

**WORKING DOCUMENT**  
**ON A POSSIBLE COMMISSION REGULATION**  
**IMPLEMENTING DIRECTIVE 2005/32/EC WITH REGARD TO**  
**HOUSEHOLD DISHWASHERS**

**Explanatory Notes**

**Rationale of the draft regulation**

**Scope**

The purpose of the implementing measure – in the following abbreviated as "IM" – is to set ecodesign requirements on the energy efficiency and other aspects of electric mains operated household dishwashers with the aim to reduce their environmental impact (as required in Article 16 of Directive 2005/32/EC). The IM applies also when appliances are sold for non-household use.

In order to cope with the very different amount of dishware, glassware, cutlery, and cooking utensils that machines can treat in a washing cycle this measure, which is based on the underlying preparatory study, uses a common functional unit represented by the 'place setting', that is a defined set of crockery, glass and cutlery for use by one person.

**Relation with unspecific ("horizontal") IMs**

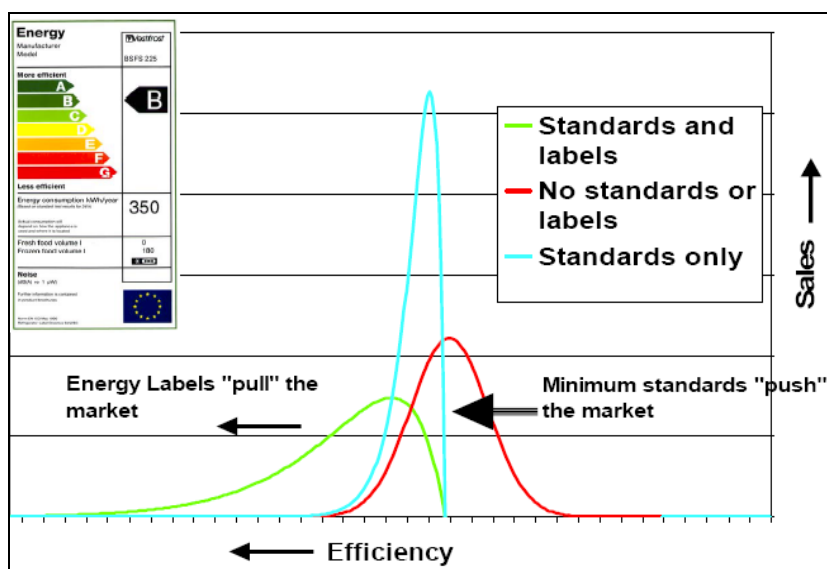
This product specific IM has relation with the horizontal standby power consumption Regulation, since it deals with two low power modes, namely 'off mode' and 'left on mode'. It is a common understanding, supported by the results of the preparatory study, that in dishwashers the off mode includes active sensor based protection function(s) to protect the user for example from accidental water leakage. The active presence of such function(s) is promoted in this measure to insure the highest level of consumer protection. The 'left on mode' is more typical of wash appliances and indicates the status when the programme has terminated and the machine has been unloaded but not switched off by a user intervention or automatically; again sensor based protection function(s) are active.

Since in this measure a new algorithm for the overall annual energy consumption is applied, including the energy consumption of the two most important low power modes (the "off mode" and "left on mode"), it is considered appropriate not setting additional specific requirements for these two modes. If no protection function(s) is active, then the standby Regulation applies and the modes are contemporarily subject to the specific requirements of the standby Regulation and considered in the overall annual energy consumption of dishwashers under this IM.

The measurement method referred into the standby Regulation is the basis for the evaluation of the duration and the power consumption of the two modes.

