ANTICSS Project Deliverable D18 (D4.5):

Test Reports – Part 5: Domestic Dishwashers – draft final version –

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Horizon 2020 programme
Project acronym: ANTICSS
Project full name:
ANTI-Circumvention of Standards for better market Surveillance

Co-funded by the Horizon 2020 Programme of the European Union

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Project Title	**Anti-Circumvention of Standards for better market Surveillance**
Deliverable Title	Test reports – Part 5: Domestic dishwashers
Due Date for Deliverable:	31 July 2020
Actual Submission date:	07 August 2020
Lead Beneficiary	<FFII-LCOE>
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Dissemination level	Public
Keywords	Standards, Circumvention, Market Surveillance, Testing, Europe, Energy, Ecodesign Directive, Energy Labels
Project duration	April 2018 – September 2021

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1 About the ANTICSS project

Objective of the research project 'Anti-Circumvention of Standards for better market Surveillance (ANTICSS)' is to assess and clearly define 'circumvention' in relation to EU Ecodesign and Energy labelling legislation and relevant harmonised standards.

The analysis of circumvention will be based on collecting and learning from cases of circumvention by literature research and dedicated expert interviews, as well as analysing existing EU Ecodesign and Energy labelling legislation and standardisation for possible loopholes. Also the potential relation between circumvention and so called 'smart' products with specific embedded software will be addressed by the project. Alternative test procedures to better detect circumvention by testing shall be developed and through testing a certain number of appliances within the ANTICSS project, the impacts 'if' and 'how much' energy consumption and/or functional performance modifications could be ascribed to circumvention will be assessed.

Based on the results, ANTICSS will provide practical capacity building measures for key actors of market surveillance and test laboratories, support communication and collaboration platforms between major stakeholders and provide policy recommendations for policy makers and standardisation bodies to prevent future circumvention under EU Ecodesign and Energy labelling. ANTICSS project is also designed to provide reliability to manufacturers by specifying potentially vague legislation and standards which might be interpreted differently by market actors and some of them taking unfair advantages so far. By overall awareness raising on circumvention among stakeholders, ANTICSS is supporting an effective EU legislation enforcement and thus increasing acceptance and trust of market actors and civil society into the Ecodesign and Energy labelling legislation.

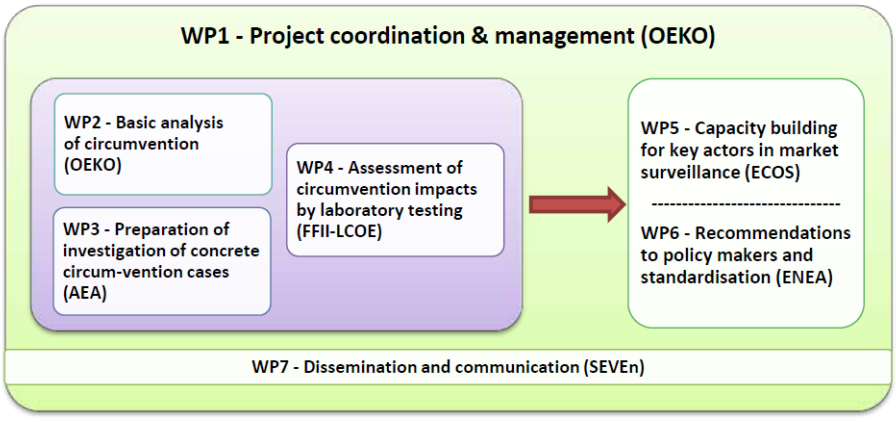

Figure 1-1: ANTICSS Work Packages

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2 ANTICSS definition of circumvention and jeopardy effects

For better understanding, first the underlying ANTICSS definitions of 'circumvention' and 'jeopardy effects' in relation to EU Ecodesign and Energy labelling legislation and related harmonised standards are presented. These definitions build the basis for the research within the ANTICSS project, namely the categorisation of collected suspect behaviour cases and the assessment of circumvention impacts in laboratory testing[1].

Definition of 'Circumvention'

„Circumvention is the act of designing a product or prescribing test instructions, leading to an alteration of the behaviour or the properties of the product, specifically in the test situation, in order to reach more favourable results for any of the parameters specified in the relevant delegated or implemented act, or included in any of the documentations provided for the product."

The act of circumvention is relevant only under test conditions and can be executed e.g.

a) by automatic detection of the test situation and alteration of the product performance and/or resource consumption during test, or

b) by pre-set or manual alteration of the product, affecting performance and/or resource consumption during test or

c) by pre-set alteration of the performance within a short period after putting the product into service.

Definition of 'Jeopardy effects'

"Jeopardy effects encompass all aspects of products or test instructions, or interpretation of test results, which do not follow the goal of the EU ecodesign and/or energy labelling legislation of setting ecodesign requirements and providing reliable information about the resource consumption and/or performance of a product. These effects may not be classified as circumvention, but become possible due to loopholes or other weaknesses in standards or regulations."

[1] Further details and examples can be found in the ANTICSS Deliverable D8 "Definition of 'circumvention' and 'jeopardy effects' in relation to EU Ecodesign and Energy labelling legislation", see https://www.anti-circumvention.eu/storage/app/media/uploaded-files/D08_ANTICSS_Final-definitions_circumvention.pdf

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3 Goal and general approach of this work package

Selection of product categories and cases for testing within ANTICSS

Objective of the current ANTICSS work package WP4 ("Assessment of circumvention impacts in laboratory testing") is to test product categories and cases initially categorised as circumvention or jeopardy effects according to the previous tasks of the project, see Table 3-1.

Table 3-1: Overview of cases tested in ANTICSS

Deliverable D18	Lot	Product category	Case
Part 1	ENER 1	Space heaters	Heaters 2 – Variable speed compressor
Part 2	ENER 5	Televisions	TV 1 – Setting of brightness TV 2/3 – Test loop recognition
Part 3	ENER 10	Room air conditioning	RAC 2 – 1) Defrost 2) Variable speed compressor
Part 4	ENER 13	Domestic freezers and refrigerators-freezers	COLD 2/4 – Multiple operation modes / holiday mode COLD 3 – Display is continuously activated
Part 5	ENER 14	Domestic dishwashers	DISH 1 – Separate bowl support DISH 2 – Specific pre-treatment before testing DISH 3 – Removal / alteration of accessories DISH 4 – Dishwasher with water tank
Part 6	ENER 14	Domestic washing machines	WASH 1.2 – Loading capacity WASH 3 – Hidden software
Part 7	ENER 16	Household tumble driers	DRIER 1 – Special preparation before testing DRIER 2 – Hidden Software
Part 8	ENER 22	Domestic ovens	OVEN 1 – Volume without shelf guides OVEN 2 – Maximum temperature in centre of oven OVEN 3 – Electronic control

Specific model selection procedure for testing appliances within ANTICSS

For each product category to be tested, three different appliance models were selected and one unit of each model was purchased.

Disclaimer 1: The model selection procedure (see Deliverable D15: *Model selection procedure for alternative testing*[2]) was specifically targeted at finding appliances with a high probability of a circumvention behaviour. Therefore the results of the tests within the ANTICSS project do not provide, and must not be considered as providing, a representative overview of the tested product categories on the market.

[2] https://www.anti-circumvention.eu/storage/app/media/D15_ANTICSS_Model-selection_final.pdf

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This selection procedure is preparatory to the achievement of the ANTICSS project objective that is learning how to improve current harmonised standards and Regulations in order to better detect and prevent circumvention in future.

Development and use of alternative test procedures within ANTICSS

For each of the cases, each model was tested according to the harmonized standard to measure the parameters of the Ecodesign and Energy label regulations of interest for the project.

Within ANTICSS, in addition, alternative test procedures have been developed (see Deliverable D14: *Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling*[3]) for the following goals:

- Analyse whether the suspected circumvention behaviour can be confirmed in laboratory tests through the application of the alternative test method, and
- Assess the magnitude of the impact of the circumvention in terms of effects on energy consumption and functional performance.

