SLOVENSKI STANDARD
SIST EN 60456:2016

01-maj-2016

Nadomešča:
SIST EN 60456:2011
SIST EN 60456:2011/AC:2011

Gospodinjski pralni stroji - Metode za merjenje funkcionalnosti

Clothes washing machines for household use - Methods for 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**

ICS:

97.060	Aparati za nego perila	Laundry appliances

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 60456

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ICS 97.060

Supersedes EN 60456:2011

English Version

Clothes washing machines for household use - Methods for measuring the performance (IEC 60456:2010 , modified)

Machines à laver le linge pour usage domestique - Méthodes de mesure de l'aptitude à la fonction (IEC 60456:2010 , modifiée)

Waschmaschinen für den Hausgebrauch - Verfahren zur Messung der Gebrauchseigenschaften (IEC 60456:2010 , modifiziert)

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CENELEC

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

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Contents

European foreword

This document (EN 60456:2016) consists of the text of IEC 60456:2010 prepared by 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 at national level by publication of an identical national standard or by endorsement (dop) 2016-12-14
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2018-12-14

This document supersedes EN 60456:2011.

Significant technical differences are:

a) the test procedure to measure power and energy consumption in left-on-mode and the referenced standard has been corrected; (Z.A. 4.9);

b) deletion of RMS and two sided confidence level formulas (Z.A. 5.2);

c) corrections in evaluation of water extraction performance (formulas) are integrated (Z.A. 5.4);

d) corrections in evaluation of spin speed (formulas) are integrated (Z.A. 5.5);

e) corrections in evaluation of power and energy consumption measurements in left-on-mode (formulas and references) are integrated (Z.A. 5.9);

f) Table ZA17: Correction of the reported precision;

g) Annex ZB is re-phrased;

h) the normative references in Annex ZC are updated;

i) new Annexes ZZA and ZZB.

This European Standard also specifies, as far as necessary, the test methods which shall be applied in accordance with the COMMISSION DELEGATED REGULATION (EU) No 1061/2010 implementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household washing machines and in accordance with the COMMISSION REGULATION (EU) No 1015/2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household washing machines.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60456:2010 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 European Standard.

Annex ZB has been re-phrased and provides control procedures for checking measured values in comparison to values declared by the manufacturer and taking into account any permitted tolerances.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports Commission Regulation (EU) No. 1015/2010 and Commission Delegated Regulation (EU) No. 1061/201.

For the relationship with Commission Regulation (EU) No. 1015/2010 and Commission Delegated Regulation (EU) No. 1061/201 see informative Annex ZZA and ZZB, which are integral parts of this document.

Endorsement notice

The text of the International Standard IEC 60456:2010 was approved by CENELEC as a European Standard with agreed common modifications.

COMMON MODIFICATIONS

2 Normative references

***Add** the following note:*

NOTE Z1 Normative references to the relevant European Standards are listed in Annex ZC (normative).

3 Terms, definitions and symbols

3.1 Terms and definitions

***Add** the following new definitions:*

3.1.Z1
full load
test load to be used for a combined **test series** according to Annex ZA, having a nominal mass that is equal to the greatest amount of cotton textiles that may be washed using the standard 60 °C cotton **programme** or the standard 40 °C cotton **programme**, as stated by the manufacturer in the instruction manual or on the energy label supplied with the **test washing machine**, whichever is higher

3.1.Z2
partial load
half of the **full load** for cotton textiles

3.1.Z3
treatment
combination of **test load** and **programme** to be used for a **test run** within a combined **test series**

3.1.Z4
treatment 60½
standard 60 °C cotton **programme** with **partial load**

3.1.Z5
treatment 40½
standard 40 °C cotton **programme** with **partial load**

3.1.Z6
treatment 60
standard 60 °C cotton **programme** with **full load**

3.1.Z7
unstable left on mode
condition after opening the door, at the end of the **programme** where the power consumption may change without any intervention by the end-user

3.1.Z8
post programme phases
phases after the end of **programme** defined to be used for the measurement of **left on mode**