**Relation with other energy efficiency policy measures**

An effective coordination is necessary between this IM and the energy labelling scheme (under framework directive 92/75/EEC) for dishwashers. It is the intention that the two policies will share not only the basic definitions but also the algorithms for the calculation of the Energy Efficiency Index. In addition, the co-ordination of the dynamic steps and time horizon of the two policy measures will insure a synergic effect of the pushing effect of the eco-design specific requirements and the pulling effect of the new labelling energy efficiency scale, according to the qualitative but well experienced relation<sup>1</sup>:



## Mandatory requirements

The following aspects are addressed by generic and specific requirements:

- Specific requirements to be enforced in two steps starting one year after the entry into force of the measure:
  - minimum EEI levels (the lower the EEI, the higher the energy efficiency) for dishwashers with a number of place settings  $\geq 10$  or  $\leq 9$
  - minimum cleaning performance
  - minimum drying efficiency.
- Generic requirements, to be implemented two years after the enforcement of the measure:
  - specifications for the standard programme to be used for the purpose of the IM, including a common denomination as “Eco-programme”, its declaration in the booklet of instruction with the same name, and its setting as the default programme in dishwashers with an automatic programme selection or with the capability to maintain the selection of a given programme.

The preparatory study did not identify other significant environmental parameters to be dealt within an ecodesign measure. The LCA (life cycle analysis) performed in the

<sup>1</sup> IEA, P. Waide, International use of policy instruments: country comparisons, Copenhagen, 05 April 2006.

ecodesign preparatory study showed that, despite the significant achieved energy efficiency improvement and water consumption reduction, the use phase is still responsible for most of the environmental impact of this product group. As far as other environmental parameters of interest:

- hazardous materials in production are dealt within the RoHs Directive
- end-of-life wastes are addressed in the WEEE Directive
- noise and water consumption are addressed in the parallel labelling Directive for this product group along with other parameters.

### **Timing and revision:**

#### Stage 1 (One year after entry into force):

Setting efficiency requirements that would result in the phasing out of the machines with EEI beyond 71 (corresponding to about the threshold of the current class A). Setting cleaning performance index requirement  $>1,12$  (that will phase out all the machines which wash less well than the current class A).

The one year transition period after entry into force should allow industry to discontinue the production of less efficient models for the different technologies.

Stage 2 (two years after entry into force): Setting the generic requirements.

Stage 2 (Six years after entry into force): Setting efficiency requirements that would result in the phasing out the machines with EEI beyond 63 (corresponding to about the current class A). Setting drying efficiency requirements  $>1,08$  (that will phase out all the machines which dry less well than the current class C).

#### Revision

It is planned to examine the necessity to revise the measure, at the latest 7 years after adoption, that is after the second Stage will be implemented. This revision should be possibly developed in parallel with the revision of the labelling directive on household dishwashers.

### **Rationale for the mandatory requirements**

The aim is to improve the environmental impact of dishwashers through a Regulation setting ecodesign requirements and in particular mandatory energy efficiency requirements related to a maximum annual energy consumption including the most important low power modes. Additional generic requirement complement the specific ones to make the overall regulation even more effective. A strong co-ordination with the EU energy labelling scheme for the same product group is recommended to achieve a synergy between the two policy measures.

The use phase is mainly addressed through the specific requirements, since the LCA performed in the preparatory study demonstrated that this phase is still responsible for most of the environmental impact of this product group.

The specific ecodesign requirements are defined as function of the machine capacity (in terms of place settings). Two standard **annual energy consumption** reference lines are in fact used for the calculation of the EEI for the machine with 10 or more place settings

and the machine with 9 or less place settings. The alternative to adopt a unique reference line valid for all the capacities would have resulted in setting out the lowest common denominator, because the smaller compact machines have technological constraints that reduce or make more difficult the technological development, but depending on the application, the two machine dimensions are needed by the consumers.

The mandatory requirements will phase out the least efficient models, contemporarily leaving the room for the implementation of an effective revised energy labelling scheme. Taking into consideration the reduction in the measurement uncertainty and the new algorithm including low power modes, the specific requirements correspond to phase out the current class B models in one year time, but by 2016 almost all the models on the market in 2005 will be phase-out.