Disclaimer 2: The values declared for the compliance with the ecodesign and energy labelling requirements are measured with harmonised standards published in the EU Official Journal for the related Regulations. The use of other measurement methods – as for the ANTICSS alternative test methods – may lead to different results and cannot be used for compliance verification. Also, it was not proven in the project (and was not the task to do so) that the alternative test method does deliver results with the same repeatability and reproducibility as the test methodology of the harmonised standards.
Nevertheless, according to the ANTICSS project's experts the specifically chosen and well documented deviations of the ANTICSS test methods from the harmonized standards do not generally result into substantial deviations of the results from those obtained when tested according to the harmonised standard test conditions. Therefore the ANTICSS project considers that the harmonised standard and the alternative test method as well as the achieved test results, although not usable for compliance verification, are in principle broadly comparable for the purposes of the project.

Interpretation of results based on the ANTICSS alternative testing procedures

The measurement results of the alternative test procedure are compared to the declared values as well as to the measurement results of the tests conducted using the harmonized standard.

The verification tolerances for market surveillance purposes related to the tested parameters as provided in the Ecodesign and Energy label regulations of the respective product category are

[3] https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

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used as a reference for determining the importance of the deviation between the results achieved under the "standard" and the "alternative" test conditions.

In general, if the deviation between the values obtained with the standard and the alternative test method exceeds the verification tolerance, the specific result of the alternative test is considered as being "different" from that of the harmonised standard and a possible indication for circumvention.

Disclaimer 3: The scope of the ANTICSS project is to define, detect the presence, and find ways to avoid in future 'circumvention' and jeopardy effects. The project is not meant to verify the compliance of the models selected for laboratory testing. In this respect in this report we have on purpose avoided to use expressions like "compliance verification" or "model compliance".
When the results of laboratory testing conducted using a *harmonised standard* deviate more than the established verification tolerance from the declared values for the involved parameters the model is indicated as "non-conforming", in a contrary case the model is indicated as "conforming".
Only the Market Surveillance Authorities partners of ANTICSS, to whom the test results are forwarded, will be in charge of any decision about launching, outside the project development, an action to verify the compliance of the models.

For models that turned out being non-conforming with the requirements of the Ecodesign and Energy label regulations according to the test results of the harmonized standard procedure, still the ANTICSS alternative test procedures were applied and test results of the harmonized and the alternative test procedure were analysed in terms of relevant deviations. The main purpose of the testing in ANTICSS is in fact the detection of possible circumvention, and this effect can well happen independently from the model compliance to the EU legislation requirements.

ANTICSS categorization of models and cases

The interpretation of the test results by the ANTICSS project team is based on the ANTICSS definitions of circumvention and jeopardy effects given in section 2. Different interpretations of the results within the project team are presented transparently. Further, the test results were also presented to the members of the ANTICSS Advisory Board[4] and their views were taken into account as well.

The following figure presents the underlying understanding for the categorisation of cases and tested models within ANTICSS.

[4] See https://www.anti-circumvention.eu/contacts/advisory-board

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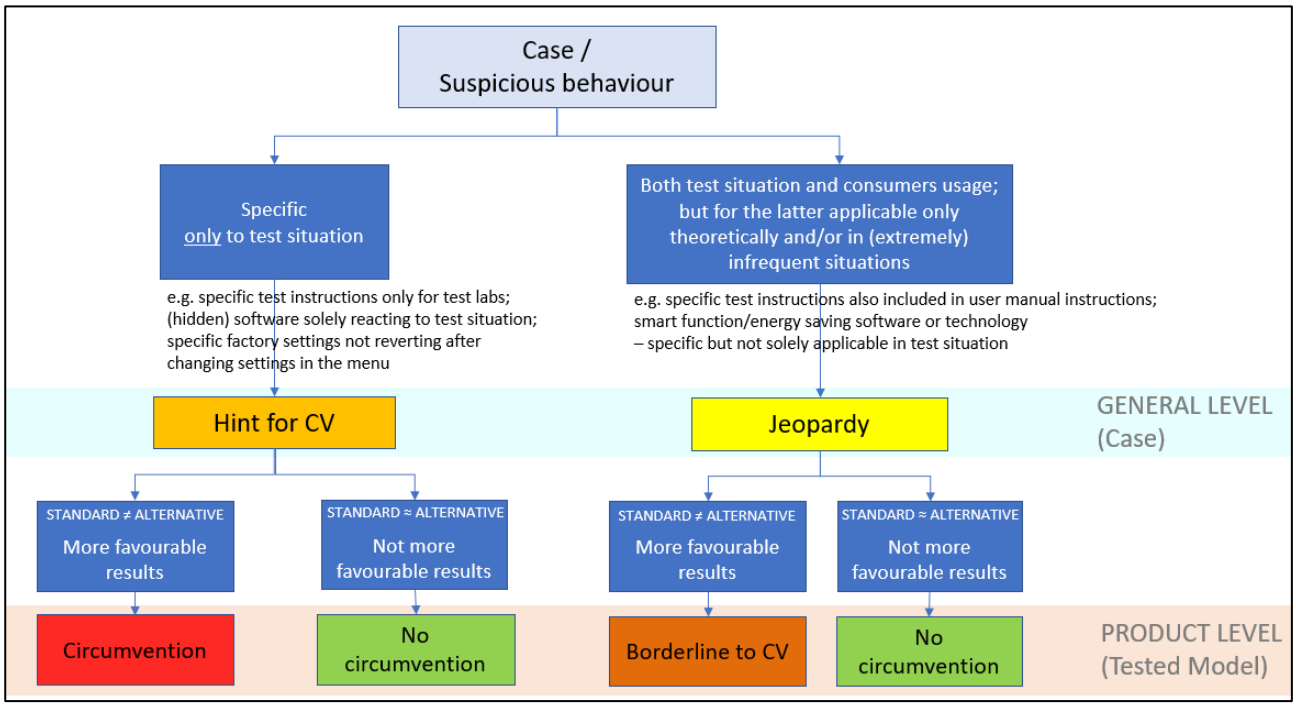

Figure 3-1: ANTICSS categorisation of cases and tested models to circumvention and jeopardy effects

ANTICSS differentiates between the general level ("Case") detected or reported, and the product level, i.e. the test results for the models tested within ANTICSS. Although the act of circumvention might not be found in the tested model (green), it might be considered still applicable to other models of the product category not tested in ANTICSS, i.e. the general case is still classified either as "jeopardy effect" (yellow) or "hints for circumvention" (orange).

- Cases specific *only* to the test situation are providing "hints for circumvention": i.e. cases indicating e.g. specific test instructions only for test labs, or (hidden) software solely reacting to the test situation, or specific factory settings not reverting after changing the settings in the menu. If the alternative test result of the tested model leads to relevant deviations of the standard test result, i.e. exceeding the verification tolerances for market surveillance purposes, the model is categorized as "circumvention".
- Cases in both the test situation and consumers usage, but for the latter applicable only theoretically or in (extremely) infrequent situations are called "Jeopardy effects": e.g. specific test instructions which are also included in the user manual instructions, or smart functions / energy or resource saving software or technologies, being specific but not solely applicable in the test situation. If the alternative test result of the tested model leads to relevant deviations of the standard test result, i.e. exceeding the verification tolerances for market surveillance purposes, the model is categorized as "borderline to circumvention".

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According to the current ANTICSS definition of circumvention, these acts are not relevant only under test conditions, but still, the design of the product or the test instructions are utilized in a way to reach more favourable results specifically in the test situation.

Categorization as circumvention – depending on the illegality of the act?

Currently, most of the cases categorized as circumvention according to the definition of ANTICSS are "formally" not illegal. So far, a paragraph on circumvention not being allowed is only included in few Ecodesign regulations of the so called "winter package"[5]. Circumvention as included in these regulations, however, only cover products recognizing the test condition and reacting specifically by automatically altering their performance during the test, i.e. point a) of the ANTICSS definition of circumvention. This means that "formally", all cases falling under point b) and c) of the ANTICSS definitions of circumvention, as well as cases of point a) but applied in product categories not including the paragraph on circumvention in the Ecodesign regulation, are so far not illegal.

This is especially discussed for those cases where manufacturer's instructions shall be explicitly followed according to the harmonized standard and/or the legislation with the objective to deliver in tests accurate results in terms of *repeatability* (to get the same value again when measuring some time later) and *reproducibility* (to get the same or similar results measured in another laboratory). In ANTICSS, the general allowance of manufacturer's instructions is pointed out as potential weakness or loophole of the standard as it provides also the possibility for exploitation to achieve more favourable results specifically in the test. Again, this is "formally" not illegal. However, these acts correspond with the definitions of ANTICSS and thus are categorized as "circumvention" or "borderline to circumvention" if the exploitation becomes apparent.

