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BSI Standards Publication

Energy Consumption of Vending Machines

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee CPL/59/13, Performance of refrigeration.

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Energy Consumption of Vending Machines

Consommation d'énergie des distributeurs automatiques

Energieverbrauch von Verkaufsautomaten

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European Committee for Electrotechnical Standardization
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European foreword

This document (EN 50597:2015) has been prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-09-07
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2018-09-07

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Introduction

Vending machines are included in the European Commission's eco-design study on ENER Lot 12. It is foreseen that an Ecodesign Regulation implementing Directive 2009/125/EC on the eco-design of energy-related products will be adopted in the future, and a corresponding standardization request will be issued to CEN and CENELEC accordingly. The development of the present European Standard was deemed necessary in a view to anticipate the above-mentioned developments.

1 Scope

This European Standard defines methods for the measurement of energy consumption of vending machines, whether or not fitted with refrigerating appliances.

The European Standard applies (but is not limited) to the following categories of machine types:

Table 1 — Vending machine categories

CATEGORY	MACHINE TYPE
1	Refrigerated closed fronted can and bottle machines where the products are held in stacks
2	Refrigerated glass fronted can and bottle, confectionery & snack machines
3	Refrigerated glass fronted machines entirely for perishable foodstuffs
4	Refrigerated multi-temperature glass fronted machines
5	Confectionery and snack machines that are not refrigerated

For verification purposes all the tests specified need to be applied to a single unit. The tests may also be made individually for the study of a particular characteristic.

This European Standard does not deal with any characteristics of machine design other than energy consumption.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50564, *Electrical and electronic household and office equipment — Measurement of low power consumption*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Relating specifically to the vending process:

3.1.1
automatic defrosting
defrosting where no action is necessary by the user to initiate the removal of frost accumulation and to restore normal operation

Note 1 to entry: It includes the automatic removal of defrost water.

3.1.2
cabinet
enclosure within a vending machine in which products are held ready to be vended

3.1.3
automatic energy saving mode
mode of a vending machine in which energy reducing measures are automatically applied as a result of operational controls fitted by the manufacturer

Note 1 to entry: These operational controls could include light or movement sensors. Timers or other controls that can be adjusted by the machine operating company do not qualify as automatic unless they have a permanent minimum configuration level that cannot be overridden by the machine operating company, in which case they may be operational for the automatic energy saving mode test at their minimum configuration.

3.1.4
factory settings
settings that are made in the factory before the machine is sent to the customer; these include, but are not limited to, thermostat settings, defrost cycles and energy saving features

3.1.5
health control cut out function
function that prevents vending of foodstuff if the machine or compartment experiences a time/temperature condition outside that permitted under food safety regulations

Note 1 to entry: This function is fitted on machines intended entirely for the storage and vending of perishable foodstuffs or with a compartment for the storage and vending of such foodstuffs.

3.1.6
loading or filling
process of putting products into the vending machine

Note 1 to entry: This may require the door of the machine to be open.

3.1.7
manufacturer's instructions
instructions that accompany the machine, including advice on installation of the machine at the final operating location

3.1.8
non-refrigerated machines
vending machines with no refrigeration system fitted

Note 1 to entry: These may dispense a variety of products including but not limited to newspapers, non-perishable snacks and toys.

3.1.9
perishable foodstuffs
foods, such as dairy products, sandwiches and plated meals that are required to be kept chilled under food safety regulations

Note 1 to entry: Requirements vary between EU Member States.

3.1.10
pull down
reduction of temperature inside the product storage area of a chilled vending machine to the machine's nominal operating temperature as specified by the manufacturer, for example as required following the loading operation

3.1.11
ready mode
mode of a vending machine in which the machine is available (ready) for use but no products are taken, and in which vended products are available for immediate delivery

3.1.12
refrigerated multi-temperature glass fronted machines
machines which can be set up to have more than one compartment, each of which is held at a different temperature, one of which is for perishable food

Note 1 to entry: The presence of a health control cutout function in the perishable food compartment is essential.

Note 2 to entry: The compartments in these machines are sized according to the needs of the final customer. In practice they are operated with no more than 50% capacity at perishable food temperatures.

