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

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 washing machines, 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 uses.

In order to cope with the very different amount of laundry that machines can treat in a washing cycle this IM, based on the underlying preparatory study, uses a common functional unit represented by the machine rated capacity which identifies the “service” given to the consumer.

Relation with unspecific ("horizontal") IMs

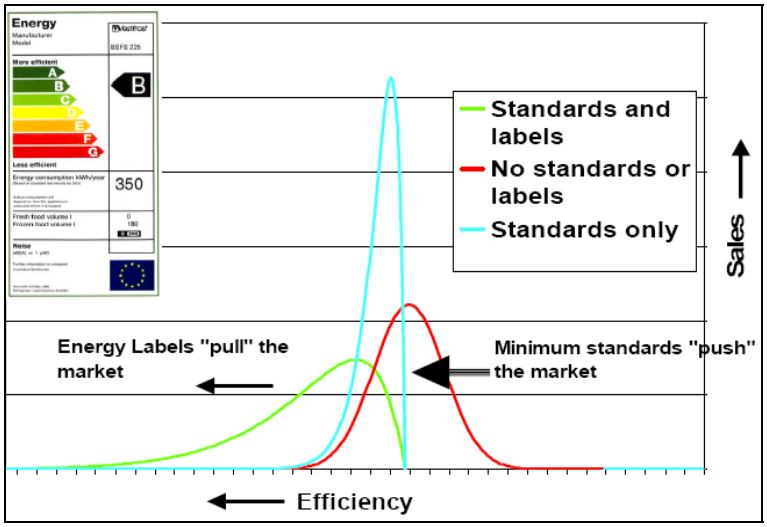
This product specific IM has a relation with the horizontal standby power consumption Regulation, since it deals with two low power modes, namely ‘off mode’ and ‘left on mode’. It is a common understanding, supported by the results of the preparatory study, that in washing machines the off mode includes 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 IM 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 washing machines 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 washing machines. 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[1]:



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:
  - maximum EEI levels (the lower the EEI, the higher the energy efficiency)
  - maximum water consumption
  - minimum washing performance.

- Generic requirements, to be implemented two years after the enforcement of the measure:
  - prevention of the detergent over-dosage: a scale on the detergent dispenser related to a table in the booklet of instructions advising consumers about the maximum amount of the detergent that should be used for the main types of detergents on the market and the textile type and degree of soling of the laundry.

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 ecodesign preparatory study showed that, despite the significant achieved energy

[1] IEA, P. Waide, International use of policy instruments: country comparisons, Copenhagen, 05 April 2006.

efficiency improvement, 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 spin drying efficiency 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 specific efficiency requirements that would result in the phasing out of the machines with EEI beyond 68 (corresponding to about the current class A threshold) and with a maximum water consumption for the 60°C cotton programme at full load. Setting washing performance requirements that will phase out all the machines which wash less well than the current class A threshold a part from the very small 3kg machines, for which the current B class performance is accepted.
The one year transition period after entry into force should allow industry to discontinue the production of less efficient models.

Stage 2 (Two years after entry into force): Setting generic requirements to prevent detergent over-dosage by consumers.

Stage 3 (Six years after entry into force): Setting specific efficiency requirements that would result in the phasing out the machines with EEI beyond 59 (corresponding to about the current class A+ threshold) for all machines with a rated capacity equal or higher than 4kg, and with a maximum water consumption for the 60°C cotton programme at partial load.

Revision
It is planned to examine the necessity to revise the measure, including the provisions for a further Stage if needed, at the latest 7 years after adoption, that is after the second Stage of specific requirements will be implemented.

Rationale for the mandatory requirements

The aim is to improve the environmental impact of washing machines through a Regulation on the design of the product by establishing mandatory energy efficiency requirements and in particular a maximum annual energy consumption (including the most important low power modes) and a maximum water consumption for the 60°C cotton and the 40°C programme at full load and partial load. Additional generic requirements complement the specific ones to make the overall regulation even more effective. Finally, a strong co-ordination with the EU energy labelling scheme for the same product group is proposed to achieve a synergy between the two policy measures.

The use phase is addressed through energy efficiency and water consumption requirements since the LCA performed for the ecodesign preparatory study demonstrated that this phase is still responsible for most of the environmental impact of washing machines due to the energy and water consumption.

Water consumption is addressed through specific requirements with the two fold scope of phasing out the most consuming machines and to avoid that new machines are put on the market with a higher water consumption. In today's machines the water consumption in the (warm) washing phase is already minimised, due to the associated energy consumption, therefore the water savings can be done mainly in the other washing phases essentially in rinsing. A strong correlation does exist between water consumption and rinsing performance as demonstrated by several studies developed worldwide. Despite all efforts and research mainly in Europe, USA and Australia no accurate method for assessing the rinsing performance is available. The alkalinity method, to be included in the new standard IEC 60456 5th edition, still presents a too large uncertainty of the results. Without a way to assess the rinsing performance the setting of more demanding water consumption requirements could easily result is poor rinsing. Machines on the EU market present already the possibility of extra rinse(s), recommended by manufacturers for people with particularly sensitive skin or babies or in some cases even when the machine is used at full load.
The setting of the water consumption requirements is then complemented by declaring the annual water consumption under the parallel Energy Labelling Directive 92/75/EEC.

