# SLOVENSKI STANDARD
# SIST EN 60456:2016/A12:2023

**01-december-2023**

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**Gospodinjski pralni stroji - Metode za merjenje funkcionalnosti - Dopolnilo A12**

Clothes washing machines for household use - Methods of measuring the performance

Waschmaschinen für den Hausgebrauch - Verfahren zur Messung der Gebrauchseigenschaften

Machines à laver le linge pour usage domestique - Méthodes de mesure de l'aptitude à la fonction



**Ta slovenski standard je istoveten z:** **EN 60456:2016/A12:2023**

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**ICS:**

97.060 Aparati za nego perila Laundry appliances

**SIST EN 60456:2016/A12:2023** **en**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

**EN 60456:2016/A12**

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ICS 97.060

English Version

# Clothes washing machines for household use - Methods of measuring the performance

Machines à laver le linge pour usage domestique - Méthodes de mesure de l'aptitude à la fonction

Waschmaschinen für den Hausgebrauch - Verfahren zur Messung der Gebrauchseigenschaften

This amendment A12 modifies the European Standard EN 60456:2016; it was approved by CENELEC on 2023-06-29. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



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# European foreword

This document (EN 60456:2016/A12:2023) 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) 2024-04-27
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-10-27

This document introduces the following technical modifications:

a) The **programme** to be tested for the **combined test series** is the new introduced **eco 40-60 programme**. This **programme** needs to be tested with default settings with the given temperature.

b) The **test loads** that have to be used for testing are full, half and quarter of the **rated capacity** of the **washing machine**. Therefore, a new **quarter load** is introduced and defined to be approximately a quarter of the **rated capacity** (see Table ZA.15). The **quarter load** is treated as a separate load and not created by dividing **full load** or **half load**.

c) The number of **test runs** per **treatment** for the **combined test series** changed to 3 tests with **full load**, 4 tests with **half load** and 3 tests with **quarter load**.

d) The time between two subsequent **test runs** within one day changed from 2 h to one hour.

e) The normalization run is included in the calculation of the load age. The maximum number of usages for **base load** with a load mass greater or equal to 4.5 kg was changed to be between 35 and 60 normalization runs and test runs and the maximum number of usages for **base load** with a load mass less than 4.5 kg was changed to be between 30 and 67 normalization runs and test runs.

f) Annex ZE is integrated, which defines the test procedure for temperature inside the load.

g) Annex ZF is integrated, which defines the test procedure for rinsing effectiveness.

h) The procedure to measure low power modes is modified (see Annex ZD).

i) Specific weighting factors are introduced for the calculation of the weighted average value of the **combined test series**.

j) Annex ZB Tolerances and control procedures is deleted. Annex ZB is replaced by a new Annex ZB which defines the testing procedure for multi-drum **washing machines**.

k) A new standard powder detergent IEC-P is introduced (see Annex B), that substitutes the standard powder detergent IEC-A* by replacing the bleach component sodium perborate with sodium percarbonate due to Commission Regulation (EU) 2020/171 amending Annex XIV to Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). According to REACH Regulation Article 56, the substances which are listed in the Annex XIV cannot be used or placed on the market after the “sunset date”, unless the authorization is granted. Sodium perborate has a sunset date of 27th of May 2023 after having been classified as toxic to reproduction.

l) The tolerances for the remaining moisture content in Table E.2 are adapted, due to change in the commercially available material.

m) In normative clauses undated references were dated.

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.

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.

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.

## 1 Modification to Clause 2, “Normative references”

***Add*** *the following references:*

EN 60704-2-4:2012,[1] *Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 2-4: Particular requirements for washing machines and spin extractors*

EN 50564:2011, *Electrical and electronic household and office equipment - Measurement of low power consumption*

EN 50643:2018,[2] *Electrical and electronic household and office equipment - Measurement of networked standby power consumption of edge equipment*