Aim of the ANTICSS project is not judging the legality or illegality of the cases and tested models, but to provide the scientific basis (definitions, test results, potential impacts) for political decision makers to decide if the results are relevant to take them into account in the future development and revision of legislation and standards.

5 Ecodesign regulations (EU) 2019/1781 (electric motors and variable speed drives); (EU) 2019/1783 (small, medium and large power transformers); (EU) 2019/1784 (welding equipment); (EU) 2019/2019 (refrigerating appliances); (EU) 2019/2020 (light sources and separate control gears); (EU) 2019/2021 (electronic displays); (EU) 2019/2022 (household dishwashers); (EU) 2019/2023 (household washing machines and household washer-dryers); (EU) 2019/2024 (refrigerating appliances with a direct sales function); (EU) 2019/424 (servers and data storage products)

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Conclusions and further proceedings based on the results of the ANTICSS alternative testing

Specific models that turned out being non-conforming with requirements of the Ecodesign and Energy label regulations according to the test results of the harmonized standard are reported to the Market Surveillance Authorities partners in the ANTICSS project for further follow up outside the development of the project.

The general results will be further fed into the next ANTICSS work packages as follows:

- Analysis on how the specific circumvention behaviour can be detected through laboratory testing, as basis for capacity building of MSAs in work package WP5 (“Capacity building for key actors in market surveillance”);
- Development of strategies and guidelines on how preventing the specific types of circumvention through the revision/improvement of the EU legislation and the relevant harmonised standards in work package WP6 (“Conclusions from circumvention investigation and policy recommendations”);
- Preparation of results and reports to be used for communication to stakeholders and the public in work package WP7 (”Dissemination and communications”).

In the following sections, the results of testing the respective product category, cases and models within the ANTICSS project are described in detail.

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4 Domestic dishwashers

The following table shows an overview of which of the three product models was tested for which of the cases initially categorized as hints for circumvention or jeopardy effect in work package WP3.

Table 4-1: Overview of cases and models tested in the product category dishwashers

	Model A	Model B	Model C
Case DISH1	Tested	---	---
Case DISH2	---	Tested	---
Case DISH3	---	---	Tested
Case DISH4	---	Tested	---

4.1 Case DISH1

4.1.1 Description of the case

For energy consumption and performance tests, automatic dishwashers have to be loaded with the indicated number of place settings, which are soiled in accordance with standard EN 50242. With regard to the loading and settings of the machine, the standard requests to follow the manufacturer's instructions.
In the reported case, a separate 'bowl' support, which is marked as 'only for standard tests' or similar on its packaging, is supplied with the machine. This support is attached to saucer support prongs in the upper rack when loading to the full 15 place settings (Standard load as specified by the manufacturer). The support is not mentioned anywhere else than in the standard loading plan supplied separately by the manufacturer, meaning that it is not intended for use by consumers.

4.1.2 Alternative testing procedure

STANDARD TESTING PROCEDURE:

Tests are conducted according to the standard conditions (EN 50242:2016) and manufacturer's instructions. For this purpose, the declared number of place settings is soiled with seven different food products, then dried in a thermal cabinet at 80 °C for 2 h; next the tableware items are loaded into the test machine and the test cycle is started with the prescribed test programme, which is the Eco programme. While the cycle is running, all relevant parameters (energy, power and water consumption, temperatures, ambient conditions) are monitored and recorded. After the end of the cycle the cleaning and drying performance of the tableware items are evaluated. All parameters required in the Ecodesign / Energy Label regulations are measured within three cycles.

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Testing according to the standard and the manufacturer's instruction includes the installation of the separate 'bowl' support, which is marked as '*only for laboratory tests*' on its packaging.

ALTERNATIVE TESTING PROCEDURE:

For the alternative testing procedure, tests are conducted according to the standard conditions (EN 50242:2016), but without installing the separate bowl support. All parameters required in the Ecodesign / Energy Label regulations are measured within three test cycles. Both, estimated annual energy consumption and specific energy consumption are also calculated based on the number of usable place settings without using the bowl support.

PURPOSE: Evaluation of possible effects of not using the additional bowl support and the potential reduction of capacity on the cleaning and drying performance, as well as the increase of the specific energy consumption per dish.

Modifications, improvements or clarifications to the initial alternative testing procedure:

The initial alternative testing procedure as described above is included in the ANTICSS report "*Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling" (Deliverable D14)*[6]. In the following, further specifications are listed.

For the testing in ANTICSS, for both the standard and the alternative testing, the procedure as foreseen in the standard was modified in order to simplify and shorten the total duration of testing: Instead of five to eight cycles, only three cycles were run to determine average consumption and performance values. Further, the reference dishwasher was not running in parallel to the test machine. Low power mode consumption and noise emission were not measured within the framework of this particular case.

Energy consumption of Left-On and Off Mode were taken from the product fiche of the manufacturer in order to calculate the annual energy consumption, Energy Efficiency Index and Class.

Cleaning and Drying Performance Indices were calculated by means of average values for the reference machine, which were gained during previous performance tests of the reference machine. A cleaning performance score of 3,50 was assumed, the drying performance score was set at 0,85 for the calculation of indices.

Between the standard testing and the alternative testing, the dishwasher was reset to factory settings, neutralized by cleaning the filters and an intensive programme without load was run. For the alternative testing the machine was treated like a new machine, i.e. all settings were adjusted once again.

6 See https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

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4.1.3 Summary of results

4.1.3.1 Model A

The results and findings are detailed below:

Table 4-2: Summary of test results for Case DISH1 – Model A

	standard test conditions	alternative test conditions	Declared	Standard vs. declared	Alternat. vs. declared	Alternat. vs. standard
Energy Consumption (E_t) (kWh)	0,90	0,90	0,95	-5,3%	-5,3%	±0%
Estimated annual energy consumption (AE_C) (280 cycles) (kWh)	256	255	271			
Energy Efficiency Index (EEI)	53	53	56			
Energy Efficiency Class	A++	A++	A++			
Cleaning Performance Score	3,83	3,60	*			
Cleaning Performance Index	1,09	1,03	> 1,12*	-3,5%	-8,8%	-5,5%
Drying Performance Score	0,78	0,77	*			
Drying Performance Index	0,92	0,91	> 1,08*	-15,6%	-16,5%	-1,1%
Water Consumption (l/ cycle)	11,7	11,5	11,0	+6,4%	+4,4%	-1,8%
Estimated annual water consumption (AW_C) (280 cycles) (l)	3276	3216	3080			
Length of Cycle (T_t) (Min)	210	211	215	-2,3%	-1,9%	+0,5%

* Not declared as being minimum requirements according to Commission Regulation (EU) No. 1016/2010

The bowl support does not have an influence on the loading scheme and on consumption values of the tested programme. In the alternative test procedure, the values for the energy and water consumption, drying performance index and the programme length are only deviating between 0 % and -1,8 % compared to the standard test procedure.

The cleaning and drying performance indices reach the minimum requirements of the Ecodesign / Energy label regulations, in both the standard and the alternative test procedure, since both parameters are within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) No. 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Thus, Model A is considered conform.

For the alternative test scenario, the cleaning performance is -5,5 % worse compared to the values of the standard test scenario. Due to the fact that the loading scheme is not affected, it is assumed that the decrease of the cleaning performance is coming from the soiling agents, which are natural products with minor variations from day to day.

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The results of the standard and alternative tests conform the declared values, since all deviations are within the verification tolerances of Commission Regulation (EU) No. 1016/2010. For the water consumption, the increased water intake in the standard and the alternative testing compared to the declared values can be explained by the inclusion of regeneration cycles for the calculation of average values. Due to the shortening of the test series, the results of all three cycles were included in the mean values. If regeneration was excluded, the average water consumption would be less than declared by the manufacturer.

For both the standard and alternative testing, the measured energy consumption per cycle is 5,3 % lower than the declared value, as shown in Table 4-2. For this reason, also the annual energy consumption and resulting EEI are lower compared to the values declared by the manufacturer.