The proposed energy efficiency and water ecodesign requirements are independent from the machines capacity category. The adoption of a unique reference valid for all the load capacities is possible because the standard annual energy consumption which is the basis for the EEI calculation is defined as a linear function of the capacity.

The proposed mandatory specific requirements would phase out the least energy efficient and highest water consuming 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 energy efficiency algorithm including low power modes, it is estimated that about one third of the models on the market in 2005 could be phased out in the first Step, and more than 80% of the models in the second Step. This means that six years after the enforcing of the measure (sometime around 2016) most of the models on the market in 2005 would be phased out.

The contemporary setting of minimum requirements for the washing performance (at a level equivalent to the current class A threshold) would ensure that the reduction in the energy/water consumption is not achieved through a reduction of the main functional performance.

For very small washing machines with a rated capacity of 3 and 3,5kg some less demanding requirements are considered: the minimum accepted washing performance is equivalent to the current class B threshold and the second Step of specific energy requirements is not applied. In fact such machines have the disadvantage of the small load capacity compared to the overall mass of the machine. Since during a washing cycle the machine itself is heated together with the load, small machine having a higher ratio between the machine mass and the washed load (than for models with a higher capacity) present a higher energy consumption since the machine itself needs to be heated whatever the load should be. In addition, when the drum volume is small due to external dimension constraints (as in a 3kg machines with dimensions around 67×50×52 cm) then also the washing performance is hampered. The phase-out of such small machines due to their lower energy efficiency/washing performance would leave

consumers with no automatic washing alternatives when the available space home is an issue.

The generic requirement on information about the maximum amount of the detergent for the most common detergent types (traditional powder, compact powder and liquids) is aimed at the prevention of the detergent over-dosage. Although the optimum detergent dosage depends mainly on its formulation and chemical composition, water hardness, user selected washing temperature, amount of laundry and amount of soil, there is a common understanding that consumers tend to overdose the detergent, thinking to achieve a better washing performance. Although instructions on detergent dosing are shown on the detergent packages, stakeholders suggestion during the preparatory study were in favour of some kind of indication on the detergent dispenser to increase the warning to the consumers against over-dosage.

Finally benchmarks are set for the three major product rated capacities, 5, 7, and 8 kg in terms of their Energy Efficiency Index and water consumption for the standard 60°C cotton programme at full load.

Verification procedure for market surveillance purposes

European standard EN 60456 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 testing shall remain under the responsibility of standardisation bodies and test laboratories.

The verification procedure for this measure foresees a set of lower values than in the EN standard for the uncertainty of the energy consumption and the other parameters for the first phase of the verification process, to be confirmed on the basis of the results of the inter-laboratory round robin test on washing machines on-going at EU and worldwide level on the new 5th edition of the IEC (and future EN) 60456. 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 washing performance index a higher measurement uncertainty (4%) 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 planned measure

Chapter 1: the scope of the IM is described, to cover electric mains operated automatic household washing machines also when they are sold for non-household use. The scope

is then refined through some exemptions which exclude appliances without spin capability and those which can use other energy sources. Washer-dryers are also excluded from the scope.

Chapter 2: definitions are provided for the terms used in the requirements set out in the Annexes. Automatic washing machines are defined as machines where the load is fully treated by the machine without the need for user intervention at any point during the programme prior to its completion. Examples of user intervention could include manual fill (non automatic water level), transfer of the load between a washing drum and a spin extractor drum or manual draining.
Definition are also given for the most important low power modes, the 'off mode' and the 'left-on mode', as in the coming new IEC 60456 5th Ed./EN 60456 under the enquiry stage at worldwide level with parallel vote in Europe.

Chapter 3 and 4: ecodesign requirements and benchmarks are set with simple reference to Annex I and II, which contain the actual requirements and indicative 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 washing machines, set out in harmonised standard EN 60456, providing compliance with measurements under the washing machines energy label directives 95/12/EC and 96/89/EC. Through the provisions in this Chapter and in Annex III, the verification procedure is made more rigorous by placing under the manufacturers' responsibility 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 a further step of the 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 washing machines.

Part 1 generic requirements: a requirement is set about the indication of a scale on the detergent dispenser correlated with a table in the booklet of instruction showing the maximum amount of detergent per washing programme, textile type and laundry soiling at least for the most common detergent types (traditional powder, compact powder and liquids). This requirement is aimed at the prevention of the detergent over-dosage, although the optimum detergent dosage depends mainly on its formulation and chemical composition, water hardness, user selected washing temperature, amount of laundry and amount of soil. In fact, there is a common understanding that consumers tend to overdose the detergent, thinking to achieve a better washing performance. Instructions for the consumer on detergent dosing are already shown on the detergent packages, but stakeholders suggestion during the preparatory study were in favour of some kind of indication on the detergent dispenser to increase the warning to the consumers against

overdose. This requirement will apply two years after the entry into force of the measure.