The contemporary setting of minimum requirements for **washing performance** and – five years later – for **drying efficiency** will assure that the reduction in the energy consumption is not achieved by a reduction in the dishwashers functional performances.

The generic requirement about the identification through a common name and a set of information for the standard programme used for the purpose of this measure and of the parallel labelling Directive is aimed at informing consumers that this programme is suitable for normal use, to clean normal soiled tableware and that it is the most efficient programme from the combined energy and water consumption point of view.

Finally benchmarks for energy efficiency, water consumption and noise are set for the two major product types of 12 and 9 place setting machines.

### **Verification procedure for market surveillance purposes**

European standard EN 50242/60346 describes a two-stage verification procedure which is used for the EU labelling scheme. This staged procedure is acceptable for the verification of this IM, but the values of the measurement uncertainty include the production variability, which is today considered as part of the overall equipment quality and therefore under manufacturers' responsibility, while the variability of the measurement method and in the testing shall remain under the responsibility of standardisation bodies and test laboratories.

The verification procedure for this measure foresees a set of lower uncertainty values than in the EN standard. For the moment a 10% measurement uncertainty has been established for the energy consumption for a single product while requiring that the average of the product sample under test (three more units) has to meet the limit EEI value with the same 10% uncertainty. The uncertainty values of the other parameters are set following the same principle of reduction of the measurement uncertainty. Only for the drying efficiency index a higher measurement uncertainty (19%) than in the current EN standard was defined on the basis of the latest available round robin test results.

This procedure will remain valid until a suitable harmonised standard is prepared by the relevant ESOs under a specific mandate issued by the Commission after the consultation with Member States and stakeholders.

## **Detailed explanation of the regulation**

Chapter 1: the scope of the IM is described, to cover electric mains operated household dishwashers also when they are sold for non-household use. The scope is then refined through some exemptions which exclude appliances operated by batteries and other energy sources.

Chapter 2: Definitions are provided for the terms used in the requirements set out in the Annexes. Some definitions have been set to complement those in EN 50242/60346, the reference standard for dishwashers in Europe, since for example low power modes are at present not addressed neither in the EN standard nor in IEC 60346 (the worldwide dishwasher standard) although under discussion for inclusion in a new revision.

Chapter 3 and 4: ecodesign requirements and indicative benchmarks are set with simple reference to Annex II and III, which contain the actual requirements and benchmarks.

Chapter 5: conformity assessment is recalled along with the elements to be included in the necessary technical documentation file.

Chapter 6: a verification procedure for market surveillance purposes already exists for dishwashers set out in a harmonised standard (EN 50242/60346), providing compliance with measurements under the dishwasher energy label directives 97/17/EC and 1999/9/EC. Through the provisions in this Chapter and in Annex IV, the verification procedure is made more rigorous by placing under the manufacturers' responsibility the uncertainty of the manufacturing process variability.

Chapter 7: the revision of the IM is foreseen no later than 7 years after its entry into force, just after the implementation of the second step of specific requirements, and possibly to the second step of the labelling scheme for this product group. This revision will evaluate the technological progress and the technical and economical feasibility of further specific requirements.

Chapter 8: deals with the entry into force of the IM and its applicability all Member States.

Annex I: sets out the mandatory requirements on dishwashers.

In **Part 1** generic requirements are set in terms of the conditions to be fulfilled by the standard cycle used for purpose of this ecodesign IM. It shall be (i) a programme recommended for normal use, to clean normal soiled tableware, (ii) clearly identifiable on the appliance programme selection device and named 'Eco-programme', (ii) the default machine programme for dishwashers equipped with an automatic programme selection/function or when the capability to maintain the selection of a given programme. In addition it shall be declared in the booklet of instructions along with information about its suitability to clean normal soiled tableware and that it is the most efficient programme from the combined energy and water consumptions point of view. This requirement will avoid that the most eco-friendly and performing programme of the dishwasher is not fully used by the consumers.

