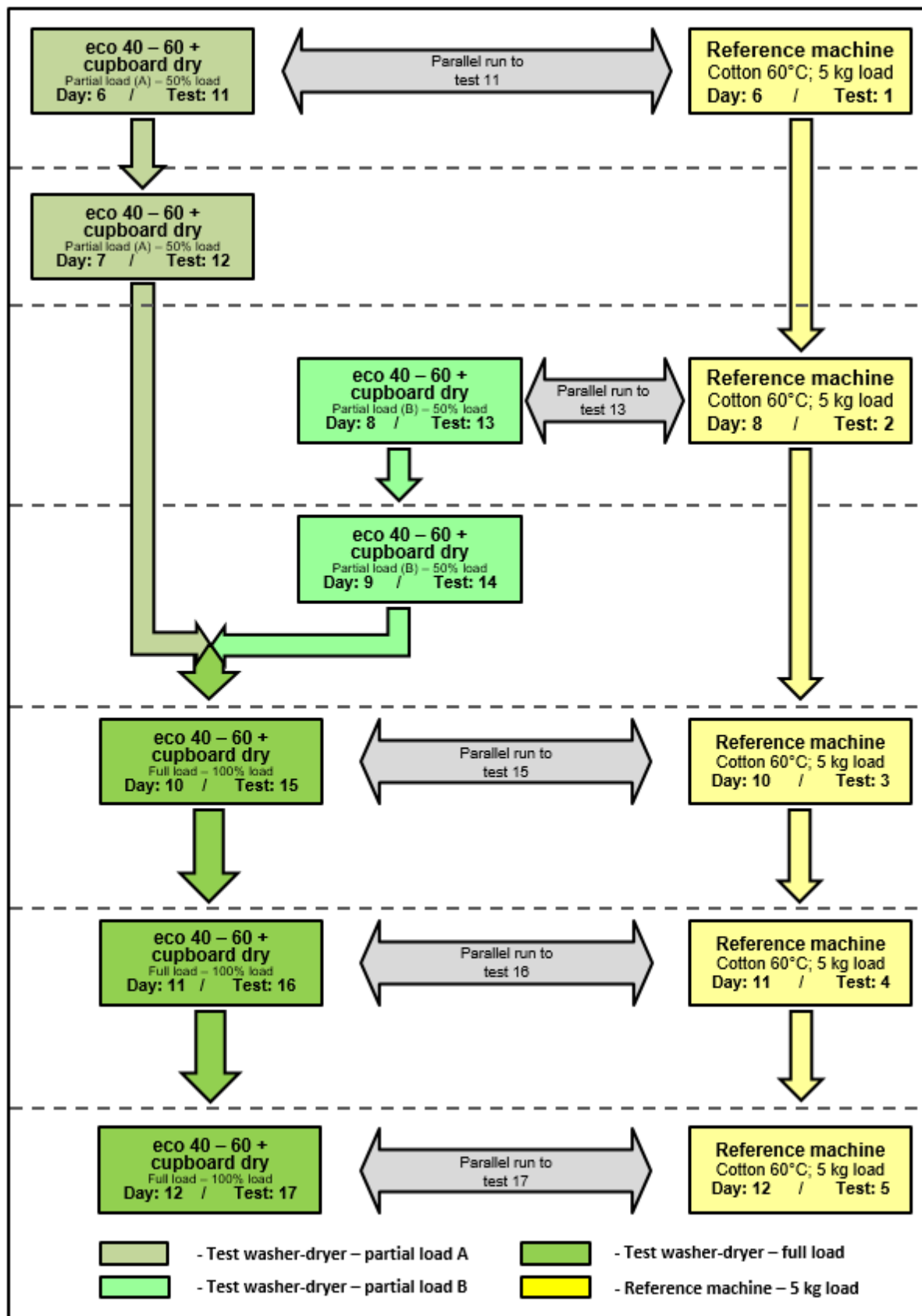


Figure ZA.1 — Test Series: load usage and order of test runs

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

A **test run** shall be considered to be invalid if one or more of the following occurs:

- laboratory conditions fail to remain within the tolerances specified in this document during the **test run**;
- laboratory test equipment or recording systems fail during the **test run**;
- the reference machine operated in parallel fails to perform within the tolerances specified in EN 60456:2016 + A11:2020 Annex D;
- a relevant test procedure specified in this document has not been followed correctly.