In **Part 2 specific requirements** are set in terms of the minimum Energy Efficiency Index, maximum water consumption and functional performances that washing machines shall fulfil with time. A two-step implementation of the energy efficiency requirements is foreseen, the first one year after the enforcement of the measure, the second step five years later (i.e. six years after the enforcement of the IM). The rationale for the mandatory requirements has been previously explained. Washing performance is set as to leave on the market only machines with the current highest efficiency.

Annex II: includes the indicative benchmarks for products belonging to the most common washing machines, the 5, 7 and 8 kg load capacity. The benchmarks are set for the specific capacities to inform about the existing room between the less efficient products and the most efficient ones, that can be used for other national or local policy measures such as incentive programmes.

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) and the washing performance for washing machines, along with provisions for a transitional period.

In **Part 1**, the EEI is calculated as the ratio between the estimated annual energy consumption and the standard annual energy consumption of a washing machine with the same capacity, expressed as percentage. The estimated annual energy consumption is given by the sum of the weighted energy consumption of the seven runs for two washing programmes and two loads (3 runs for the standard 60°C cotton programme at full load + 2 runs for the standard 60°C cotton programme at partial load + 2 runs for the standard 40°C cotton programme at partial load) plus the estimated energy consumption of the two most important low power modes, the 'off mode' and the 'left on mode' for the same washing programmes.
To calculate the overall annual consumption the knowledge of the use pattern of the washing machines is a prerequisite. In the current labelling scheme 220 washing cycles per year are considered in the calculation of informative annual energy consumption of the washing machine. This value has been maintained also in this measure since it has been substantially confirmed by the preparatory study, where on average a washing machine is used for about 4,86 times per week, or about 233 times per year when excluding 4 weeks holiday.
Once the duration (in minutes) of the three washing programmes is known (through a test using the EU standard) and has been weighted (according to the same 3+2+2 approach) 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 (again weighted average for the three washing programmes) 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. When a

power management operates in the washing machine, automatically reverting the left on mode to off mode, also the time the machine remains in left on mode (weighted average for the three washing programmes) shall be measured, and the formula to be applied for the calculation of the overall annual consumption is slightly different.
This assumption will assure that whether sensor based protection function are activated in the low power modes, their energy consumption is kept to the real minimum and when they are not present the power of low power modes is subject to the standby Regulation requirements.

The use of the weighted (3+2+2) values of the standard 60°C and 40°C cotton programmes at full load and partial load is in line with the results of the preparatory study and is giving continuity with the current labelling scheme and the industry Voluntary Commitments which are all based on the standard 60°C cotton programme at full load. Averaging the answers of a survey on almost 2 500 consumers from 10 countries, the study found that there is a 37% preference for the 40°C programmes, while the second most used temperature is 60°C (23 %) and the 90 °C (7%). A dominance of the cotton programmes (cotton, linen, mixed) was also found, with more than 50% of the consumers declaring that these programmes are used always or often. The 3+2+2 approach represents also the highly energy consuming 90°C programme still used by consumers.

The Standard Annual Energy Consumption of washing machines is a linear function of the machine capacity, where the intercept and the angular coefficient derive from the regression of the washing machine models with 4,5-6,5 kg capacity in the 1997 database[2], matching the 5 kg machine base case identified by the previous studies[3], and which was used as basis for the mentioned two rounds of the industry Voluntary Commitment on washing machines. This choice would allow to keep this ecodesign IM in line with the previous policy measures.

Part 2 contains the method for calculating the weighted average washing performance for the same 3 runs for the standard 60°C cotton programme at full load + 2 runs for the standard 60°C cotton programme at partial load + 2 runs for the standard 40°C cotton programme at partial load.

Part 3 states that until an harmonised standard for the measurement of the 60°C cotton and 40°C cotton programmes at full and partial load is available the alternative formulae described in Annex V shall be used.

In Annex V: alternative formulae - based on the well known standard 60°C cotton programme at full load - are indicated for a transitional period, in case a suitable harmonised standard, including measurements for the 60°C and the 40°C cotton programmes at full and partial load, is not available when the first Step of this IM enters into force.

[2] In 1997 the first technical database was developed by manufacturers' Association CECED to support the first Industrial Voluntary Commitment on reduction the energy consumption of washing machines. The database was given to the Commission and to National Authorities in the framework of the verification procedure.