In **Part 2** specific requirements are set in terms of the minimum Energy Efficiency Index and functional performances that dishwashers shall fulfil with time. A two-step implementation of the minimum energy efficiency requirements is foreseen, the first Step one year after the enforcement of the measure, the second Step five years later (i.e. six years after the enforcement of the measure). The rationale for the mandatory requirements has been previously explained.

Annex II: includes the benchmarks for products belonging to the most important dishwasher types: the 9 place settings and the 12 place settings machines. The indicative benchmarks are set to inform about the existing room between the less efficient products and the most efficient ones, that can be used for other EU policy measures, such as the energy labelling - or for any national or local incentive programme.

Annex III: contains provisions on the verification procedure to be applied by the Member States' authorities when performing market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), and until a suitable harmonised standard is published for the purpose of this Annex and of following Annex VI.

Annex IV: contains the method for calculating the Energy Efficiency Index (EEI). EEI of dishwashers is the ratio between its estimated annual energy consumption and the standard annual energy consumption of a dishwasher with the same number of place settings, expressed as percentage, and rounded to one decimal place.

The estimated annual energy consumption of a dishwasher is given by the sum of the energy consumption for the standard washing cycle plus the energy consumption of the two most important low power modes, the 'off mode' and the 'left on mode'. To calculate this overall consumption the knowledge of the use pattern of the dishwashers is a prerequisite. The preparatory study found that today on average a dishwasher is used for 280 times in a year.

Once the duration (in minutes) of the standard washing cycle is known, through a test using the EU harmonised standard, the overall amount of time in a year spent for washing can be calculated. The remaining time is divided in two and each half is then allocated to each low power mode; this time multiplied by the power of each mode gives the energy consumption in the two modes. The attribution of an equal amount of time to each of the two considered low power modes has been successfully used in other policy measures at international level.

In case a power management operates in the dishwasher, automatically reverting the left on mode to off mode, also the time the machine remains in left on mode shall be measured, and the formula to be applied for the calculation of the overall annual consumption is slightly different. This approach will assure that when sensor based protection functions are active in the low power modes their energy consumption is kept to the real minimum. When they are not present the low power modes are subject to the standby Regulation requirements.

The Standard Annual Energy Consumption of dishwashers is a linear function of the place setting number. Two reference lines are used, for the machines with  $ps \geq 10$  and  $ps \leq 9$ , derived by the linear functions already used in the current energy labelling. The intercept and the angular coefficient have been adapted since the current labelling scheme is based on a per cycle energy consumption and not on an overall annual energy consumption.

Annex V: the measured parameters and the more technical terms used in the other Annexes are defined here. Measurements have to be reliable, accurate and reproducible. A mandate for the corresponding European harmonised standard will be issued to the European standardisation bodies after the consultation of Member States. When the new standard will be ready this Annex will be modified accordingly.

#### Other elements in the proposed IM

Rounding is indicated for all calculation steps: the cycle energy consumption ( $E_t$ ) is rounded to the three decimal places, the annual energy consumption and the standard annual energy consumption are rounded to two decimal places, the EEI value is rounded to one decimal place.

The mandatory presence of power management and of a hard switch have been considered. Under the assumption that the power consumption in the left-on-mode is higher than in off-mode, if a **power management** is implemented the energy savings (for the quicker auto-off of the machine) is proportional to the difference in the power consumption between the two modes and the time after which the auto-off takes place. The presence of the power management might allow manufacturers to design machines with a higher left-on-mode power, because it is reverted to the off-mode power in a short time. On the contrary, when no power management is present the power of both left-on-mode and off-mode should be minimised. If the two modes present the same power there is no scope in adopting a power management, which – all other conditions being equal – will only increase the manufacturing cost (and eventually the purchasing price) without any additional energy savings. Nevertheless, when no sensor based protection functions are active in low power modes, dishwashers fall under the standby consumption Regulation, which calls for the implementation of a power management function in few years.