## 2 Modification to Clause 3, “Terms, definitions and symbols”

***Add*** *the following table before 3.1.1:*

“

**Table 3.1 — Reference table for terms in alphabetical order**

| Term | subclause |
|---|---|
| **automatic machine** | 3.1.10 |
| **base load** | 3.1.18 |
| **combined cycle time** | 3.1.Z19 |
| **combined programme time** | 3.1.Z18 |
| **combined rated capacity** | 3.1.Z17 |
| **combined test series** | 3.1.Z10 |
| **Cycle** | 3.1.15 |
| **cycle time** | 3.1.25 |
| **delay start** | 3.1.Z22 |
| **eco 40–60** | 3.1.Z24 |
| **end of programme** | 3.1.24 |
| **full load** | 3.1.Z1 |
| **half load** | 3.1.Z2 |
| **horizontal axis washing machine** | 3.1.8 |
| **left on mode** | 3.1.29 |
| **main wash duration** | 3.1.26 |
| **manual washing machine** | 3.1.9 |
| **multi-drum mode** | 3.1.Z14 |
| **multi-drum washing machine** | 3.1.Z13 |
| **network** | 3.1.Z21 |
| **nominal test load mass** | 3.1.21 |



[1] As amended by EN 60704-2-4:2012/A11:2020.
[2] As amended by EN 50643:2018/A1:2020.

| Term | subclause |
|---|---|
| **off-mode** | 3.1.28 |
| **operation** | 3.1.13 |
| **part *A*** | 3.1.Z3 |
| **part *B*** | 3.1.Z4 |
| **programme** | 3.1.14 |
| **programme time** | 3.1.23 |
| **quarter load** | 3.1.Z5 |
| **rated capacity** | 3.1.22 |
| **rated voltage** | 3.1.30 |
| **reference machine** | 3.1.3 |
| **remaining moisture content** | 3.1.27 |
| **simultaneous cycle** | 3.1.Z16 |
| **simultaneous programme** | 3.1.Z15 |
| **spin extraction** | 3.1.16 |
| **spin extractor** | 3.1.5 |
| **spin speed** | 3.1.17 |
| **standard extractor** | 3.1.6 |
| **standby mode** | 3.1.Z20 |
| **test load** | 3.1.19 |
| **test load mass** | 3.1.20 |
| **test run** | 3.1.11 |
| **test series** | 3.1.12 |
| **test washing machine** | 3.1.2. |
| **Treatment** | 3.1.Z6 |
| **treatment full** | 3.1.Z7 |
| **treatment half** | 3.1.Z8 |
| **treatment quarter** | 3.1.Z9 |
| **vertical axis washing machine** | 3.1.7 |
| **washer-dryer** | 3.1.4 |
| **washing machine** | 3.1.1 |
| **wrinkle guard function** | 3.1.Z23 |

“

***Replace*** *the term 3.1.12 and terms 3.1.22 to 3.1.24 and 3.1.28 with the following:*

“

**3.1.12**
**test series**
repetitions of **test runs** with the same **treatment** which, collectively, are used to assess the performance for one **treatment**

**3.1.22**
**rated capacity**
maximum mass of dry textiles of a particular type which the manufacturer declares can be treated in the **test washing machine** on the **programme** selected

Note Z1 to entry: For **multi-drum mode washing machines** the **rated capacities** are for each individual drum.

Note Z2 to entry: For different textile types the **rated capacity** of a **multi-drum washing machine** is usually different.

**3.1.23**
**programme time**
time from the initiation of the **programme** (excluding any user programmed delay) until the end of the **programme**

Note Z1 to entry: If the **end of programme** is not indicated, the **programme time** is equal to the **cycle time**.

**3.1.24**
**end of programme**
the time when the **test washing machine** indicates the end of the **programme** and the load is accessible to the user

Note Z1 to entry: Where there is no **end of programme** indicator and the door is locked during **operation**, the **programme** is complete when the load is accessible to the user. Where there is no **end of programme** indicator and the door is not locked during **operation**, the **programme** is complete when the power consumption of the appliance drops to some steady-state condition and is not performing any function.



Note Z2 to entry: An indication of the end of the **programme** may be in the form of a light (on or off), a sound, an indicator shown on a display or the release of a door or latch. In some **washing machines** there may be a short delay from an **end of programme** indicator until the load is accessible by the user.

**3.1.28**
**off-mode**
condition in which the **test washing machine** is connected to the mains and is not providing any function



Note Z1 to entry: The following is also considered as **off mode**:

(a) conditions providing only an indication of off-mode;

(b) conditions providing only functionalities intended to ensure electromagnetic compatibility.