[3] Study for the Commission of the European Communities on Washing Machines, Dryers and Dishwashers, carried out by Group of Efficient Appliances (GEA), (Final Report, June 1995) and Sensitivity Analysis of Energy Efficiency Improvements for Washing Machines, carried out by Van Holsteijn en Kemna (NL), (Final report, April 1996)

Annex VI: the measured parameters are defined here along with to the IEC 60456 5th Ed. standard clauses[4] to be used for washing machine testing. 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

Rounding is indicated for all calculation steps: he programme 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 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 savings (for the 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. When no sensor based protection function are active in low power modes, washing machines fall under the standby consumption Regulation, which calls for the implementation of a power management in some 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 these 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.

In the last years higher load capacity washing machines appeared on the European market. Due to the different dimensions of the drums the effect of a given **spinning speed** is not the same in these machines and therefore the definition of a common specific requirement appears not effective. It was therefore considered more appropriate to address spinning speed within the parallel directive on energy labelling as a technical information to be given to consumers.

The **spin drying** effect, in terms of the Remaining Moisture content percentage (RM%) in the load, is important when a further drying in a (tumble) dryer is run. The

[4] The CDV has recently positively passed the enquiry stage. The FDIS is under prepration

preparatory study has verified that there is an optimum ownership level (at country level) or an intensity of use of the dryer (at single user level) below which the additional energy necessary for a washing machine to achieve a lower RM% (equivalent to an improvement in spinning speed of 400 rpm) is not compensated by the energy (or economic) savings in the further drying of the same amount of textiles.
This minimum ownership level, lower the northern is the country, has been identified for the three main Climate Zones: Cold, Moderate and Warm as respectively 6%, 9-10% and 20-25%. The contemporary dryer intensity of use threshold (by each owner) to achieve an economical balance between the higher price of a washing machine with a lower RM% and the energy savings in the (tumble) drying has also been identified in 16%, 26% and 62% of the washing cycles. When dryers ownership is compared to the two thresholds, it appears that the countries of the Warm Climatic Zone are far from both the energy and the economic values, the same occurs for Poland in the Moderate Climatic Zone. Again it was considered more appropriate to address the remaining moisture content within the parallel directive on energy labelling than defining a EU wide specific requirement under ecodesign.

The preparatory study also highlighted that the market forces are apparently able to manage the issue of the washing machine spinning speed without any intervention by the legislator. The washing machines in the 2005 technical database are almost perfectly divided into two groups, half with a spinning speed below 1.000 rpm and the other half with a spinning speed beyond this value. There is also an anecdotic evidence that sales of washing machines are already differentiated by country, with higher spinning models mostly sold in Northern European countries, while lower spinning speed models are predominant in South Europe.

Table 1: Dryer ownership and threshold level for some countries in Climatic Zones

Country	Dryer ownership (%)	Year	Threshold dryer level (%) use intensity	ownership
Warm climatic zone				
MT	12,2	2001	62	20-25 (with 100% usage)
PO	13	2006		
SL	18	2003		
ES	n.a.	--		
IT	9	2006[b]		
GR	n.a.	--		
Moderate climatic zone				
FR	35	2008[a]	26	9-10 (with 100% usage)
DE	39	2005		
PL	5	2008[a]		
DK	44	2004		
IR	46	2005		
UK	42,4	2008[a]		
NL	68	2005		
Cold climatic zone				
FIN	59	2004	16	6 (with 100% usage)
SW	52	2004		

[a]Lot 16, Task 3 results; [b]Lot 14, Task 3 results

The technical evaluation is supported by the results of the consumer survey developed in the preparatory study. When the average spin speed of the washing machines in investigated countries is compared with the ownership of the dryers in the same countries (Figure 1 and 2) the outcome is that in Italy and Czech Republic, where the dryer ownership is respectively 8% and 9%, the average washing machine spin speed is 795 rpm and 772 rpm; on the contrary in UK, Germany and Sweden, where the dryer ownership is about 70%, 55% and 55%, the average washing machine spin speed is 1.062 rpm, 1.096 rpm and 1.069 rpm respectively.