As far as the mandatory presence of a **hard switch** is concerned, and although this requirement goes in the direction of the “zero consumption” (when the machine is physically disconnected from the mains there is no energy consumption) at which all appliances are aimed at, the real effectiveness of this requirement has to be considered taking into account the need of active sensor based protection function(s), which are deactivated when the appliance is disconnected from the mains, and in the light of the new energy efficiency algorithm considering the overall annual energy consumption including the low power modes. Under this algorithm, all the sources of energy consumption shall be minimised since all contribute to the annual energy consumption which will be regulated by the proposed specific requirements.

**Noise** is not addressed in this measure because the preparatory study demonstrated that there is a strong correlation between the noise reduction (through a better machine insulation) and a significant improvement of the energy consumption. Therefore it was considered more appropriate to address noise in the parallel labelling directive. The today dishwasher on the market have a noise at about 45-50 dB(A), but values can go down to about 41 dB(A) or up to about 55 dB(A).

#### Estimated energy savings

The combined effect of the ecodesign implementing measure and of the new energy

labelling scheme have been estimated in the preparatory study for the EU25 countries, compared to a reference BaU scenario foreseeing 100% of the models on market having an energy efficiency equivalent to the current A in 2015. For dishwashers the achievable savings are in the order of about 3,7% (or 1,3 TWh) in 2020, to reach a maximum of about 8% (or 3,8 TWh) in 2030, when the best performing (and still not available in the market) washing technologies are expected to dominate the market.



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*Chapter 1*  
*Subject matter and scope*

This implementing measure pursuant to Directive 2005/32/EC establishes eco-design requirements of electric mains operated household dishwashers also where these are sold for non-household uses.

Appliances that can use fuels (such as LPG, kerosene, bio-diesel, etc.) and are only battery operated are excluded.

*Chapter 2*  
*Definitions*

For the purposes of this Regulation, the definitions set out in Directive 2005/32/EC shall apply. The following definitions shall also apply:

1. “dishwasher” means a machine which cleans, rinses, and dries dishware, glassware, cutlery, and, in some cases, cooking utensils by chemical, mechanical, thermal, and electric means. A dishwasher may or may not have a specific drying operation at the end of the program.
2. “rated dishwasher capacity” means a whole number of place settings together with the serving pieces stated by the manufacturer, which can be cleaned and dried when loaded in accordance with the manufacturer’s instructions.
3. “place settings” means a defined set of crockery, glass and cutlery for use by one person.
4. “programme” means a series of operations which are pre-defined within the dishwasher and which are declared as suitable for specified levels of soil and/or type of load and together form a complete cycle.
5. “programme time” means the time measured from the initiation of the programme (excluding any user programmed delay) until an end of programme indicator and the user has access to the load. If there is no end of programme indicator, the programme time is equal to the cycle time.
6. “cycle” means a complete washing, rinsing, and drying process, as defined by the programme selected, consisting of a series of operations.

7. “off-mode” is a condition where the product is switched off using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a mains power source and used in accordance with the manufacturer’s instructions. Where there are no controls, the dishwasher is left to revert to a steady state power consumption of its own accord.

8. “left-on mode” is the lowest power consumption mode that may persist for an indefinite time after the completion of the programme and unloading of the machine without any further intervention of the user.

9. “equivalent dishwasher” means a model placed on the market with the same rated capacity, technical and performance characteristics, energy and water consumption and noise of another model placed on the market under a different commercial code number by the same manufacturer.

### *Chapter 3* ***Ecodesign requirements***

Dishwashers falling under the definitions of Chapter 2 shall meet the generic ecodesign requirements set out in **Annex I, Part 1** and the specific ecodesign requirements set out in **Annex I, Part 2**.

### *Chapter 4* ***Benchmarks***

The benchmarks for best-performing products and technology available on the market at the time of drafting this Regulation are of indicative nature and are identified in **Annex II**.