The maximum number of repeat **test runs** carried out on the reference machine in a **test series** shall be one. If more than one repeat **test run** is required on the reference machine due to invalid **test runs** then the **test series** for the machines concerned shall be invalid.

If an invalid **test run** occurs on the reference machine:

- on day 6, then that reference machine **test run** shall be repeated on day 7;
- on day 8, then that reference machine **test run** shall be repeated on day 9;
- on day 10 or 11 or 12, then that reference machine **test run** and all parallel **test runs** shall be repeated.

If an invalid **test run** occurs on a test machine then that test machine **run** shall be repeated in parallel with an additional **test run** on the reference machine.

If one or both of a pair of **half load test runs** (**part A** and **part B**) is invalid then both **test runs** shall be regarded as invalid and repeated with an additional **test run** on the reference machine parallel to one of the **half load test runs**. If the first of a pair of **half load test runs** is invalid, then the second **test run** of that pair shall still be carried out.

If an invalid **test run** is repeated, the repeat **test run** shall be carried out in the given sequence. For example, a **half load test run** shall not be repeated at the end of a **test series**.

If a **test run** is interrupted before the rinsing process is finished, then the base load shall be washed again in the **eco 40-60 programme** without detergent.

The reason for carrying out additional **test runs** shall be reported.

The results from any invalid **test runs** shall be eliminated completely from any subsequent evaluation. This includes in the case of **half loads** all **test runs** of a pair (**part A** and **part B**).

All **test runs** started shall be included when recording the age of the load.

A schematic representation of a **test series** is set out in Figure ZA.2.