“

***Replace*** *terms 3.1.Z1 to 3.1.Z10 and terms 3.1.Z13 and 3.1.Z14 with the following:*

“

**3.1.Z1**
**full load**
**test load** used for a **combined test series** according to Annex ZA, having a nominal mass that is equal to the **rated capacity** of the **test washing machine**

**3.1.Z2**
**half load**
**test load**, **part *A*** or **part *B***, used for a **combined test series** according to Annex ZA, having a nominal mass that is approximately equal to a half of the **rated capacity** of the **test washing machine**

**3.1.Z3**
**part *A***
one half of the **full load**

**3.1.Z4**
**part *B***
remaining part of the **full load** excluding **part *A***

**3.1.Z5**
**quarter load**
**test load** used for a **combined test series** according to Annex ZA, having a nominal mass that is approximately equal to a quarter of the **rated capacity** (see Table ZA.15) of the **test washing machine**

**3.1.Z6**
**treatment**
combination of **test load** and **programme** to be used for a **test run** within a **test series**

**3.1.Z7**
**treatment full**
eco 40-60 programme with full load

**3.1.Z8**
**treatment half**
eco 40-60 programme with half load



**3.1.Z9**
**treatment quarter**
eco 40-60 programme with quarter load

**3.1.Z10**
**combined test series**
combination of **test series** with different **treatments** which, collectively, are used to assess the performance



**3.1.Z13**
**multi-drum washing machine**
**washing machine** equipped with more than one drum whether in separate units or in the same casing

**3.1.Z14**
**multi-drum mode**
**programme** where some or all of the drums of a **multi-drum washing machine** are operated simultaneously

Note Z1 to entry: A **washing machine** with more than one drum for the **treatment** of the textiles, where drums cannot be operated simultaneously is not regarded as having a **multi-drum mode**. In this case each drum has to be tested separately.

Note Z2 to entry: This definition may apply only for specific **programmes**. In this case only these **programmes** can be tested in **multi-drum mode**.

“

***Add** the following terms:*

“

**3.1.Z15**
**simultaneous programme**
series of **operations** which are pre-defined within the **multi-drum washing machine** and which are declared by the manufacturer as suitable for washing certain textile types in two or more drums at the same time

**3.1.Z16**
**simultaneous cycle**
complete washing process, started at the same time for two or more drums, as defined by the **simultaneous programme** selected, consisting of a series of **operations** (wash, rinse, spin, etc.) and including any **operations** that occur after the completion of the **simultaneous programme**

Note Z1 to entry: Examples of **operations** that may occur after the completion of the **programme** are pumping, monitoring and anti-creasing (where applicable).

**3.1.Z17**
**combined rated capacity**
sum of rated capacities of all drums suitable for running a **simultaneous programme**

**3.1.Z18**
**combined programme time**
the time from the simultaneous initiation of the **programme** for two or more drums (excluding any user programmed delay) until the end of the **simultaneous programme**

Note Z1 to entry: If the **end of programme** is not indicated, the **combined programme time** is equal to the **combined cycle time**.

**3.1.Z19**
**combined cycle time**
time from the simultaneous initiation of the **programme** for two or more drums (excluding any user programmed delay) until all activity ceases



Note Z1 to entry: Activity is considered to have ceased when the power consumption reverts to a steady-state condition that persists indefinitely without user intervention. If there is no activity after the end of the **programme**, the **combined cycle time** is equal to the **combined programme time**.

Note Z2 to entry: **Cycle time** includes any activity that may occur after the **programme** is completed. This could include any electronic activity or any additional mechanical activity that occurs for a limited period after any **end of programme** indicator. Any cyclic event that occurs indefinitely is considered to be steady-state.

**3.1.Z20**
**standby mode**
condition where the **test washing machine** is connected to the mains and provides only the following functions, which can persist for an indefinite time:

(a) reactivation function, or reactivation function and a mere indication of enabled reactivation function; and/or

(b) reactivation function through a connection to a **network**; and/or

(c) information or status display; and/or

(d) detection function for emergency measures

**3.1.Z21**
**network**
communication infrastructure with topology of links, an architecture, including the physical components, organizational principles, communication procedures and formats protocols

**3.1.Z22**
**delay start**
condition where the user has selected a specified delay to the beginning of the **cycle** of the selected **programme**

**3.1.Z23**
**wrinkle guard function**
**operation** of the **test washing machine** after completion of a **programme** to prevent excessive wrinkle building of the laundry

**3.1.Z24**
**eco 40-60**
name of the programme to be able to clean normally soiled cotton laundry declared to be washable at 40 °C or 60 °C, together in the same washing cycle