### *Chapter 5* ***Conformity assessment***

1. The procedure for assessing conformity referred to in Article 8(2) of Directive 2005/32/EC shall be the internal design control system set out in Annex IV of Directive 2005/32/EC or the management system set out in Annex V of Directive 2005/32/EC.

2. For the purposes of conformity assessment pursuant to Article 8 of Directive 2005/32/EC, the technical documentation file shall contain the elements required in **Annex V, Part 2** and the results of the calculation required in **Annex IV**.

Where the information included in the technical documentation file for a particular dishwasher model has been obtained by calculation on the basis of design, and/or extrapolation from other equivalent or similar dishwashers, the documentation should include details of such calculations and/or extrapolations, and of tests undertaken to verify the accuracy of the calculations undertaken (details of mathematical model for calculating performance and of measurements taken to verify this model). Information

shall also include a list of all other equivalent or similar dishwasher models whose information has been obtained on the same basis.

*Chapter 6*  
***Verification procedure for market surveillance purposes***

When performing the market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), Member State authorities shall apply the verification procedure set out in **Annex III** of this Regulation.

*Chapter 7*  
***Revision***

No later than [7] years after entry into force of this Regulation the Commission shall review it (including the annexes) in the light of technological progress and present the result of this review to the Consultation Forum.

*Chapter 8*  
***Entry into force***

This Regulation shall enter into force on the 20th day following that of its publication in the *Official Journal of the European Union*.

Annex II Part 2 specifies for each ecodesign requirement the period of time after the date referred to in the first paragraph following which the requirement applies.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,

*For the Commission*

*Member of the Commission*

**ANNEX I**  
**Ecodesign requirements**

**1. Generic ecodesign requirements**

[Two] years after this implementing measure has come into force:

a) the standard washing cycle to be used for the purpose of this ecodesign IM shall be:

- a cycle for normal use, to clean normal soiled tableware;
- clearly identifiable on the appliance programme selection device and/or the machine display, if any, and named “Eco-programme”;
- indicated in the booklet of instructions with the same name and with the specification that it is suitable for normal use, to clean normal soiled tableware and that it is the most efficient programme from the combined energy and water consumptions point of view;
- set as the default cycle for machines equipped with an automatic programme selection or any function allowing the automatic selection of a washing programme or to maintain the selection of a given programme.

**2. Specific ecodesign requirements**

The specific requirements include a minimum cleaning performance and drying efficiency and a maximum overall annual energy consumption in terms of the maximum Energy Efficiency Index (EEI) value that dishwasher models shall fulfil.

1) One year after this implementing measure has come into force:

- the EEI shall be lower than 71
- the cleaning performance index  $P_C$  shall be higher than 1,12.

2) [Six] years after this implementing measure has come into force, unless the progress of the market justifies otherwise:

- the EEI shall be lower than 63
- the drying efficiency index  $P_D$  shall be higher than 1,08.

The Energy Efficiency Index of a dishwasher shall be calculated in accordance with Annex IV.

## ANNEX II Benchmarks

The following indicative benchmarks are identified for the purpose of Annex I, part 3, point 2, of Directive 2005/32/EC:

At the time of adoption of this Regulation, the following values can be considered as single benchmarks for the products concerned in terms of their Energy Efficiency Index and energy consumption, water consumption, cleaning performance, drying performance and airborne acoustical noise. The two most important dishwasher types are considered: the 12 place settings and the 9 place machines

### Dishwashers with 12 place settings:

- EEI = 0,58, corresponding to an energy consumption of 0,950 kWh/cycle (or annual energy consumption of 209 kWh/year for 280 cycles) without considering the energy consumption of low power modes; corresponding noise 45 dB(A)
- water consumption: 9 litre/cycle, corresponding to 2.520 litre/year for 280 cycles;
- cleaning performance  $P_C > 1,12$
- drying performance  $P_D > 1,08$
- airborne acoustical noise: 41 dB(A), but the dishwasher energy consumption is 1,050 kWh/cycle (or annual energy consumption of 294 kWh/year for 280 cycles);