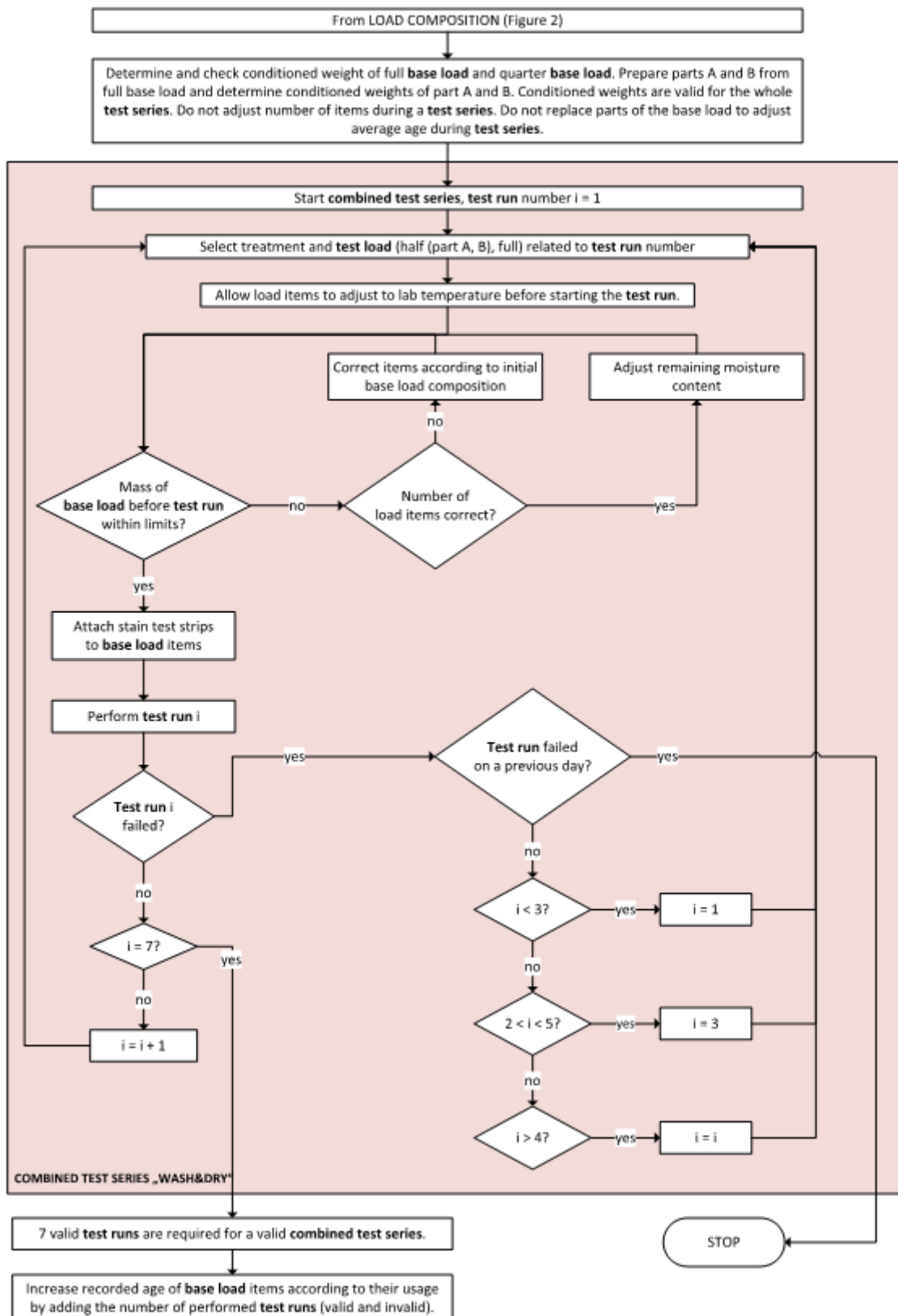


Figure ZA.2 — Test Series: process and decisions for load mass and age

ZA.4.5 Measurements to determine the washing performance

To assess washing performance, measurements shall be carried out as specified in Clause 8.3.3 of EN 60456:2016 + A11:2020 and ZA.4.5 of EN 60456:2016 + A11:2020.

ZA.4.6 Measurements to determine drying performance

The drying performance shall be expressed as the amount of moisture remaining in the **base load** at the end of the **drying cycle** relative to the conditioned mass of the same **base load**. The stain test strips are removed at the completion of the test **programme** as set out in Clause 7. The mass of the dried **base load** (of the complete load for **test runs** at **rated capacity** or of **part A** or **part B** for **test runs** at **partial load**) at the completion of the **programme** shall be recorded.

ZA.4.7 Measurements to determine water consumption, energy consumption of the programme and programme time

During the **test runs** instrumentation for the measurement of water volume, water temperature and electrical energy shall record the required parameters in accordance with ZA.4.8 of EN 60456:2016 + A11:2020 .

ZA.4.8 Measurement of power in low power modes

Measurement to determine the power in low power modes shall be in accordance with the requirements of ZA.4.9 of EN 60456:2016 + A11:2020.

ZA.4.9 Measurement to determine the rinsing effectiveness

Measurement to determine the rinsing effectiveness shall be in accordance with the requirements of CLC/TS 50677.

ZA.4.10 Measurement to determine the temperature inside the load

Measurement to determine the temperature inside the load shall be in accordance with the requirements of CLC/TS 50707:2019.

ZA.4.11 Procedure for segmented operation cycle

If the **washer-dryer** does not offer a continuous **wash and dry cycle**, at the end of the washing **programme** a drying **programme** according to Clause 8.3.3.1 shall be selected and the **washer-dryer** started again within 5 min.

The test strips shall not be removed from the **test load** until the drying **programme** is complete. At the end of the drying **programme** and when the **washer-dryer** has stopped, the load shall be removed within 5 min, the test strips shall be separated and the **base load** shall be immediately weighed.

ZA.5 Assessment of performance

ZA.5.1 General

This Clause 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 wash and dry **test series** for the **test machine**:

- evaluation of data (see ZA.5.2);
- washing performance (see ZA.5.3);
- **final moisture content** (see ZA.5.4);
- water consumption (see ZA.5.5);

- **programme time** (see ZA.5.6);
- energy consumption of the **programme** (see ZA.5.7);
- calculation of the Energy Efficiency Index (*EEI*) (see ZA.5.9).