Figure 1: Calculated average spin speed per country and in total

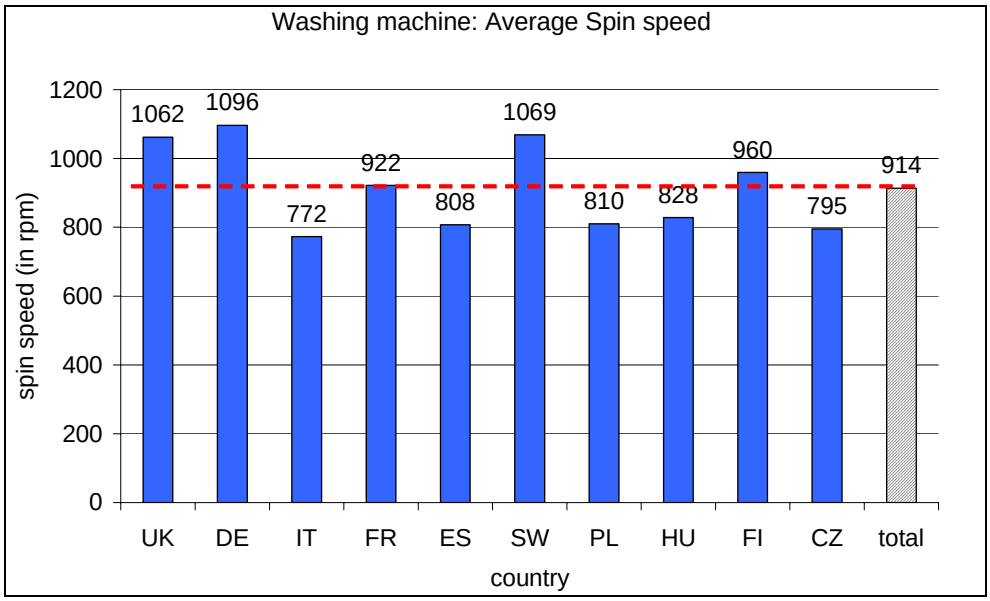
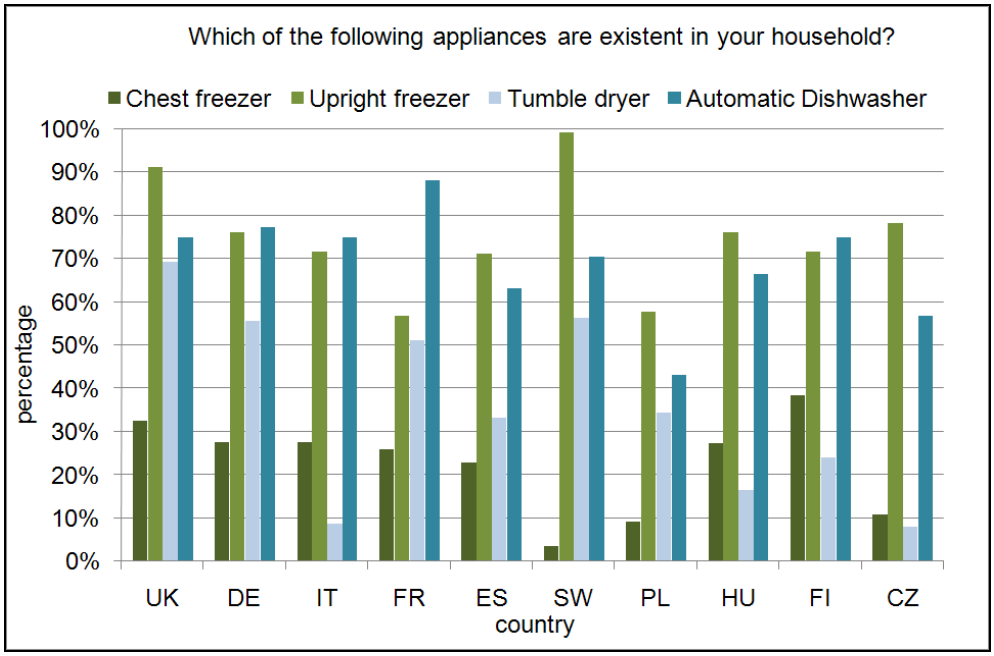


Figure 2: Equipment of household appliances in % (per country)



This outcome is now also supported by the results of Task 3 of the Lot 16 preparatory study on dryers: in the new consumer survey the average spin speed of the washing machines in households having a dryer (86% of the sample) is **1.217** rpm[5]. The same survey run in the Lot 14 preparatory study on washing machines, where the dryer owners were on average only 35,8%, resulted in an average spin speed of **914** rpm. In other words, according to the consumer surveys in the two studies, and with all the possible cautions due to the small samples (250 households) and the semi-quantitative answers achieved, users owning a dryer purchase higher spin speed (~300 rpm) washing machines .

As far as airborne acoustical **noise** is concerned, the loudest noise in washing machines occurs during the spinning phase, especially at the higher spinning speeds. The setting of any common specific requirement on noise would have a negative effect on the spread of higher spinning speed machines, which are mostly sold in Nordic countries for the reasons just explained. Therefore it was considered more appropriate to address noise in the parallel labelling directive for this product group. The washing machines on the today market have on average a noise at about 50/75 dB(A) in washing/spinning phases.

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 2020. For washing machines the achievable savings are in the order of about 2,6% (or 1,1 TWh) in 2020, to reach a maximum of about 6% (or 2,8 TWh) in 2030 when the best performing (and still not available in the market) washing technologies are expected to dominate the market.

[5] with a distribution of the mostly used washing spin speeds, as 25% “1000-1150 rpm”, 22% “1600-1800 rpm” and lower spinning speeds (below 1000 rpm) represented.

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

Chapter 1
Subject matter and scope

1. This implementing measure pursuant to Directive 2005/32/EC establishes eco-design requirements for the placing on the market of electric mains operated automatic household washing machines also where these are sold for non-household uses.