### Dishwashers with 9 place settings:

- EEI = 0,635, corresponding to an energy consumption of 0,800 kWh/cycle (or annual energy consumption of 176 kWh/year for 280 cycles) without considering the energy consumption of low power modes;
- water consumption: 10 litre/cycle, corresponding to 2.800 litre/year for 280 cycles;
- cleaning performance  $P_C > 1,12$
- drying performance  $P_D > 1,08$
- airborne acoustical noise: n.a.

**ANNEX III**  
**Verification procedure for market surveillance purposes**

When performing the market surveillance checks referred to in Directive 2005/32/EC, Article 3 (2), the authorities of the Member States shall apply the following verification procedure.

Member State authorities shall test one single unit.

**1 Annual Energy Consumption**

The value measured shall not be greater than the rated value of  $AE_C$  by more than [10] %. If the result of the test carried out on the first dishwasher is greater than the rated value plus 10 %, the test shall be carried out on a further three randomly selected dishwashers. The arithmetical mean of the values of these three dishwashers shall not be greater than the rated value plus [10] %.

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

**2 Cleaning performance index**

The value measured shall not be lower than the rated value of  $P_C$  by more than [10] %. If the result of the test carried out on the first dishwasher is lower than the rated value by more than [10] %, the test shall be carried out on a further three randomly selected dishwashers. The arithmetical mean of the values of these three dishwashers shall not be lower than the rated value by more than [10] %.

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

**3 Drying efficiency index**

The value measured shall not be lower than the rated value of  $P_D$  by more than [19] %. If the result of the test carried out on the first dishwasher is lower than the rated value by more than 19%, the test shall be carried out on a further three randomly selected dishwashers. The arithmetical mean of the values of these three dishwashers shall not be less than the rated value by [19] %.

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

**4 Energy consumption**

The value measured shall not be greater than the rated value of  $E_r$  by more than [10] %. If the result of the test carried out on the first dishwasher is greater than the rated value plus 10 %, the test shall be carried out on a further three randomly selected dishwashers.

The arithmetical mean of the values of these three dishwashers shall not be greater than the rated value plus [10] %

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

## **5 Programme duration**

The value measured shall not be longer than the rated values  $T_t$  by more than [10] %. If the result of the test carried out on the first dishwasher is longer than the declared values plus 10%, the test shall be carried out on a further three dishwashers, which shall be randomly selected from the market. The value of each of these three dishwashers shall not be longer than the declared value plus [10] %.

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

## **6 Power consumption in off-mode and left-on mode**

The verification of the power consumption  $P_o$  and  $P_l$  shall be done in accordance with Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.

## **7 Duration of the left-on mode**

The value measured shall not be longer than the rated value of  $T_l$  by more than [10] %. If the result of the test carried out on the first dishwasher are longer than the declared value plus 10%, the test shall be carried out on a further three dishwashers, which shall be randomly selected from the market. The value of each of these three dishwashers shall not be longer than the declared value plus [10] %.

Otherwise, the model and all other equivalent dishwashers shall be considered not to comply.

## ANNEX IV

### Method for calculating the Energy Efficiency Index of a dishwasher

For the calculation of the EEI, the energy consumption of any given dishwasher is compared to the standard energy consumption of a dishwasher with the same number of place settings.

a) The Energy Efficiency Index is calculated as:

$$EEI = \frac{AE_C}{SAE_C} \times 100 \text{ and is rounded to one decimal place}$$

where:

- $AE_C$  = annual energy consumption of a dishwasher
- $SAE_C$  = standard annual energy consumption of a dishwasher.