For the evaluation of washing performance the result from the **test machine** is compared to the result from the **reference machine** which is operated in parallel.

Under no circumstances shall any data from an invalid **test run** in either the **test washing machine** or the **reference machine** be used for evaluation. For detailed definition of invalid **test runs** for the **test series** refer to ZA.4.4.

ZA.5.2 Evaluation of data

Test data from two **treatments** and 7 **test runs** in total shall be evaluated. It is required that the results from **test runs** within one **treatment** are averaged to yield a single test result per **treatment**. Where it is required, the results from each of the two **treatments** are averaged to yield a single test result. This Clause describes how the average value shall be calculated for each performance parameter.

- a) In addition to the evaluations described in the following Clauses, a statistical analysis shall be carried out. This Clause describes the procedure for the statistical analysis. The formulae in Clause 5 use the following abbreviations:

- *full* means **treatment full**;
- 1/2 means **treatment half**.

- b) The average value $\bar{x}_z$ of a **treatment** z shall be calculated as follows:

$$\bar{x}_z = \frac{1}{n_z} \sum_{i=1}^{n_z} x_{z,i}$$

where

- $x_{z,i}$ is the value of **test run** i for **treatment** z ($z = full, 1/2$);
- n_z is the number of **test runs** for **treatment** z ($z = full, 1/2$), with $n_{full} = 3$ for **full load** and $n_{1/2} = 4$ for **half load**.

- c) The standard deviation s_z for **treatment** z shall be calculated as follows:

$$s_z = \sqrt{\frac{\sum_{i=1}^{n_z} (x_{z,i} - \bar{x}_z)^2}{n_z - 1}}$$

where

- $\bar{x}_z$ is the average value for **treatment** z ($z = full, 1/2$);
- $x_{z,i}$ is the value of **test run** i for **treatment** z ($z = full, 1/2$);
- n_z is the number of **test runs** for **treatment** z ($z = full, 1/2$), with $n_{full} = 3$ for **full load** and $n_{1/2} = 4$ for **half load**;
- z is the **treatment** ($z = full, 1/2$).

- d) The weighted average value x of a **test series** shall be calculated as follows and rounded to the nearest integer number:

$$x = \frac{3 \times x_{full} + 2 \times x_{1/2}}{5}$$

where

x_{full} is the average value for **treatment full**;

$x_{1/2}$ is the average value for **treatment half**.

NOTE 1 This formula relates to weighted average value of water consumption (see ZA.5.5 b)) and weighted average value of energy consumption (ZA.5.7 b)).

- e) The weighted pooled standard deviation s of a **test series** shall be calculated as follows:

$$s = \sqrt{\frac{2 \times \left(\frac{3}{5} s_{full}\right)^2 + 2 \times \left(\frac{2}{5} s_{1/2}\right)^2}{5}}$$

where

s_{full} is the standard deviation for **treatment full**;

$s_{1/2}$ is the standard deviation for **treatment half**.

NOTE 2 This formula relates to weighted average value of water consumption (see ZA.5.5 b)) and weighted average value of energy consumption (ZA.5.7 b)).

ZA.5.3 Evaluation of washing performance

- a) The average value for the sum of the reflectance values C_z per **treatment** shall be calculated as follows:

$$C_z = \frac{1}{n_z} \sum_{i=1}^{n_z} C_{z,i}$$

where

$C_{z,i}$ is the sum of the average reflectance values (Y-values) of **test run i** for **treatment z** ($z = full, 1/2$), as calculated in 9.2 b);

n_z is the number of **test runs** for **treatment z** ($z = full, 1/2$), with $n_{full} = 3$ for **full load** and $n_{1/2} = 4$ for **half load**.