3.1.Z9
post programme phase LU
phase after the end of **programme** defined to be used for the measurement of the **unstable left on mode**

3.1.Z10
post programme phase LO
phase after the end of **programme** defined to be used for the measurement of the **left on mode**

3.1.Z11
left on mode duration
time to revert automatically the machine to **off mode** after the end of the **programme** if the **test washing machine** is equipped with a **power management system**

3.1.Z12
power management system
system within the **test washing machine** which reverts it automatically to **off mode**

3.1.Z13
rated value
value declared by the supplier

Note 1 to entry: This may be a declared value and/or a ecodesign limit value. Declared values are the values required for the energy label and for the fiche.

3.1.Z14
limit value
rated value adjusted by the tolerance to give the maximum and/or minimum value to compare with the measured result

3.2 Symbols

Add *the following new symbols:*

3.2.Z1 Symbols relating to Annex ZA

$[\ ]$	rounding up/down to full integer values (no decimal places) as described in ISO 31-0
$\lfloor\ \rfloor$	always rounding up to full integer values (no decimal places)
$\lceil\ \rceil$	always rounding down to full integer values (no decimal places)
AE_c	Annual Energy Consumption (kWh)
AW_c	Annual Water Consumption (l)
c	rated capacity to calculate the Standard Annual Energy Consumption of the test washing machine
C_k	sum of the average reflectance values (Y-values) for each test run
$\overline{C_z}$	average value for the sum of the reflectance values for the treatments 40½ and 60½ with partial load
$\overline{C_{ref}}$	average sum of the reflectance values in each test run of the reference machine out of all 5 runs
$\overline{C_{60}}$	average value for the sum of the reflectance values for the treatment 60
$\overline{D}$	average value for the remaining moisture content for the combined test series (%)
D_i	remaining moisture content of test run i with full load (%)
$\overline{D\max}$	maximum remaining moisture (%)
$\overline{D_z}$	average value for the remaining moisture content for the treatments 40½ and 60½ with partial load (%)
$D_{z,part}$	is the remaining moisture content of test run with partial base load part (part = A, B) with treatment type z (z = 40½, 60½) in %
$\overline{D_{40\frac{1}{2}}}$	average for the remaining moisture content for treatment 40½ (%)
$\overline{D_{60\frac{1}{2}}}$	average value for the remaining moisture content for treatment 60½ (%)
$\overline{D_{60}}$	average value for the remaining moisture content for treatment 60 with full load (%)
EEI	Energy Efficiency Index of a test washing machine
i	test run

I_W	Washing Efficiency Index for the combined test series
$I_{W,z}$	Washing Efficiency Index for the treatments 40½ and 60½ with partial load
$I_{W\,40½}$	Washing Efficiency Index for treatment 40½
$I_{W\,60½}$	Washing Efficiency Index for treatment 60½
$I_{W,60}$	Washing Efficiency Index for the treatment 60
M	mass of the conditioned base load (g)
M_{det}	mass of detergent used (g)
M_{dry}	mass of base load before each test run (without test strips) (g)
$M_{r,i}$	mass of the base load at the end of the test run i (i = 1,2,3) (g)
M_{part}	mass of the conditioned partial load (Part A or Part B) (g)
$M_{r_{z,part}}$	is the mass at the end of the test run with partial base load part (part = A, B) with treatment type z (z = 40½, 60½) in g
Mn_{part}	nominal partial test load mass (kg)
n	number of test runs per treatment
$n_{A,PC}$	number of pillowcases in Part A
$n_{A,SH}$	number of sheets in Part A
$n_{A,STS}$	number of stain test strips in Part A
$n_{A,T}$	number of towels in Part A
$n_{B,PC}$	number of pillowcases in Part B
$n_{B,SH}$	number of sheets in Part B
$n_{B,STS}$	number of stain test strips in Part B
$n_{B,T}$	number of towels in Part B
n_{PC}	number of pillowcases at rated test load mass
n_{SH}	number of sheets at rated test load mass
n_T	number of towels at rated test load mass