3.1.13
vending machine entirely for perishable foodstuffs
machines designed for the safe storage of perishable foods that meet the necessary regulatory requirements

Note 1 to entry: Presence of a health control cutout function is an essential part of that requirement.

3.1.14
vending mode
transient mode of a vending machine during which products are dispensed

3.1.15
zone cooled vending machine
vending machines for which the cabinet is not fully cooled throughout its volume and in which product is cooled to the final vending temperature only as it reaches close to the dispensing mechanism

Note 1 to entry: This is the usual configuration for category 1 machines.

Note 2 to entry: Zone cooled machines are not appropriate for perishable foodstuffs.

3.2 Relating to the tests:

3.2.1
net volume
net internal refrigerated volume of the cabinet within which the products directly available for vending are contained, measured according to 6.4

3.2.2
normal conditions of use
operating conditions which exist when the **cabinet**, including all permanently located accessories, has been set up and situated as stated in the manufacturer's instructions / technical documentation and is in service

Note 1 to entry: The effects of actions by non-technical personnel for purposes of loading, unloading, cleaning, defrosting, the manipulation of accessible controls and any removable accessories, etc., according to the **manufacturer's instructions** are within this definition. The effects of actions resulting from interventions by technical personnel for the purposes of maintenance or repair are outside this definition.

3.2.3
test package
food product used as load when testing chilled food compartments

Note 1 to entry: The test packages used in these tests need to be commercially available, unopened, 330 ml cans of soft drinks.

Note 2 to entry: It has been established that the difference in heat capacity of cans of different soft drinks is insignificant in these tests.

4 General requirements

4.1 Applicability

This standard establishes the tests and calculations necessary to determine the energy rating of a vending machine.

The standard relates to the categories of vending machines described in Table 2.

Table 2 — Description of vending machine categories

CATEGORY	MACHINE TYPE	COMMENT
1	Refrigerated closed fronted can and bottle machines where the products are held in stacks	These machines serve refrigerated beverages that are not visible before vending.
2	Refrigerated glass fronted can and bottle, confectionery & snack machines	These machines are refrigerated for foodstuffs serving quality reasons not related to food safety.
3	Refrigerated glass fronted machines entirely for perishable foodstuffs	These machines are refrigerated for food safety reasons and have a health control cutout function.
4	Refrigerated multi-temperature glass fronted machines	These machines have more than one compartment, each of which is held at a different temperature, one of which is for perishable food. The compartment containing perishable food shall be controlled by a health control cutout function.
5	Confectionery and snack machines that are not refrigerated	These machines store product at ambient temperature without cooling.

The following types of vending machine are excluded from this standard:

- ice cream vending machines;
- drink machines dispensing hot and/or cold drinks into cups;
- vending machines operating at temperatures below 0°C.

The machine manufacturer shall provide adequate information to confirm that the machine is suitable for testing according to this specification and that it can perform the tests as required, if necessary with minimum intervention by manufacturers' technical staff.

Information shall be provided by completing the test report in Annex B.

4.2 Test room

Tests shall be carried out in a test room at (23 ± 2) °C and (60 ± 5)% relative humidity with defined air movement. The conditions in the test room shall be measured by a probe located 500 mm upstream of the vending machine (on the air supply side of the cabinet) in line with the front of the cabinet and at half the height of the vending machine being tested.

Lighting shall be installed to maintain (600 +/- 100) lx measured at a height of 1 m above the floor level.

Air movement shall be provided. The air movement, shall be, as far as practicable, parallel to the plane of the cabinet opening and to the horizontal axis. The air velocity at any point on the vertical side of the vending machine shall be between 0,1 m/s and 0,2 m/s.

The direction of air flow shall be such that the air does not enter the cabinet when the door is open.

4.3 Instruments, measuring equipment and measuring accuracy

All measurements shall be carried out with instruments that have been calibrated.

Temperature measurements shall be made to an accuracy of ±1 °C.

Time measurements shall be made to the nearest [0,01] h.

Relative humidity shall be measured to an accuracy of ± 5%.

Electrical energy consumption shall be measured to a resolution of ± 0,01 kWh and with an accuracy of ± 1%.

NOTE See EN 50564 for guidance on power measurement.