- b) The Washing Efficiency Index $I_{W,z}$ shall be calculated per **treatment** as follows:

$$I_{W,z} = \frac{C_z}{C_{ref}}$$

where

C_z is the average value for the sum of the reflectance values for **treatment z** ($z = full, 1/2$);

C_{ref} is the average sum of the reflectance values for the **reference machine** out of all **5 test runs** (as calculated in 9.2c of EN 60456:2016 + A11:2020).

- c) The washing efficiency index I_W for the **test series** shall be calculated as follows and rounded to two decimal places:

$$I_W = \min(I_{W,full}, I_{W,1/2})$$

where

$I_{W,1/2}$ is the washing efficiency index for **treatment half**;

$I_{W,full}$ is the washing efficiency index for **treatment full**.

ZA.5.4 Evaluation of final moisture content

- a) The **final moisture content** $\mu_{part,i}$ for each **test run** with **half load** (**part A** or **part B**) shall be expressed in % and calculated as follows:

$$\mu_{part,i} = \frac{m_{part,f,i} - m_{part,0}}{m_{part,0}} \times 100 \%$$

where

$m_{part,0}$ is the mass of the conditioned **half load** part ($part = \text{part A, part B}$) in g;

$m_{part,f,i}$ is the mass of the **half load** part ($part = \text{part A, part B}$) at the end of the **test run** i ($i = 1, 2, 3, 4$) in g.

The **final moisture content** $\mu_{full,i}$ for each **test run** with **full load** shall be expressed in % and calculated as follows:

$$\mu_{full,i} = \frac{m_{full,f,i} - m_{full,0}}{m_{full,0}} \times 100 \%$$

Where

$m_{full,0}$ is the mass of the conditioned **full load** in g;

$m_{full,f,i}$ is the mass of the **full load** at the end of the **test run** i ($i = 1, 2, 3$) in g.

- b) The average value for the **final moisture content** $\mu_{1/2}$ for **treatment half** shall be expressed in % and calculated as follows:

$$\mu_{1/2} = \frac{1}{4}(\mu_{A,1} + \mu_{A,2} + \mu_{B,3} + \mu_{B,4})$$

where

$\mu_{A,1}$ is the **final moisture content** of **test run 1** with **half load part A** in %;

$\mu_{A,2}$ is the **final moisture content** of **test run 2** with **half load part A** in %;

$\mu_{B,3}$ is the **final moisture content** of **test run 3** with **half load part B** in %;

$\mu_{B,4}$ is the **final moisture content** of **test run 4** with **half load part B** in %.

The average value for the **final moisture content** μ_{full} for **treatment full** shall be expressed in percent and calculated as follows:

$$\mu_{full} = \frac{1}{n_{full}} \sum_{i=1}^{n_{full}} \mu_{full,i}$$

where

$\mu_{full,i}$ is the **final moisture content** of **test run** i ($i = 1, 2, 3$) with **full load** in %;

n_{full} is the number of **test runs** for **treatment full**, with $n_{full} = 3$.

- c) The **final moisture content** μ for the **test series** shall be expressed in percent, calculated as follows and rounded to the nearest whole percent:

$$\mu = \max(\mu_{full}, \mu_{1/2})$$

where

$\mu_{1/2}$ is the average value for **final moisture content** for **treatment half** in %;

μ_{full} is the average value for **final moisture content** for **treatment full** in %.

ZA.5.5 Evaluation of water consumption

- a) The average value for the total water consumption V_z for each **treatment** shall be expressed in L and calculated as follows:

$$V_z = \frac{1}{n_z} \sum_{i=1}^{n_z} V_{z,i}$$

Where

$V_{z,i}$ is the total water consumption of **test run** i for **treatment** z ($z = full, 1/2$) in L;

n_z is the number of **test runs** for **treatment** z ($z = full, 1/2$), with $n_{full} = 3$ for **full load** and $n_{1/2} = 4$ for **half load**.

- b) The weighted average value for the total water consumption V for the **test series** shall be expressed in litres, calculated as follows and rounded to the nearest whole litre:

$$V = \frac{3 \times V_{full} + 2 \times V_{1/2}}{5}$$

where

V_{full} is the average water consumption for **treatment full** in L;

$V_{1/2}$ is the average water consumption for **treatment half** in L.