Regarding the Energy Efficiency class, a strange effect was observed. The Efficiency Class seems to be declared wrong, since the declared annual energy consumption of 271 kWh would lead to an EEI of 56 and by this to class A+, while the manufacturer declares an Energy Efficiency class of A++. On the other hand, the energy consumption measured both in the standard and alternative test, leads to an EEI of 53 and hence to the Energy Efficiency class A++.

4.1.4 Conclusions about this case

According to the flow chart (see section 3, Figure 3-1), this case at the general level, i.e. specific instructions only for test laboratories, initially provided “hints for circumvention” according the definition included in chapter 2 of this report, in particular corresponding to section b) of the definition:

“Circumvention is the act of designing a product or prescribing test instructions, leading to an alteration of the behaviour or the properties of the product, specifically in the test situation, in order to reach more favourable results for any of the parameters specified in the relevant delegated or implemented act, or included in any of the documentations provided for the product.
The act of circumvention is relevant only under test conditions and can be executed e.g.
b) by pre-set or manual alteration of the product, affecting performance and/or resource consumption during test.”

The tested Model A cannot be classified as circumvention, since there is no relevant effect of the bowl support on performance or consumption according to the test results of the alternative testing compared to the results of the standard test. At first sight, the additional bowl for testing does not provide any advantage, neither testing nor for consumers, besides the fact that the positioning of the medium serving bowl is slightly facilitated. Therefore, it is not clear why this accessory is supplied for test institutes at all.

The alternative test method, which was applied for this special case, can be adopted for similar cases, in order to disclose suspicious behaviour. The procedure is applicable for Market Surveillance Authorities without additional burden or effort, merely adjustments of the loading scheme may be necessary.

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4.2 Case DISH3

4.2.1 Description of the case

According to regulation or standard "*The dishwasher manufacturer's instructions regarding installation and use shall be followed*." In many dishwashers (from multiple manufacturers) it is necessary to remove or alter the position of many of the "accessories" fitted to the appliance when supplied. It is highly unlikely that a consumer would do the same. If the parts are not removed, the "standard" load will not fit in the appliance. The dishwasher as supplied cannot be loaded with the claimed full capacity. Instructions on removal of all the relevant parts are only given in the 'Instructions for Test Laboratories' and unlikely to be carried out by the consumer in day to day use.

4.2.2 Alternative testing procedure

STANDARD TESTING PROCEDURE:

Tests are conducted according to standard conditions (EN 50242:2016) and manufacturer's instructions. For this purpose, the declared number of place settings is soiled with seven different food products, then dried in a thermal cabinet at 80 °C for 2 h, next the tableware items are loaded into the test machine and the test cycle is started with the prescribed test programme, which is the Eco programme. While the cycle is running, all relevant parameters (energy, power and water consumption, temperatures, ambient conditions) are monitored and recorded. After the end of the cycle the cleaning and drying performance of the tableware items is evaluated.

For the tests according to the test standard and the manufacturer's instructions, the accessories are removed and/or the position altered as described by the manufacturer and the machine is loaded with the declared number of place settings.

ALTERNATIVE TESTING PROCEDURE:

For the alternative testing procedure, tests are conducted according to standard conditions (EN 50242:2016) and manufacturer's instructions but without removing or altering accessories. An alternative loading scheme is designed, fitting the maximum number of place settings and corresponding serving pieces when the machine is loaded "as supplied". For each test scenario, three test cycles are conducted and mean values for consumption and performance criteria are determined.

PURPOSE: Evaluation of the possible effects of not removing or altering the position of the accessories and the resulting reduction of capacity (e.g. 15 instead of 16 place settings), as well as the increase of the specific energy consumption per place setting.

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Modifications, improvements or clarifications to the initial alternative testing procedure

The initial alternative testing procedure as described above is included in the ANTICSS report "*Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling" (Deliverable D14)*[7]. In the following, further specifications are listed.

For the testing in ANTICSS, for both the standard and the alternative testing, the procedure as foreseen in the standard was modified to simplify and shorten the total duration of testing: Instead of five to eight cycles, only three cycles were run to determine average consumption and performance values. Further, the reference dishwasher was not running in parallel to the test machine.

Low power mode consumption and noise emission were not measured for the purpose of this particular case.

Energy consumption of Left-On and Off Mode were taken from the product fiche of the manufacturer in order to calculate the annual energy consumption, Energy Efficiency Index and Class.

Cleaning and Drying Performance Indices were calculated by means of average values for the reference machine, which were gained during previous performance tests of the reference machine. A cleaning performance score of 3,50 was assumed, the drying performance score was set at 0,85 for the calculation of indices.

Between the standard and alternative testing, the dishwasher was reset to factory settings, neutralized by cleaning the filters and an intensive programme without load was run. For the alternative testing, the machine was treated like a new machine, i.e. all settings were adjusted once again.

[7] https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

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4.2.3 Summary of results

4.2.3.1 Model C

The results and findings are detailed below.

Table 4-3: Summary of test results for Case DISH3 – Model C

	standard test conditions	alternative test conditions	Declared	Standard vs. declared	Alternat. vs. declared	Alternat. vs. standard
Energy Consumption (E_t) (kWh)	0,755	0,73	0,75	+0,7%	-2,5%	-3,2%
Specific Energy Consumption (Wh per ps)	47,2	60,9	46,9	+0,7%	+30,0%	+29,2%
Estimated annual consumption (AE_C) (280 cycles) (kWh)	215	208	219			
Energy Efficiency Index (EEI)	43,83	45,05	44,69			
Energy Efficiency Class	A+++	A+++	A+++			
Cleaning Performance Score	3,65	3,59	*			
Cleaning Performance Index	1,04	1,03	> 1,12*	-8,0%	-8,8%	-1,0%
Drying Performance Score	0,72	0,69	*			
Drying Performance Index	0,85	0,81	> 1,08*	-22,0%	-25,7%	-4,7%
Standard Place Settings (ps)	16	12	16			
Water Consumption (l/cycle)	10,9	10,9	10,3	+5,8%	+5,8%	±0%
Specific Water Consumption (l per ps)	0,68	0,91	0,64	+6,3%	+42,2%	+33,8%
Estimated annual consumption (AW_C) (280 cycles) (l)	3052	3052	2880			
Length of Cycle (T_t) (Min)	218	217	205	+6,3%	+5,9%	+0,5%

* Not declared; minimum requirements acc. Commission Regulation (EU) No. 1016/2010

With the alternative loading scheme and all accessories kept included in the machine, only 12 instead of 16 place settings can be fitted into the dishwasher. By this, the capacity is decreasing by 25% in terms of place settings, by 24% in terms of items and by 23% in terms of weight.

This drastic reduction of the capacity is mainly caused by the use of the complete cutlery basket, which has to be placed in the lower rack. By this, the number of plates that can be fit into the lower basket is reduced. Additionally, the use of the third rack decreases the capacity of the upper rack, so that dessert plates cannot be placed there and have to be fit in the lower rack. Even though a higher number of cutlery items, saucers, cups and glasses would fit into the machine, their amount is adjusted to the number of plates, in order to work with complete sets of place settings. The amount of soil and detergent is corrected accordingly, i.e. reduced to the amount associated with a 12 place setting load.

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The results of the tests according to the **standard procedure** for energy consumption, cleaning efficiency index and programme time are within the verification tolerances[8] (see Table 4-4). However, the drying performance index of the standard measurement is beyond the verification tolerance of -19% and thus does not conform with minimum requirements according to Commission Regulation (EU) No. 1016/2010.

With the **alternative procedure**, the total energy consumption is slightly lower (-3,2%) compared to the standard test results, because of the reduced weight of the load; also the drying performance index is slightly lower (-4,7%) compared to the standard test. The most drastic changes of the alternative test results compared to the standard test results are found for the specific energy (+29,2%) and water consumption (+33,8%) per place setting.

For the tested Model C, Energy Efficiency Index and the resulting energy class are hardly affected by the reduction of the loading capacity[9].

4.2.4 Conclusions about this case

The drying performance index of the machine does not conform with the minimum requirements of the Ecodesign regulation according to the standard test, thus **Model C is not conform with regard to this parameter**.