2. The following appliances are excluded from the scope of this Regulation:

- washing machines with no spin capability;
- combined washer-driers;
- washing machines that can use fuels (such as LPG, kerosene, bio-diesel, etc.);
- washing machines that are only battery operated.

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. "washing machine" means an appliance for cleaning and rinsing of textiles using water which may also have a means of extracting excess water from the textiles;

2. "automatic washing machine" means a washing machine where the load is fully treated by the machine without the need for user intervention at any point during the programme prior to its completion. Examples of user intervention could include manual fill (non automatic water level), transfer of the load between a washing drum and a spin extractor drum or manual draining.

3. "rated capacity" means the maximum mass in kg of dry textiles, at 0,5 kg intervals, which the manufacturer declares can be treated in the washing machine on the programme selected.

4. "capacity at partial load" means a half of the washing machine rated capacity.

5. "programme" means a series of operations which are pre-defined within the washing machine and which are declared by the manufacturer as suitable for washing certain textile types.

6. “cycle” means a complete washing process, as defined by the programme selected, consisting of a series of different operations (wash, rinse, spin, etc.) and including any operations that occur after the completion of the programme, such as pumping, monitoring and anti-creasing operations where applicable.

7. “programme duration” means the time from the initiation of the programme (excluding any user programmed delay) until the completion of the programme. If the end of programme is not indicated, the programme time is equal to the cycle time. The programme is complete when the washing machine indicates the end of the programme and the load is accessible to the user. 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

8. “remaining moisture content” means the amount of moisture that is contained in the load in relation to the equilibrium condition defined as 0% remaining moisture content.

9. “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 washing machine is left to revert to a steady state power consumption of its own accord.

10. “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.

11. “Equivalent washing machine” means a model placed on the market with the same rated capacity, technical and performance characteristics, energy and water consumption and noise in washing and spinning of another model placed on the market under a different commercial code number by the same manufacturer.

Chapter 3
Ecodesign requirements

Washing machines falling under the definitions of Chapter 2 paragraph 4 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 informative 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 VI, Part 2** and the results of the calculations required in **Annex IV**.

Where the information included in the technical documentation file for a particular washing machine model has been obtained by calculation on the basis of design, and/or extrapolation from other equivalent or similar washing machines, 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 washing machine 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 I 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 indications shall be given about the maximum dosage of the detergent that manufacturers recommend not overcoming, in the form of a scale in the detergent dispenser and a complementary informative table in the booklet of instructions including:

- information about dosage for at least traditional powder, compact powder and liquid detergents
- per degree of laundry soiling
- for the washing programmes in the washing machine
- a correlation with the scale in the dispenser.

2. Specific ecodesign requirements

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

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

– the EEI shall be lower than 68;
– the washing performance index W_P shall be higher than 1,03 for washing machines with a rated capacity higher that 3 kg;
– the washing performance index W_P shall be higher than 1,00 for washing machines with a rated capacity lower or equal than 3 kg;
– the water consumption for the standard 60°C cotton programme at full load shall be:

$W_{t,60} \leq 5 \times c + 35$
where c is the machine rated capacity for the standard 60°C cotton programme at full load.

2) [Six] years after this implementing measure has come into force:

– the EEI shall be lower than 59 for washing machines with a rated capacity equal or higher than 4 kg
– the water consumption for the standard 60°C cotton programme at partial load shall be:

$W_{t,60} \leq 5 \times c_1 + 35$
where c_1 is the machine capacity for the standard 60°C cotton programme at partial load.

The Energy Efficiency Index and the washing performance index W_P shall be calculated in accordance with Annex IV.

ANNEX II
Benckmarks

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 benchmarks for the products concerned in terms of their Energy Efficiency Index and water consumption for the standard 60°C cotton programme at full load.

Washing machines with a rated capacity of 5kg:

- energy consumption of 0,830 kWh/cycle (or 0,166 kWh/kg)
- water consumption of 35 litre/cycle

corresponding to an annual energy consumption of 183 kWh without considering the energy consumption of low power modes, and a water consumption of 7.700 litre for 220 cycles at full load.

Washing machines with a rated capacity of 7kg:

- energy consumption of 1,020 kWh/cycle (or 0,145 kWh/kg)
- water consumption of 37 litre/cycle

corresponding to an annual energy consumption of 224 kWh without considering the energy consumption of low power modes, and a water consumption of 8.140 litre for 220 cycles at full load.

Washing machines with a rated capacity of 8kg:

- energy consumption of 1,200 kWh/cycle (or 0,15 kWh/kg)
- water consumption of 52 litre/cycle

corresponding to an annual energy consumption of 264 kWh without considering the energy consumption of low power modes, and a water consumption of 11.440 litre for 220 cycles at full load.

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, until a suitable harmonised standard is published for the purpose of this Annex and of Annex VI.