$part$	partial load identifier (part = A,B)
p_c	laboratory supply water pressure cold (kPa)
p_h	laboratory supply water pressure hot (if connected) (kPa)
$P_{LU,z}$	value for the average power for the 2 post programme phases (LU and LO) for the treatments 40½, 60½ and 60 (W)
P_{LU}	average power during post programme phase LU (W)
P_{LO}	average power during post programme phase LO (W)
$P_{LO,z}$	average power during post programme phase LO per treatment (W)
P_{LX}	average value for left on mode power during post programme phase X for the combined test series (W)
$P_{LX\,40½}$	average power in post programme phase X for treatment 40½ (W)
$P_{LX\,60½}$	average power in post programme phase X for treatment 60½ (W)
$P_{LX\,60}$	average power in post programme phase X for treatment 60 (W)
P_O	average value for left on mode power for the combined test series (W)
$P_{O,z}$	average power in the off mode per treatment (W)
$P_{O40½}$	average energy consumption for treatment 40½ (W)
$P_{O60½}$	average energy consumption for treatment 60½ (W)
P_{O60}	average energy consumption for treatment 60 (W)
$r_{40½,60½,60}$	sum of squared residuals per treatment
r_x	residual per treatment
$\overline{S}$	average value for the maximum spin speed for the combined test series (rpm)
SAE_C	Standard Annual Energy Consumption (kWh)
S_i	maximum spin speed of test run I with treatment type p (p = 60) (rpm)
$\overline{S\,\max}$	lowest value for the maximum spin speed (rpm)
$\overline{S_z}$	average value for the maximum spin speed for the treatments 40½ and 60½ with partial load (rpm)

$S_{z,i}$	maximum spin speed of test run i with treatment type z (z = 40½, 60½) (rpm)
$\overline{S_{40\frac{1}{2}}}$	average maximum spin speed for the treatment 40½ (rpm)
$\overline{S_{60\frac{1}{2}}}$	average maximum spin speed for the treatment 60½ (rpm)
$\overline{S_{60}}$	average value for the maximum spin speed for the treatment 60 with full load (rpm)
s_x	standard deviation per treatment
Std_Y	standard deviation per test series
t_a	ambient temperature (test room) (°C)
t_c	measured average cold water inlet temperature (°C)
t_h	measured average hot water inlet temperature (°C)
t_i	programme time for test run i with treatment type z (z = 60) (min)
t_{mLU}	measurement time for post programme phase LU (min)
t_{mLO}	measurement time for post programme phase LO (min)
$t_{m,z}$	measurement time in off mode for each treatment (min)
t_{MW}	main wash duration (min)
$\overline{t_z}$	average value for the programme time for the treatments 40½ and 60½ with partial load (min)
$t_{z,i}$	programme time for test run i with treatment type z (z = 40½, 60½) (min)
$\overline{t_{40½}}$	average programme time for treatment 40½ (min)
$\overline{t_{60½}}$	average programme time for treatment 60½ (min)
$\overline{t_{60}}$	average programme time for treatment 60 (min)
$\overline{t_L}$	average value for left on duration (min)
$t_{L40½}$	left on duration for treatment 40½ (min)
$t_{L60½}$	left on duration for treatment 60½ (min)
t_{L60}	left on duration for treatment 60 (min)