Further, according to the flow chart (see section 3, Figure 3-1), this case at the general level, i.e. specific test instructions only for test laboratories, initially provided "hints for circumvention" according the definition included in chapter 2 of this report, in particular corresponding to section b) of the definition:

"Circumvention is the act of designing a product or prescribing test instructions, leading to an alteration of the behaviour or the properties of the product, specifically in the test situation, in order to reach more favourable results for any of the parameters specified in the relevant delegated or implemented act, or included in any of the documentations provided for the product.
The act of circumvention is relevant only under test conditions and can be executed e.g.
b) by pre-set or manual alteration of the product, affecting performance and/or resource consumption during test."

For the tested Model C, the deviations of the standard and alternative test results are relevant which leads to the ANTICSS categorisation of "circumvention".

[8] 10% for energy consumption, cleaning efficiency index and programme time
[9] Initial EEI is too far away from the A+++ limit (50) and the small increase of the EEI does not lead to a decrease of the Efficiency class

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The tested dishwasher has declared a high maximum loading capacity and numerous accessories supplied with the appliance; however, the only way to achieve this loading capacity at all is removing all the relevant parts, a specific loading scheme which is only given in the 'Instructions for Test Laboratories'. This alteration is just applied for the test procedure, thus the resulting resource consumptions are applicable to this special test situation only.

Since the declared loading capacity is used to calculate the Energy Efficiency Index (EEI), a higher loading capacity might help reaching a better Energy Efficiency Class, although this is not the case for this specific tested model. This higher Efficiency Class, combined with marketing measures promoting the high capacity, may be useful to sell more models.

In principle, a high loading capacity as well as the supply of various accessories can be beneficial for consumers, but they can take advantage of only one of these two possibilities at a time. Moreover, the declared capacity can be loaded into the machine with a very special loading scheme only. With racks and accessories that the user prefers to use and without any hint in the user manual how the high capacity can be loaded in households, customers will probably not be able to reach the declared loading capacity and maybe also the associated efficiency.

The upcoming test standard EN 60436:2020 introduces a new concept for the composition of the test load, which is intented to reflect household conditions better and includes a higher variety of shapes and materials. With this new concept, manufacturers may adjust the design of their racks and accessories and better reflect consumers' needs.

The proposed alternative test procedure, i.e. altering the loading scheme and accessories supplied with the machine to set-up the appliance for testing "as supplied", is an appropriate method to disclose suspicious behaviour and could be adopted by market surveillance authorities. The test burden is similar to the one for the standard test. Some additional time is only required to find a suitable and reasonable loading scheme and to determine the most realistic loading capacity.

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4.3 Case DISH2

4.3.1 Description of the case

In the reported case, a specific instruction how to adjust the appliance for tests in laboratories (three dedicated programme runs) is given in the instruction of use (Information for test institutes only). All three programmes should be done on the same day. The standard test can be started the next day. After 12 hours, it is ensured that the appliance has reached ambient temperature. These specific instructions might serve as indication for the appliance to detect being under a test situation.

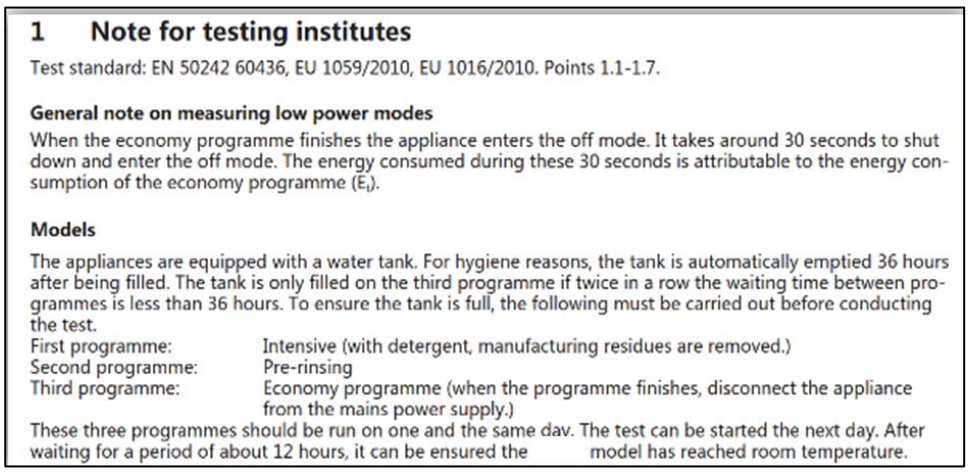
4.3.2 Alternative testing procedure

ALTERNATIVE TESTING PROCEDURE:

First, the machine is tested with the alternative testing procedure. For this purpose, tests are performed according to test standard EN 50242:2016, but the pre-treatment of the machine is NOT done in line with the description of the manufacturer. Three pre-conditioning cycles, others than the ones prescribed in the manufacturer's instructions, are run (1. Machine care → 2. Daily quick → 3. Eco) without disconnecting the machine after the end of the cycles, then the performance tests are started on the next day. Three test cycles are conducted and mean values for consumption and performance criteria are determined.

STANDARD TESTING PROCEDURE:

After that, tests according harmonised standard EN 50242:2016 and manufacturer's instructions are conducted, i.e. the cycles prescribed are run in the given order (1. Intensive → 2. Pre-Rinse → 3.Eco) and after the third cycle the machine is disconnected from the power supply (see Figure 4-1). On the next day the performance tests are started. Three test cycles are conducted and mean values for consumption and performance criteria are determined.



1 Note for testing institutes

Test standard: EN 50242 60436, EU 1059/2010, EU 1016/2010. Points 1.1-1.7.

General note on measuring low power modes

When the economy programme finishes the appliance enters the off mode. It takes around 30 seconds to shut down and enter the off mode. The energy consumed during these 30 seconds is attributable to the energy consumption of the economy programme (E_t).

Models

The appliances are equipped with a water tank. For hygiene reasons, the tank is automatically emptied 36 hours after being filled. The tank is only filled on the third programme if twice in a row the waiting time between programmes is less than 36 hours. To ensure the tank is full, the following must be carried out before conducting the test.

First programme:	Intensive (with detergent, manufacturing residues are removed.)
Second programme:	Pre-rinsing
Third programme:	Economy programme (when the programme finishes, disconnect the appliance from the mains power supply.)

These three programmes should be run on one and the same day. The test can be started the next day. After waiting for a period of about 12 hours, it can be ensured the model has reached room temperature.

Figure 4-1: Note for testing institutes for Model B

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PURPOSE: Analysis whether the dishwasher recognizes the test condition by means of the fixed pre-treatment and the programme course is adjusted accordingly in order to reduce energy and/or water consumption or increase the performance.

Modifications, improvements or clarifications to the initial alternative testing procedure

The initial alternative testing procedure as described above is included in the ANTICSS report "Alternative test methods and approaches to unmask circumvention under EU Ecodesign and Energy labelling" (Deliverable D14)[10]. In the following, further specifications are listed.

For the testing in ANTICSS, for both the standard and the alternative testing, the procedure foreseen in the standard was modified in order to simplify and shorten the total duration of testing. Instead of five to eight cycles, only three cycles were run to determine average consumption and performance values. These three cycles were run on consequitive days for all test procedures. The reference dishwasher was not running in parallel to the test machine.
Low power mode consumption and noise emission were not measured within the framework of this particular case. Energy consumption of Left-On and Off Mode were taken from the product fiche of the manufacturer in order to calculate the annual energy consumption, Energy Efficiency Index and Class. Cleaning and Drying Performance Indices were calculated by means of average values for the reference machine, which were gained during previous performance tests of the reference machine. A cleaning performance score of 3,50 was assumed for the reference machine, the drying performance score was set at 0,85 for the calculation of indices.

The alternative test procedure had to be applied in the beginning, so that the machine was not able to detect the standard test condition and adjust to it. The procedure for preparing the machine for the alternative testing procedure was selected to reflect household conditions. Manufacturers usually recommend to run at least one cycle with high temperatures on a new machine to remove residues from the manufacturing process. Therefore, the machine was pre-conditioned in a *Machine care* programme, followed by a *Daily Quick* and *Eco* programme, which are considered as regular household programmes.