b) The Annual Energy Consumption  $AE_C$  of a dishwasher, in kWh/year rounded to two decimal places, shall be calculated as:

$$AE_C = E_t \times 280 + \frac{\left[ P_o \times \frac{525.600 - (T_t \times 280)}{2} + P_l \times \frac{525.600 - (T_t \times 280)}{2} \right]}{60 \times 1.000}$$

where

- $E_t$  is the energy consumption for the standard cycle, in kWh and recorded to three decimal places;
- $P_l$  is the power in the “left-on mode” for the standard cycle, in W and recorded to two decimal places;
- $P_o$  is the power in “off-mode” for the standard cycle, in W and recorded to two decimal places;
- $T_t$  is the programme time for the standard cycle, in minutes and recorded to the nearest minute.

When a power management is enforced, reverting automatically the product to the ‘off mode’ after the end of the programme,  $AE_C$  shall be calculated taking into consideration the effective duration of the “left-on mode”, according to the following formula:

$$AE_C = E_t \times 280 + \frac{\{(P_l \times T_l \times 280) + P_o \times [525.600 - (T_t \times 280) - (T_l \times 280)]\}}{60 \times 1.000}$$

where  $T_l$  is the measured time in “left-on mode” for the standard cycle, in minutes and recorded to the nearest minute.



The value 280 is the total number of standard washing cycles per year.

c) The Standard Annual Energy Consumption  $SAE_C$  of a dishwasher shall be calculated, in kWh/year and rounded to two decimal places, as:

$$SAE_C = 7,0 \times ps + 378$$

for  $ps \geq 10$ , where  $ps$  is the rated capacity in standard place settings;

$$SAE_C = 25,2 \times ps + 126$$

for  $ps \leq 9$ , where  $ps$  is the rated capacity in standard place settings.

## ANNEX V

### Measurement of the energy consumption and other parameters

The parameters described in this IM for a dishwasher, and in particular those in Part 1, shall be measured for the standard cycle by reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state of the art and in particular under the conditions described in Part 2.

#### **1. Measured parameters**

- a) energy consumption: the arithmetical mean ( $E_t$ ) of the values measured for at least 5 standard cycles with cold fill, expressed in kWh and rounded to three decimal places;
- b) programme time: the arithmetical mean ( $T_t$ ) of the values measured for at least 5 standard cycles with cold fill, expressed in minutes and rounded to the nearest minute.
- c) cleaning performance: is the logarithm of the ratio of the average score of the soil traces and remains found on each load item, in the machine under test and the reference machine. At least 5 cleaning test cycles of the standard programme shall be run and the logarithm is calculated for each cycle. The cleaning index  $P_C$  is the average of the results of all the cycles rounded to 2 decimal places.
- d) power consumption in 'off mode': according to the measurement method as in Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment
- e) power consumption in 'left-on mode': according to the measurement method as in Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment
- f) 'left-on mode' duration: according to the measurement method as in Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.

#### **2. Testing conditions**

- a) Definitions: Clause 3 of EN 50242 Ed.2/EN 60436, when different Chapter 2 prevails.
- b) General conditions for measurements: Clause 5 of EN 50242 Ed.2/EN 60436.

- c) Cleaning performance: Clause 6 of EN 50242 Ed.2/EN 60436.
- d) Drying performance: Clause 7 of EN 50242 Ed.2/EN 60436.
- e) Energy consumption, water consumption and time: Clause 8 of EN 50242 Ed.2/EN 60436.
- f) Data to be reported: Annex Z1 of EN 50242 Ed.2/EN 60436.
- g) Tolerances and control procedures: Annex Z2 of EN 50242 Ed.2/EN 60436.
- h) Low power modes power: the measurement of the power of 'off mode' and 'left-on mode' of washing machines is described in IEC 60456 5<sup>th</sup> Ed. Annex L, to be done in accordance with the requirements of the measurement method as in Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.
- i) Low power modes duration: the measurement of the duration of the 'left-on mode' of washing machines is according to the measurement method as in Commission Regulation (EC) No .../.. of [...] implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.