“

***Replace*** *3.2.Z1 with the following:*

“

**3.2.Z1 Symbols relating to Annex ZA, Annex ZD and Annex ZF**

| Symbol in this document | Symbol in IEC 60456: 2010 | Unit | Description | Clause (first appearance) |
|---|---|---|---|---|
| $\lceil\ \rceil$ | - | - | rounding up to full integer values (no decimal places) as defined in EN ISO 80000-2:2019 | ZA.2 |
| $\lfloor\ \rceil$ | - | - | Rounding to nearest integer values (no decimal places) as defined in EN ISO 80000-2:2019 | ZA.2 |
| $I_{W,z}$ | - | - | Washing Efficiency Index for **treatment** *z* (*z* = *full*, 1/2, 1/4) | ZA.5.4 |
| *A* | - | - | weighting factor for the full **rated capacity** | ZA.5.3.2 |
| $Asp_a$ | - | A | average absorbance | ZF.3.2.4 |
| $Asp_{avg,j}$ | - | A | average net absorbance for test run *j* | ZF.3.2.4 |
| $Asp_i$ | - | A | net absorbance for specimen *i* | ZF.3.2.4 |
| $Asp_{i,223}$ | - | A | absorbance reading at 223 nm for specimen *i* | ZF.3.2.4 |
| $Asp_{i,330}$ | - | A | absorbance reading at 330 nm for specimen *i* | ZF.3.2.4 |
| $Asp_m$ | - | A | peak absorbance at wavelength *m* | ZF.3.2.4 |
| $Asp_{r,m}$ | - | A | relative peak absorbance at wavelength *m* | ZF.3.2.4 |
| *B* | - | - | weighting factor for half of the **rated capacity** | ZA.5.3.2 |
| *C* | - | - | weighting factor for a quarter of the **rated capacity** | ZA.5.3.2 |
| *c* | - | kg | **rated capacity** to calculate the Standard Annual Energy Consumption of the **test washing machine** | ZA.5.3.2 |
| $c_j$ | - | mg/L | concentration of the detergent of test run *j* | ZF.3.3.5 |
| $c_{S1}$ | - | mg/L | concentration of Stock 1 solution | ZF.5.4 |
| $c_{S2}$ | - | mg/L | concentration of Stock 2 solution | ZF.5.5 |

| Symbol in this document | Symbol in IEC 60456: 2010 | Unit | Description | Clause (first appearance) |
|---|---|---|---|---|
| $c_{WSS}$ | - | mg/L | detergent concentration of working standard solution | ZF.5 |
| $C_{z,i}$ | - | - | sum of the average reflectance values (Y-values) for **treatment** *z* (*z* = *full*, 1/2, 1/4) for each **test run** *i* (*i* = 1, 2, 3, 4) | ZA.5.4 |
| $C_{ref}$ | $\overline{C}_{ref}$ | - | average sum of the reflectance values in each **test run** of the **reference machine** out of all 5 runs | ZA.5.4 |
| $C_z$ | - | - | average value for the sum of the reflectance values for **treatment full**, **treatment half** and **treatment quarter** | ZA.5.4. |
| $D$ | - | % | average value for the **remaining moisture content** for the **combined test series** | ZA.5.5 |
| $D_{1/2,part}$ | - | % | **remaining moisture content** of **test run** with **half load** part (*part* = **part *A***, **part *B***) | ZA.5.5 |
| $D_j$ | - | mg/g | mass of detergent recovered per gram of test swatches per test run *j* | ZA.3.3.5 |
| $DL_l$ | - | g/kg | ratio of mass of detergent per kg of load for the **test run** | ZA.6.2 |
| $R_{max}$ | - | g/kg | **rinsing effectiveness** for the **combined test series** | ZA.6.2 |
| $D_{z,i}$ | - | % | **remaining moisture content** of **test run** *i* for the **treatment** *z* (*z* = *full*, 1/2, 1/4) | ZA.5.5 |
| $e$ | - | - | slope of the detergent concentration curve | ZF.3 |
| $EEI$ | - | - | Energy Efficiency Index of a **test washing machine** | ZA.5.10 |
| $f$ | - | - | intercept of the detergent concentration curve | ZF.3.3.5 |
| $i$ | - | - | test run | ZE.5 |
| $k$ | - | - | data logger number | ZE.5 |
| $L_j$ | - | mg/g | ratio of mass of detergent and test swatch *j* | ZF.3.3.5 |
| $m$ | - | - | total number of data loggers | ZE.5 |
| $m_{det}$ | - | - | mass of detergent | ZF.5.4 |
| $m_1$ | - | - | mass of transferred Stock 1 solution | ZF.5.5 |
| $m_2$ | - | - | mass of transferred Stock 2 solution | ZF.5.6 |
| $m_j$ | - | g | weight of test swatch *j* | ZF.3.3.5 |
| $m_{w,j}$ | - | g | weight of water in sample *j* | ZF.3.3.5 |
| $M$ | $M$ | g | mass of the conditioned **base load** | ZA.6.2 |
| $M_{det}$ | $M_{det}$ | g | mass of detergent used | ZA.6.2 |
| $M_{dry}$ | $M_{dry}$ | g | mass of **base load** before each **test run** (without test strips) | ZA.6.2 |
| $Mn_{part}$ | - | kg | nominal partial **test load mass** | ZA.2 |