As the manufacturer specifies in the instructions that the machine shall be disconnected from the power supply after the third pre-conditioning cycle, this aspect of potential power failures was examined more closely. Therefore, one test series with three cycles was performed with disconnecting the machine after the end of each pre-conditioning and each test cycle, which is the default process with the applied test rack. A second alternative test series was conducted, where the machine was kept connected to the mains permanently.

Between the test procedures the dishwasher was reset to factory settings, neutralized by cleaning the filters and an intensive programme without load was run. For the following test procedure the machine was treated like a new machine, i.e. all settings were adjusted once again.

10 See https://www.anti-circumvention.eu/storage/app/media/D14_ANTICSS_Alternative-test-procedures_final.pdf

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4.3.3 Summary of results

4.3.3.1 Model B

The results are detailed below:

Table 4-4: Summary of test results for Case DISH2 – Model B

	Standard test condition Discon-nected	Alternat. test condition Discon-nected	Alternat. test condition Connected	Declared Value	Standard vs. Declared	Alternat. discon-nected vs. Standard	Alternat. discon-nected vs. Declared	Alternat. connected vs. Standard	Alternat. connected vs. Declared
Energy Efficiency Class	A+++	A+++	A+++	A+++					
Energy Consumption (E_t) (kWh)	0,82	0,80	0,81	0,76	+ 7,5 %	- 2,2 %	+ 5,2 %	- 1,1 %	+ 6,3 %
Estimated annual consumption (AE_C) (280 cycles) (kWh)	229	224	227	214					
Energy Efficiency Index (EEI)	48	47	48	45					
Cleaning Performance Index	1,08	1,12	1,09	> 1,12*	- 4,4 %	- 4,0 %	- 0,9 %	+ 0,9 %	- 3,5 %
Drying Performance Index	0,98	0,96	0,96	> 1,08*	- 10,1 %	- 1,7 %	- 11,9 %	+ 2,0 %	- 10,9 %
Water Consumption (l/ cycle)	6,8	8,6	7,0	6,9	- 1,5 %	+ 26,7 %	+ 24,6 %	+ 1,4 %	+ 3,0 %
Estimated annual consumption (AW_C) (280 cycles) (l)	1901	2408	1960	1932					
Length of Cycle (T_t) (Min)	278	279	282	280	- 0,7 %	+ 0,2 %	- 0,4 %	+ 1,4 %	+ 0,7 %

* Not declared; minimum requirements acc. Commission Regulation (EU) No. 1016/2010

The cleaning and drying performance indices reach the minimum requirements, in both the standard and in the alternative test procedure, since both parameters are within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) No. 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Also the other parameters measured under standard test conditions are within the verification tolerances of Commission Regulation (EU) No. 1016/2010[11], thus Model B is considered as conform.

In the alternative test procedure with the machine kept connected to the mains permanently, the test results are rather similar to the standard test results (deviations between -1,1% and 2,0%).

[11] 10% for energy consumption and programme time; no verification tolerance provided for water consumption.

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The most striking test result is seen for the water consumption in the alternative test condition when the appliance is disconnected at the end of each cycle. A large share (26,7%) of additional water is taken up compared to the standard test result. In the following, this effect is examined in further detail.

The machine reacts differently to the three chosen preparation and test procedures. Differences between the scenarios are mainly coming from the behaviour of the water tank (cf. also Case DISH4).

When the machine is disconnected in the alternative test procedure at the end of each pre-conditioning and test cycles, the tank is not filled after the third pre-conditioning run and instead of using water from the tank, additional fresh water has to be used; correspondingly the water consumption is higher and on average 1,8 l of additional water are used compared to the standard test procedure (see Figure 4-2). The tank needs three cycles (within a short period of time) until it is filled and the water can be used for the next cycle. Also, the tank is not emptied after a power failure, if the last programme was an Eco programme. So, in the case of alternative testing with disconnecting after each cycle, the tank is not filled during the first and second pre-conditioning, because of the interrupted power supply. The third pre-conditioning cycle (Eco programme) and the first and second test cycle (each Eco programmes) were used to fill the tank, because water is not discarded after an Eco programme. Thus, only the third test cycle had a lower water consumption, due to the tank water which could be utilized finally.

When the machine in the alternative test procedure is kept connected, the tank is filled after the third cycle (which is the last pre-conditioning cycle), and the following test cycles can directly utilize water from the tank. This way, a low water consumption is achieved which is rather similar to the declared values.

Figure 4-2: Comparison of the water consumption for the three test cycles of Case DISH 2 (regeneration operations excluded)

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4.3.4 Conclusions about this case

The current harmonized standard describes that the manufacturer's instructions shall be followed regarding installation and use of the dishwasher. According to the standard, at least three pre-conditioning cycles shall be performed; the programme(s) for pre-conditioning are not further specified in the standard, thus the procedure can be provided by the manufacturer or, in the absence of instructions, can be defined by a test institute. This loophole might enable manufacturers setting up a certain procedure or fixed programmes for the preparation of their appliances to reach more favourable conditions for testing.

According to the flow chart (see section 3, Figure 3-1), this case at the general level, i.e. specific test instruction only for test labs, initially provided "hints for circumvention" according the definition included in chapter 2 of this report, in particular corresponding to section b) of the definition:

"Circumvention is the act of designing a product or prescribing test instructions, leading to an alteration of the behaviour or the properties of the product, specifically in the test situation, in order to reach more favourable results for any of the parameters specified in the relevant delegated or implemented act,or included in any of the documentations provided for the product. The act of circumvention is relevant only under test conditions and can be executed
b) by pre-set or manual alteration of the product, affecting performance and/or resource consumption during test."

This is applicable to the tested dishwasher Model B, since the machine provides test instructions solely for the test laboratory, specifying three dedicated cycles for *preconditionig* (with ECO programme as third preconditioning cycle) and the disconnection after the ECO cycle as last preconditioning cycle. The three *preconditioning* cycles ensure that the water tank is completely filled after the preconditioning (as the filling needs three cycles), i.e. before the following *test* cycles start and therefore the water in the tank can be used throughout the testing.

Further, according to the standard, after each *test* cycle, the machine has to be disconnected. The tested Model, however, is programmed in a way that after disconnection, when being in the ECO programme, the tank is *not* emptied (explained in the user manual instructions, see Figure 4-3 in Case DISH4). Again, this also ensures that the water in the tank can be used throughout the whole testing. This is especially relevant if the third pre-conditioning cycle would be on a Friday, and the first test cycle would start then only on Monday; in this case, the tank would be emptied again as emptying is foreseen after 36 hours (probably due to hygienic reasons).

Alternative testing procedure "connected"

In the alternative procedure "connected", two aspects where changed compared to the standard test procedure: different programmes where chosen for the preconditioning (however, still the ECO programme as third preconditioning cycle), and the machine was kept connected after each

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preconditioning and test cycle (which rather corresponds to the usual situation in households), to see if one of these parameters would have an effect on the test results.

For the tested Model B, no circumvention has been detected for this alternative test setting "connected", i.e. the deviations of the standard and alternative test results are not relevant. The tank was being filled throughout the three preconditioning cycles and the water could be used throughout the whole testing. It has to be noted, however, that the test cycles started within 36 hours after preconditioning. If the last preconditioning cycle would have taken place on a Friday and the test cycles started on Monday only, then the alternative testing "connected" would have resulted in a higher water consumption as the tank would have been emptied and refilled in that situation (no disconnection after the 3rd preconditioning ECO cycle in this alternative scenario, i.e. no ensurance that the tank is kept filled).

Alternative testing procedure "disconnected"

In this alternative procedure, two aspects where changed compared to the standard test procedure: different programmes where chosen for the preconditioning (however, still the ECO programme as third preconditioning cycle), and the machine was disconnected after each preconditioning and test cycle (which, however, does not correspond to the usual situation in households), to see if one of these parameters would have an effect on the test results.

Indeed, the alternative testing procedure "disconnected" led to an increased water consumption: Due to the disconnection, the water tank was not filled or emptied again after the first two preconditioning cycles. The tank filling started in the third preconditioning cycle (ECO programme) and was not emptied, as the tank is kept filled in case of disconnection during the ECO mode. However, as three cycles are needed to fill the tank, the first and second test cycle were also needed to fill the tank so that the water saving effect of the tank could not be utilized for all three test cycles.