ZA.5.6 Evaluation of programme time

- a) The average value for the **programme time** t_z for each **treatment** shall be expressed in min and calculated as follows:

$$t_z = \frac{1}{n_z} \sum_{i=1}^{n_z} t_{z,i}$$

where

$t_{z,i}$ is the **programme time** of **test run** i for **treatment** z ($z = full, 1/2$) in min;

n_z is the number of **test runs** for **treatment** z ($z = full, 1/2$), with $n_{full} = 3$ for **full load** and $n_{1/2} = 4$ for **half load**.

ZA.5.7 Evaluation of energy consumption of the programme

- a) The total energy consumption of the **programme** for each **test run** shall be determined according to 9.1.

The average value for the total energy consumption W_z for each **treatment** shall be expressed in kWh and calculated as follows:

$$W_z = \frac{1}{n_z} \sum_{i=1}^{n_z} W_{z,i}$$

Where

$W_{z,i}$ is the total energy consumption of **test run** i for **treatment** z ($z = full, 1/2$) in kWh;

n_z is the number of **test runs** for **treatment** z ($z = full, 1/2$), with $n_{full} = 3$ for **treatment full** and $n_{1/2} = 4$ for **treatment half**.

- b) The weighted average value for the total energy consumption W for the **test series** shall be expressed in kWh, calculated as follows and rounded to three decimal places:

$$W = \frac{3 \times W_{full} + 2 \times W_{1/2}}{5}$$

where

$W_{1/2}$ is the average energy consumption for **treatment half** in kWh;

W_{full} is the average energy consumption for **treatment full** in kWh.

ZA.5.8 Calculation of the Energy Efficiency Index (EEI)

For the calculation of the Energy Efficiency Index EEI , the average total energy consumption W shall be compared to its Standard Cycle Energy Consumption SCE_c .

- a) The Standard Cycle Energy Consumption SCE_c shall be calculated in kWh as follows and rounded to three decimal places:

$$SCE_c = -0,0502 \times c^2 + 1,1742 \times c - 0,644$$

where

c is the **rated washing-drying capacity**.

b) The Energy Efficiency Index EEI shall be calculated as follows and rounded to one decimal place:

$$EEI = \frac{W}{SCE_c} \times 100$$

where

W is the weighted average energy consumption as calculated in ZA.5.7b in kWh;

SCE_c is the Standard Cycle Energy Consumption.

ZA.5.9 Calculation of the rinsing effectiveness

The **rinsing effectiveness** R_{max} for the **test series** shall be expressed in g/kg, calculated as follows and rounded to one decimal place:

$$R_{max} = \max(R_{full}, R_{1/2})$$

where

$R_{1/2}$ is the average ratio of mass of detergent per kg of load for **treatment half** in g/kg;

R_{full} is the average ratio of mass of detergent per kg of load for **treatment full** in g/kg.

ZA.6 Data to be reported

ZA.6.1 General

This Clause presents the data to be reported for the test **washer-dryer**. The data to be reported for the **reference machine** is the same as shown in Annex S of EN 60456:2016 + A11:2020.

The layout of the following tables is only a recommendation.

Title: "**Test Report to EN 62512**" (state edition and year issued)

ZA.6.2 Data for the test washer-dryer

The data for the test **washer-dryer** can be reported in Table ZA.15 of EN 60456:2016 + A11:2020.

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

For a **test series** used to determine the performance parameters of a test **washer-dryer** when applying the combined **test series** of the **eco 40-60 programme** with **full load**, **half load** and **quarter load** according to Annex ZA of EN 60456:2016 + A11:2020, the data shown in Table ZA.16, Table ZA.17 and Table ZA.18 of EN 60456:2016 + A11:2020 shall be reported.

For **test runs** carried out on the reference machine, the data shown in Table S.2a of EN 60456:2016 + A11:2020 shall be reported.

For a **test series** used to determine the performance of a test **washer-dryer** when applying the **test series** for the **wash and dry cycle** with **full load** and **half load** according to Annex ZA of this document, the data shown in Table ZA.19 and ZA.20 shall be reported.