| Symbol in this document | Symbol in IEC 60456: 2010 | Unit | Description | Clause (first appearance) |
|---|---|---|---|---|
| $M_{part}$ | - | g | mass of the conditioned **half load** (*part* = **part *A***, **part *B***) | ZA.5.5 |
| $M_{r,1/2,\mathrm{part},i}$ | - | g | mass of the **half load** part (*part* = **part *A***, **part *B***) at the end of the **test run** *i* (*i* = 1, 2, 3, 4) | ZA.5.5 |
| $M_{r,z,i}$ | - | g | mass of **base load** for **treatment** *z* (*z* = *full*, 1/4) at the end of the **test run** *i* (*i* = 1, 2, 3) | ZA.5.5 |
| $n_{PC}$ | - | - | number of pillowcases at rated **test load mass** | ZA.2 |
| $n_{PC,A}$ | - | - | number of pillowcases in **part *A*** | ZA.2 |
| $n_{PC,B}$ | - | - | number of pillowcases in **part *B*** | ZA.2 |
| $n_{SH}$ | - | - | number of sheets at rated **test load mass** | ZA.2 |
| $n_{SH,A}$ | - | - | number of sheets in **part *A*** | ZA.2 |
| $n_{SH,B}$ | - | - | number of sheets in **part *B*** | ZA.2 |
| $n_{STS,A}$ | - | - | number of stain test strips in **part *A*** | ZA.2 |
| $n_{STS,B}$ | - | - | number of stain test strips in **part *B*** | ZA.2 |
| $n_T$ | - | - | number of towels at rated **test load mass** | ZA.2 |
| $n_{T,A}$ | - | - | number of towels in **part *A*** | ZA.2 |
| $n_{T,B}$ | - | - | number of towels in **part *B*** | ZA.2 |
| $n_z$ | - | - | number of **test runs** for **treatment** *z* | ZA.5.3 |
| *part* | - | - | **half load** identifier (*part* = **part *A***, **part *B***) | ZA.5.5 |
| $p_c$ | $p_c$ | kPa | laboratory supply water pressure cold | ZA.6.2 |
| $P_{ds}$ | - | W | power consumption in **delay start** | ZD.1 |
| $p_h$ | $p_h$ | kPa | laboratory supply water pressure hot (if connected) | ZA.6.2 |
| $P_{ns}$ | - | W | Power consumption in **standby mode** in condition of **network** standby | ZD.1 |
| $P_{om}$ | - | W | Power consumption in **off mode** | ZD.1 |
| $P_{sm}$ | - | W | Power consumption in **standby mode** | ZD.1 |
| $R$ | - | g/kg | rinsing effectiveness (average of all test runs) | ZF.3.3.5 |
| $R_j$ | - | g/kg | ratio of mass of detergent of test run *j* | ZF.3.3.5 |
| $R_{1/4}$ | - | g/kg | is the average value for **rinsing effectiveness** for **treatment quarter** | ZA.5.11 |
| $R_{1/2}$ | - | g/kg | is the average value for **rinsing effectiveness** for **treatment half** | ZA.5.11 |
| $R_{full}$ | - | g/kg | average value for **rinsing effectiveness** for **treatment full** | ZA.5.11 |
| $S_{1/4}$ | - | $\mathrm{min}^{-1}$ | maximum **spin speed** for **treatment quarter** | ZA.5.6 |
| $S_{1/2}$ | - | $\mathrm{min}^{-1}$ | maximum **spin speed** for **treatment half** | ZA.5.6 |
| $SCE_c$ | - | kWh | Standard Cycle Energy Consumption | ZA.5.10 |
| $S_{full}$ | - | $\mathrm{min}^{-1}$ | maximum **spin speed** for **treatment full** | ZA.5.6 |