As a disconnection after each cycle is not usual for real life conditions at all, this alternative test scenario is not taken as basis for the assessment with regard to circumvention of the tested Model.

Overall conclusion

With the specific test instructions for laboratories, the manufacturer ensures that the water saving effects of the water tank machine are taken into account in the standard test procedure accordingly. Generally, this water saving technology does not provide more favourable results only under test conditions (which would be circumvention), but is also applicable in real life.

However, there is still a loophole in the current harmonized test standard as the programme(s) for pre-conditioning are not further specified in the standard thus the procedure can be provided by the manufacturer which might be exploited. To some extent, this loophole will be closed with the upcoming test standard EN 60436:2020, where a 'programme suitable for normally or heavily soiled tableware' shall be chosen for the preconditioning cycles. This requirement of the standard prevails, even if the manufacturer prescribes different programmes.

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Additionally, the current harmonized test procedure has a weakness as it does not take into account water tank machines appropriately. The current harmonized standard is not requiring information or measures how to cope with additional water consumption or fluctuating water intakes of modern machines. Water stored in tanks, heat exchangers, regeneration water or water for tank cleaning activities cannot be handled appropriately with the current test standard, even though it is contributing to the annual water consumption noticeably. The upcoming test standard EN60436:2020 will include a method by which manufacturers are urged to provide information to the user about regeneration and associated resource consumption; however, additional water consumption due to emptying and refilling of the tank is still difficult to handle and will not be included in the mean annual consumption value that is declared on the energy label.

The alternative test method can be applied by Market Surveillance Authorities, but the test burden will increase if various alternative test procedures shall be applied. Disregarding the prescribed preparation method completely, may be one way to eliminate influences coming from the manufacturer's instructions for test institutes. The fluctuations and increase of the standard deviation need to be examined more closely for the particular cases.

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4.4 Case DISH4

4.4.1 Description of the case

Some dishwashers are fitted with a water storage tank that conserves water (rinsing water or water coming from the mains supply) inside the appliance after the test. The water is used during the pre-wash of the next cleaning cycle in order to save water. The water in the tank will be discarded after a certain time, if the dishwasher is not operated. An additional tank cleaning operation may cause an even higher water and energy consumption. Therefore, resource-saving effects can only be realized, if the dishwasher is run on a daily basis, which is the case during performance tests but may not reflect household conditions.

4.4.2 Alternative testing procedure

STANDARD TESTING PROCEDURE:

Tests are conducted according to the standard conditions (EN 50242:2016) and manufacturer's instructions. The pre-conditioning and test cycles are performed on consecutive days. For this purpose, the declared number of place settings is soiled with seven different food products, then dried in a thermal cabinet at 80 °C for 2 h, next the tableware items are loaded into the test machine and the test cycle is started with the prescribed test programme, which is the Eco programme. While the cycle is running, all relevant parameters (power, energy and water consumption, temperatures, ambient conditions) are monitored and recorded. After the end of the cycle the cleaning and drying performance of the tableware items is evaluated.

ALTERNATIVE TESTING PROCEDURE:

For the alternative testing procedure, tests are conducted according to standard conditions and manufacturer's instructions, but with tests each three days instead of consecutive days, i.e tests are conducted in intervals of 72 hours instead of 24 hours.

Additionally, the pre-conditioning cycles are carried out 3 days in advance before the 1st test cycle is run, to guarantee equivalent conditions of the water tank for each test cycle.

Finally, the behaviour of the machine, the performance and consumption criteria are compared, especially the water consumption.

PURPOSE: Analysis of potential water and energy-saving effects of a water tank, which may only be reached by frequent usage (which is reached in the standard conditions) compared to the energy and water consumption if the interval between tests runs exceeds 48 hours.

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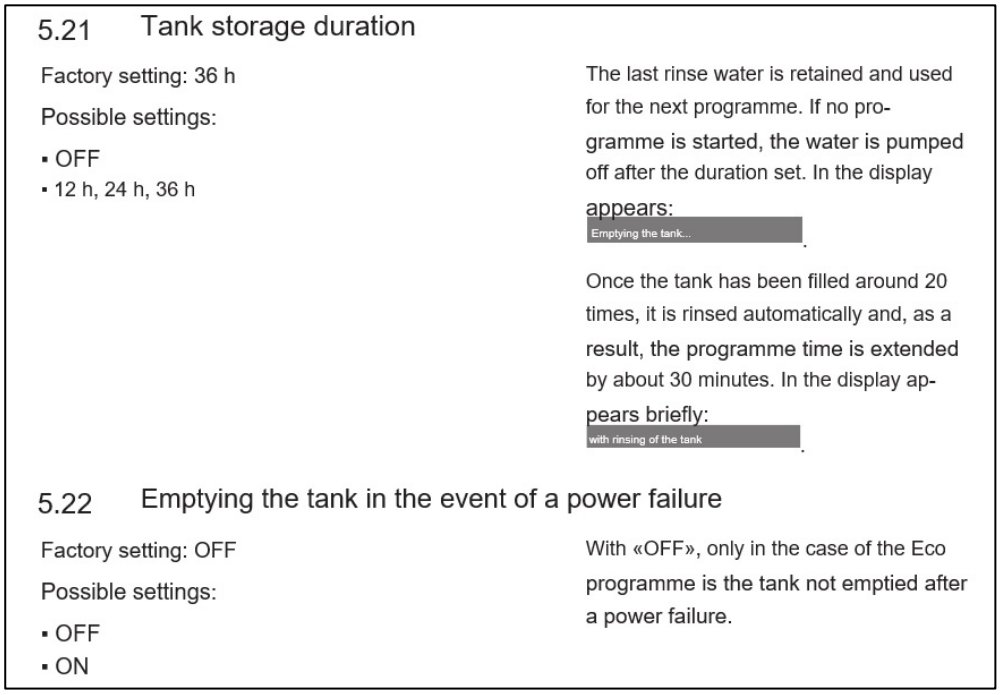

5.21 Tank storage duration

Factory setting: 36 h

Possible settings:

- OFF
- 12 h, 24 h, 36 h

The last rinse water is retained and used for the next programme. If no programme is started, the water is pumped off after the duration set. In the display appears:

Emptying the tank...

Once the tank has been filled around 20 times, it is rinsed automatically and, as a result, the programme time is extended by about 30 minutes. In the display appears briefly:

with rinsing of the tank

5.22 Emptying the tank in the event of a power failure

Factory setting: OFF

Possible settings:

- OFF
- ON

With «OFF», only in the case of the Eco programme is the tank not emptied after a power failure.

Figure 4-3: Description of the tank storage function of Model B (User manual)

Modifications, improvements or clarifications to the initial alternative testing procedure

For both the standard and alternative the testing, the procedure as foreseen in the standard was modified in order to simplify and shorten the total duration of testing.

Instead of five to eight cycles, only three cycles were run to determine average consumption and performance values. The reference dishwasher was not running in parallel to the test machine. Low power mode consumption and noise emission were not measured within the framework of this particular case. Energy consumption of Left-On and Off Mode were taken from the product fiche of the manufacturer in order to calculate the annual energy consumption, Energy Efficiency Index and Class.

Cleaning and Drying Performance Indices were calculated by means of average values for the reference machine, which were gained during previous performance tests of the reference machine. A cleaning performance score of 3,50 was assumed for the reference machine, the drying performance score was set at 0,85 for the calculation of indices.

Between the standard and alternative testing, the dishwasher was reset to factory settings, neutralized by cleaning the filters and an intensive programme without load was run. For the alternative testing the machine was treated like a new machine, i.e. all settings were adjusted once again.