t_t	average value for the programme time for the combined test series (min)
$t_{4,1-\alpha/2}$	“Student T” factor for 4 degrees of freedom for a confidence level of 95 %, is 2,776
V	pooled mean (weighted mean) per test series
V_{cm}	volume of cold water used during the main wash (l)
V_{hm}	volume of supply hot water used during the main wash (l)
V_{ct}	volume of cold water used in the test (l)
V_{ht}	volume of supply hot water used in the test (l)
V_i	total water consumption for test run i with treatment type p (p = 60) in min
V_m	water consumption during the main wash (l)
$V_{z,i}$	total water consumption for test run i with treatment type z (l)
$\overline{V_z}$	average value for the total water consumption for the treatments 40½ and 60½ with partial load (l)
$\overline{V_{60}}$	average value for the total water consumption for the treatment 60 with full load (l)
$\overline{V_{40½}}$	average water consumption for treatment 40½ (l)
$\overline{V_{60½}}$	average water consumption for treatment 60½ (l)
V_{total}	average value for the total water consumption for the combined test series (l)
$\bar{x}$	average value per treatment
x_i	value for each test run of the treatment
$\bar{x}_{40½,60½,60}$	average value per treatment
W_{et}	is the total electrical energy metered during the test (kWh)
$\overline{W_z}$	average value for the total energy consumption for the treatments 40½ and 60½ with partial load (kWh)
$W_{z,i}$	total energy consumption for test run i with treatment type z (z = 40½, 60½) (kWh)
W_i	total energy consumption for test run i with treatment type z (z = 60) (kWh)
$\overline{W_{60}}$	average value for energy consumption for treatment 60 (kWh)

$\overline{W_{40½}}$	average value for energy consumption for treatment 40½ (kWh)
$\overline{W_{60½}}$	average value for energy consumption for treatment 60½ (kWh)
$W_{total,cold}$	average value for total energy consumption without hot water (kWh)
W_{total}	average value for total energy consumption for the combined test series (kWh)
$W_{LU,z}$	energy consumption during post programme phase LU per treatment (Wh)
$W_{LO,z}$	energy consumption during post programme phase LO per treatment (Wh)
$W_{O,z}$	energy consumption in off mode per treatment (Wh)
z	treatment type

5 Test conditions, materials, equipment and instrumentation

5.1 General

Add

Rounding rules that are given in the regulation supersede standardization.

5.2 Ambient conditions

5.2.1 Electricity supply

Replace *the text under 5.2.1 as follows:*

The supply voltage to each **test washing machine** shall be maintained throughout the test at 230 V ± 1 % or at 400 V ± 1 % as defined by the manufacturer's installation guide. If more than one option for installation is available and no clear indication for testing is given, the supply voltage shall be 230 V ± 1 %. The supply voltage measured during the tests shall be recorded.

NOTE Z1 In the case of a fixed cable, the plug (or the end of the cable) is the reference point at which the supply voltage shall be maintained.

The supply frequency to each **test washing machine** shall be maintained at 50 Hz ± 1 % throughout the test.

5.2.2 Water supply

5.2.2.2 Water hardness

Add *after the first paragraph the following new paragraph:*

For the combined **test series** according to Annex ZA water with a total hardness of (2,5 ± 0,2) mmol/l (hard water) shall be used.

5.2.2.3 Water temperature

Add *after NOTE 1 the following new paragraph:*

For the combined **test series** according to Annex ZA the temperature of the hot water supply (if applicable) shall be set according to declaration given by the manufacturer (± 2 K) in the instruction manual. If no clear indication is given, the hot water supply temperature shall be set at (60 ± 2) °C.

When the manufacturer specifies a hot water temperature range, which includes (60 ± 2) °C, the hot water temperature shall be set at (60 ± 2) °C. When the manufacturer specifies a hot water temperature range, which does not include (60 ± 2) °C, the hot water temperature shall be set at the end of the temperature range which is closest to (60 ± 2) °C. When the manufacturer specifies a single temperature with a tolerance, then that temperature shall be used.

The hot and cold water inlet supply temperature (as applicable) shall be determined as close as possible to the point of connection of each **test washing machine** to the laboratory water supply system.

Add *at the end the following new paragraph and* ***replace*** *NOTE 2 as follows:*

For the combined **test series** according to Annex ZA the water supply system shall be configured so that the temperature of all water entering the inlet hose of the **test washing machine** is within specified tolerance with the exception of up to 250 ml of each increment. A temperature recording system shall record inlet water temperature at intervals of no less than once per second.

NOTE 2 Clause 8 requires water temperatures and volumes to be recorded on a continuous basis during filling in order to determine weighted average temperature.