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 washing machine is greater than the rated value plus 10 %, the test shall be carried out on a further three randomly selected washing machines. The arithmetical mean of the values of these three washing machines shall not be greater than the rated value plus [10] %.

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

2 Washing performance index

The value measured shall not be lower than the rated value of W_P by more than [4] %. If the results of the test carried out on the first washing machine is lower than the rated value by more than [4] %, the test shall be carried out on a further three randomly selected washing machines. The arithmetical mean of the values of these three washing machines shall not be lower than the rated value minus [4] %.

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

3 Energy consumption

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

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

4 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 washing machine is longer than the declared values plus 10%, the test shall be carried out on a further three washing machines,

which shall be randomly selected from the market. The value of each of these three washing machines shall not be longer than the declared value plus [10]%

Otherwise, the model and all other equivalent washing machine models shall be considered not to comply.

5 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.

6 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 washing machine are longer than the declared value plus 10%, the test shall be carried out on a further three washing machines, which shall be randomly selected from the market. The value of each of these three washing machines shall not be longer than the declared value plus [10] %.

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

ANNEX IV
Method for calculating the Energy Efficiency Index and the washing performance

1. Calculation of the Energy Efficiency Index

For the calculation of the EEI of a washing machine, the energy consumption of any given washing machine is compared to the standard energy consumption of a washing machine with the same capacity.

a) The Energy Efficiency Index shall be calculated as:

$$EEI = \frac{AE_C}{SAE_C} \times 100$$ and rounded to the first decimal place

where:
- AE_C = annual energy consumption of a washing machine
- SAE_C = standard annual energy consumption of a washing machine.

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

$$AE_C = E_t \times 220 + \frac{\left[P_o \times \frac{525.600 - (T_t \times 220)}{2} + P_l \times \frac{525.600 - (T_t \times 220)}{2} \right]}{60 \times 1.000}$$

E_t is the energy consumption for the standard washing programmes, in kWh and recorded to three decimal places, determined as:

$E_t = (3 \times E_{t,60} + 2 \times E_{t,60½} + 2 \times E_{t40½})/7$

where
- $E_{t,60}$ is the energy consumption for the standard 60°C cotton programme at full load, in kWh, recorded to three decimal places;
- $E_{t,60½}$ is the consumption for the standard 60°C cotton programme at half load, in kWh, recorded to three decimal places;
- $E_{t40½}$ is the energy consumption for the standard 40°C cotton programme at half load, in kWh, recorded to three decimal places;

P_l is the power in the 'left-on mode' for the standard washing programmes, in W and recorded to the second decimal place, determined as:

$P_l = (3 \times P_{l,60} + 2 \times P_{l,60½} + 2 \times P_{l,40½})/7$

where

- $P_{l,60}$ is the power in 'left-on mode' for the standard 60°C cotton programme at full load, in W and recorded to the second decimal place;
- $P_{l,60½}$ is the power in 'left-on mode' for the for the standard 60°C cotton programme at half load, in W and recorded to the second decimal place;
- $P_{l,40½}$ is the power in 'left-on mode' for the standard 40°C cotton programme at half load, in W and recorded to the second decimal place.

P_o is the power in 'off mode' for the standard washing programmes, in W and recorded to the second decimal place, determined as:

$$P_o = (3 \times P_{o,60} + 2 \times P_{o,60½} + 2 \times P_{o,40½})/7$$

where

- $P_{o,60}$ is the power in 'off-mode' for the standard 60°C cotton programme at full load, in W and recorded to the second decimal place;
- $P_{o,60½}$ is the power in 'off-mode' for the for the standard 60°C cotton programme at half load, in W and recorded to the second decimal place;
- $P_{o,40½}$ is the power in 'off-mode' for the standard 40°C cotton programme at half load, in W and recorded to the second decimal place.

T_t is the programme duration for the standard washing programmes, in minutes and recorded to the nearest minute, determined as:

$$T_t = (3 \times T_{t,60} + 2 \times T_{t,60½} + 2 \times Tt,_{c40½})/7$$

where

- $T_{t,60}$ is the programme duration for the standard 60°C cotton programme at full load, in minutes and recorded to the nearest minute;
- $T_{t,60½}$ is the programme duration for the for the standard 60°C cotton programme at half load, in minutes and recorded to the nearest minute;
- $T_{t,40½}$ is the programme duration for the standard 40°C cotton programme at half load, 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:

$$AE_C = E_t \times 220 + \frac{\{(P_l \times T_l \times 220) + P_o \times [525.600 - (T_t \times 220) - (T_l \times 220)]\}}{60 \times 1.000}$$

where T_l is the time in 'left-on mode' for the standard washing programmes, in minutes and recorded to the nearest minute, determined as:

$$T_l = (3 \times T_{l,60} + 2 \times T_{l,60½} + 2 \times T_{l,40½})/7$$

where

- $T_{l,60}$ is the time in 'left-on mode' for the standard 60°C cotton programme at full load, in minutes and recorded to the nearest minute;
- $T_{l,60½}$ is the time in 'left-on mode' for the for the standard 60°C cotton programme at half load, in minutes and recorded to the nearest minute;
- $T_{l,40½}$ is the time in 'left-on mode' for the standard 40°C cotton programme at half load, in minutes and recorded to the nearest minute.