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4.4.3 Summary of results

4.4.3.1 Model B

The results are detailed below:

Table 4-5: Summary of test results for Case DISH4 – Model B

	standard test conditions	alternative test conditions	Declared Value	Standard vs. declared	Alternat. vs. declared	Alternat. vs. standard
Energy Consumption (E_t) (kWh)	0,817	0,846	0,760	+ 7,5 %	+ 11,3 %	+ 3,5 %
Estimated annual consumption (AE_C) (280 cycles) (kWh)	229	237	214			
Energy Efficiency Index (EEI)	48	50	45			
Energy Efficiency Class	A+++	A++	A+++			
Cleaning Performance Index	1,08	1,07	> 1,12*	- 4,4 %	- 5,3 %	- 0,9 %
Drying Performance Index	0,98	0,96	> 1,08*	- 10,1 %	- 11,1 %	- 2,0 %
Water Consumption (l/ cycle)	6,79	11,2	6,9	- 1,6 %	+ 62,3 %	+ 64,9 %
Estimated annual consumption (AW_C) (280 cycles) (l)	1904	3123	1932			
Length of Cycle (T_t) (Min)	278	277	280	- 0,7 %	- 1,1 %	0 %

* Not declared; minimum requirements acc. Commission Regulation (EU) No. 1016/2010

The cleaning and drying performance indices conform with the minimum requirements, both in the standard and in the alternative test procedure since both parameters are within the verification tolerances for market surveillance authorities as listed in Annex III of Commission Regulation (EU) No. 1016/2010 (-10 % for the cleaning performance index, -19 % for the drying performance index). Also the other parameters measured under standard test conditions are within the verification tolerances of Commission Regulation (EU) No. 1016/2010[12], thus Model B is considered as conform.

The most striking parameter is the water consumption which is considerably increasing (+64,9 % compared to the standard test procedure) when the alternative test procedure is applied (see Table 4-5). With a break of > 48 h between test cycles, the tank is emptied after a certain time and tap water is taken up at the beginning of the next cycle.

The energy consumption is also slightly increasing (+3,5 % compared to the standard test results), when fresh water of 15 °C is taken up from the tap instead of using the tank water at ambient temperature (23 °C). This leads to a higher Energy Efficiency Index (EEI) and a lower Efficiency Class (A++ instead of A+++ as declared).

[12] 10 % for energy consumption and programme time; no verification tolerance provided for water consumption.

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Overall, the water consumption is significantly increasing if the tank is emptied between two test cycles. Additional regeneration or tank-cleaning operations may lead to an even higher water intake. All of these activities contribute also to an increase of the energy consumption.

For the programme duration, cleaning and drying performance, no influence of the alternative test procedure was observed.

4.4.4 Conclusions about this case

According to the flow chart (see section 3, Figure 3-1), this case at the general level, i.e. a water saving technology – specific but presumably not solely applicable in test situation, in combination with specific test instructions (also included in the user manual instructions) was initially categorized as "jeopardy effect" according the definition included in chapter 2 of this report:

"Jeopardy effects encompass all aspects of products or test instructions, or interpretation of test results, which do not follow the goal of the EU ecodesign and/or energy labelling legislation of setting ecodesign requirements and providing reliable information about the resource consumption and/or performance of a product. These effects may not be classified as circumvention, but become possible due to loopholes or other weaknesses in standards or regulations."

Further, according to the flow chart (see section 3, Figure 3-1), this case would be categorized as jeopardy effect if the water saving technology would be both applicable for the test situation and the consumers usage, but for the latter applicable only in *rather infrequent or exceptional situations*, i.e. the advantage explicitly gained in the test situation. Initial suspect was that the available settings for the tank storage duration (12 h, 24 h, 36 h according to the user instructions) might be too short to benefit from this special feature in real life on a large scale. Therefore, the alternative procedure was chosen to show the effect if the water tank would be emptied more often in case of less frequent usage. Indeed, the effect of this alternative procedure was a higher water consumption.

After revisiting this case, however, it cannot be stated that the water saving function is only applied in rather *exceptional* situations. If the water is stored in the tank for a maximum of 36 hours, then the dishwasher can be used around 243 cyles per year (which corresponds to a usage of 4-5 cycles per week) using the tank water. According to the current Ecodesign and Energy labelling regulations (EU) 1016/2010 and (EU) 1059/2010 on dishwashers, the calculations of the annual energy consumption of dishwashers is based on a total number of 280 standard cleaning cycles per year (i.e. about 5 cycles per week) – an average which is also confirmed by data on European user behaviour. [13] Therefore, the initial categorisation of the case as "jeopardy effect" cannot be maintained anymore.

[13] Boyano A., Moons H., Villanueva A., Graulich K., Rüdenauer I., Alborzi F., Hook I., Stamminger R., Ecodesing and Energy Label for household dishwashers, EUR 28645 EN, doi:10.2760/024232

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The case / tested Model can be rather classified as “missing representativeness of the standard” as the current harmonized test procedure does not take into account water tank machines appropriately. The current harmonized standard is not requiring information or measures how to cope with additional water consumption or fluctuating water intakes of modern machines. Water stored in tanks, heat exchangers, regeneration water or water for tank cleaning activities cannot be handled appropriately with the current test standard, even though it is contributing to the annual water consumption noticeably. The upcoming test standard EN60436:2020 will include a method by which manufacturers are urged to provide information to the user about regeneration and associated resource consumption; however, additional water consumption due to emptying and refilling of the tank is still difficult to handle and will not be included in the mean annual consumption value that is declared on the energy label.

When it comes to household conditions, the water tank might be used efficiently, but this is applicable only in those cases where the dishwasher is run on a nearly daily basis (4-5 times per week. When the dishwasher is less frequently used, the annual water consumption of the machine will increase compared to the declared values due to the emptying and refilling of the water tank after 36 hours. In this respect, there is a shortcoming in the user manual as it does not give any hint that the water consumption will increase in case of lower frequency usage of the dishwasher. Further, the tank is only filled if three cycles are run within a maximum duration of 36 hours, thus water-saving effects cannot be realized until the fourth cycle; also this information is not provided to consumers, but only in the notes for test institutes (see Figure 4-1 in Case DISH2).

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4.5 Summary of results of this product category

The following tables provide a summary of the results of cases and models tested in the product category domestic dishwashers:

ANTICSS standard test results

Both Model A and Model B are conforming with the requirements of the Ecodesign and Energy labelling regulations according to the harmonized standard test, whereas Model C is non-conforming to the requirements of the Ecodesign and Energy labelling regulations with regard to the drying efficiency index.

Table 4-6: Overview of the standard test results of cases and models tested in the product category household tumble driers

Standard test	Model A	Model B	Model C
Standard test	Conforming	Conforming	**Not conforming (Drying Efficiency Index)**

ANTICSS alternative test results

For Case DISH1, the general case, i.e. provision of specific test instructions (additional bowl support to be used) solely for test laboratories is categorised as “hint for circumvention”. For the tested Model A no circumvention has been detected, i.e. the deviations of the standard and alternative test results are not relevant.

For Case DISH3, the general case, i.e. provision of specific test instructions solely for test laboratories (removal of accessories only in the test situation), is categorised as hint for circumvention. For the tested Model C circumvention has been found as the deviations of the standard and alternative test results are relevant.

For Case DISH2, the general case, i.e. provision of specific test instructions (specific preconditioning of the machine before testing) solely for test laboratories is categorised as “hint for circumvention”. For the tested Model B no circumvention has been detected, i.e. the deviations of the standard and alternative test results (scenario “connected”) are not relevant.

Cases DISH4, i.e. a water saving technology – specific but presumably not solely applicable in test situation, in combination with specific test instructions (also included in the user manual instructions) was initially categorized as “jeopardy effect”. After revisiting this case, however, it cannot be stated that the water saving function is only applied in rather exceptional situations but it approximately corresponds to the European average use cycles used as total number of standard cleaning cycles per year according to the current EU Ecodesign and Energy label regulations. Therefore, the initial categorisation of the case as “jeopardy effect” cannot be maintained anymore.

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However, the case / tested Model can be rather classified as "missing representativeness of the standard" as the current harmonized test procedure does not take into account water tank machines appropriately.

Table 4-7: Overview of the ANTICSS alternative test results of cases and models tested in the product category domestic dishwashers

Alternative test	Model A	Model B	Model C
Case DISH1		Not tested	Not tested
Case DISH3	Not tested	Not tested	
Case DISH2	Not tested		Not tested
Case DISH4	Not tested	Missing representativeness of the standard	Not tested

ANTICSS colour legend:

General level (Case)	Product level (tested Model)	
Yellow: Jeopardy effect Orange: Hints for Circumvention	Green: Dark orange: Red:	No Circumvention Borderline to circumvention Circumvention

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Czech Republic: SEVEn - SEVEn, the Energy Efficiency Center, z.u.
Czech Republic: SEIA - Státní energetická inspekce
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