The value 220 is the total number of standard washing cycles per year.

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

$$SAE_C = 47{,}0 \times c + 51{,}7$$

where c is the machine rated capacity for the standard 60°C cotton programme at full load or the standard 40°C cotton programme at full load, whichever is the lowest.

2. Calculation of the washing performance

The washing performance W_P of a washing machine for the standard washing programmes shall be determined as:

$W_P = (3 \times W_{P,60} + 2 \times W_{P,60½} + 2 \times W_{P,40½})/7$ and rounded to three decimal places,

where

- $W_{P,60}$ is the washing performance for the standard 60°C cotton programme at full load of a washing machine, recorded to three decimal places;
- $W_{P,60½}$ is the washing performance for the standard 60°C cotton programme at half load of a washing machine, recorded to three decimal places;
- $W_{P,40½}$ is the washing performance for the standard 40°C cotton programme at half load of a washing machine, recorded to three decimal places .

3. Transitional period

In case no harmonised standard for the measurement of the standard 40°C cotton programme at partial load and the standard 60°C cotton programme at partial load is available one year after the entry into force of this IM, and unless this harmonised standard becomes available, the formulae for the calculation of E_t, P_l, P_o, T_t, T_l and W_P in Parts 1 and 2 of this Annex are substituted by the corresponding formulae in Annex V.

ANNEX V
Formulae for the transitional period

1. Calculation of the Energy Efficiency Index

$E_t = [3 \times E_{t,60} + 2 \times (0,8 \times E_{t,60}) + 2 \times (0,64 \times E_{t,60})]/7$

where $E_{t,60}$ is the energy consumption for the standard 60°C cotton programme at full load, in kWh and rounded to three decimal places.

$P_l = P_{t,60}$

where $P_{l,60}$ is the power in 'left-on mode' for the standard 60°C cotton programme at full load, in W and recorded to two decimal places.

$P_o = P_{o,60}$

where $P_{o,60}$ is the power in 'off-mode' for the standard 60°C cotton programme at full load, in W and recorded two decimal places..

$T_t = T_{t,60}$

where $T_{t,60}$ is the programme duration for the standard 60°C cotton programme at full load, in minutes and recorded to the nearest minute.

$T_l = T_{l,60}$

where $T_{l,60}$ is the measured time in "left-on mode" for the standard 60°C cotton programme at full load, in minutes and rounded to the nearest minute.

2. Calculation of the washing performance

$W_P = W_{P,60}$

where $W_{P,60}$ is the washing performance for the standard 60°C cotton programme at full load, recorded to three decimal places.

ANNEX VI
Measurement of the energy consumption and other parameters

The parameters described in this IM for a washing machine, and in particular those in Part 1, shall be measured for the standard 60°C cotton programme at full and partial load and the standard 40°C cotton programme at partial load 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 of the values measured for at least 5 runs of the standard reference programmes, expressed in kWh and rounded to three decimal places;

b) programme duration: average of values measured in at least 5 runs of the standard reference programmes, expressed in minutes and rounded to the nearest minute. Programme duration is the time from the initiation of the programme (excluding any user programmed delay) until the completion of the programme;

c) washing performance: ratio of the average sum of the reflectance values of each of the 5 soils for the test washing machine and for the reference washing machine. At least 5 runs of the standard reference programme(s) shall be run and the sum of the reflectance values is calculated for each programme;

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 IEC 60456 5th Ed., when different Chapter 2 prevails.

b) General conditions for measurements: Clause 5 of EN 60456: 2005 (Clause 5 of IEC 60456 5th Ed.).

c) Preparation for testing: Clause 6, 7 and 8 of IEC 60456 5th Ed.

d) Materials: Clause 6 of EN 60456: 2005 (Clause 5 of IEC 60456 5th Ed.)

e) Instrumentation and accuracy: Clause 7 of EN 60456: 2005 (Clause 5 of IEC 60456 5th Ed).

f) Energy consumption: Clause 11 of EN 60456: 2005 (Clause 8.5 and 9.5 of IEC 60456 5th Ed.).

g) Washing performance: Clause 8 of EN 60456: 2005 (Clause 8.2 and 9.2 of IEC 60456 5th Ed.).

h) Programme duration: Clause 11 of EN 60456: 2005 (Clause 8.5 and 9.5 of IEC 60456 5th Ed.).

i) Low power modes power: the measurement of the power of 'off mode' and 'left-on mode' of washing machines is described in IEC 60456 5th 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.

j) 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.