4.4 Power supply

The tolerance on power supply shall be ± 2% for voltage and ± 1% for frequency in relation to the nominal values given on the marking plate or otherwise stated by the manufacturer.

5 Conditions for the tests

5.1 General

Each machine intended to be tested shall be selected from stock or routine production and shall be typical in construction and have only default settings as supplied on delivery to the customer except as required to meet 5.6 and to achieve the operational modes required under 6.2.2.

Machines shall be prepared according to the **manufacturer's instructions** as if they were to be installed in their intended vending location, including the fitting of parts such as leg covers and spacers.

Unless otherwise specified, the tests are carried out on a single machine that shall withstand all the relevant tests and carried out in the order given in this standard.

Machines shall be categorized according to the information in the manufacturer's brochure. Where the machine is described as being capable of being operated with different sections at different temperatures, one of which sells perishable food, the machine shall be tested as a category 4 machine. Where a machine is fitted with a chiller but no reference is made to perishable food, it shall be tested as a category 2 machine.

All carousel or drum machines (where the products on display are held on a circular disc) fitted with a chiller shall be tested as category 3 machines.

If it is evident from the construction of the machine that a particular test is not applicable, the test is not carried out.

EXAMPLE As an example, in a category 5 machine there is no reloading or **pull down** measurement.

5.2 Equipment location for test

Figure B.1 shows the position of the machine in the test room.

The machine shall be installed so that the rearmost part of the **cabinet** is a minimum of 100 mm from any vertical surface at the rear of the machine.

There shall be a minimum of 1 m between the side or front of the machine casing and any vertical surface at the side or front of the machine.

There shall be a minimum of 250 mm between the top of the machine and the ceiling of the test room.

5.3 Energy consumption and recording

The energy consumption shall be measured by a direct meter reading method, as described in EN 50564 and recorded in the test report shown in Annex B.

5.4 Product temperature sensors

Product temperature sensors are not required for the testing of category 5 machines.

In machines that are being tested with two temperature zones, sensors shall be placed in both compartments.

Temperature sensors shall be placed half way along the long side of the cans and taped to the side of the cans so that they are in direct contact with the can. Sensors shall be protected against heat radiation from the external environment.

For closed face can and bottle machines two sensors are taped to cans in the columns adjacent to the outer columns of the product stack. Thus they shall be taped to cans in columns 2 and 4 of a 5 column machine. They shall be fixed to cans in the fourth row from the bottom of the stack, or if there are less than 4 rows to the top row.

Glass fronted spiral or tray machines shall be set up entirely with spirals or trays so as to vend only 330 ml cans.

For machines operating at one temperature, 12 temperature sensors shall be placed on cans at the extremes of the cabinet and in the middle row. For machines tested with two compartments, 8 sensors shall be placed on the cans at the extremes of the uppermost and lowest rows in the colder compartment and 4 sensors shall be placed at the extremes of the middle row in the warmer compartment.

Glass fronted carousel vending machines shall be set up with 12 sensors, four located on cans equidistance apart in each of the top, middle and bottom rows.

5.5 Product loading for test

Machines shall be filled to the maximum capacity defined by the manufacturer. The capacity shall be reported.

Note that for categories 1,2 and 4, loading temperatures are different for initial loading and for pull-down test loading.

NOTE See Table 3.

5.6 Product storage temperatures

Machines that can be operated with compartments at different temperatures (category 4 machines) shall be tested with the 50% of the volume set for the lowest applicable temperature as described in this section.

Category 1 machines shall be tested in ready mode with the machine set with a maximum measured product temperature of 7 °C.

Category 2 machines (not suitable for perishable foodstuff), shall be tested in ready mode with the product at a maximum of 12 °C.

Category 3 machines shall be tested in ready mode with the machine set with a maximum product temperature of 3 °C.

Category 4 machines shall be tested in ready mode with a product temperature of a maximum of 3 °C in the cooler compartment and a maximum of 12 °C in the warmer compartment.

In the case of a zone-cooled machine, the temperature of products further away from the dispensing mechanism may be above the vending temperature, but temperature requirements apply to those products to which the sensors are attached as described in 5.4.

The factory set temperatures may need to be adjusted to achieve these temperatures.

5.7 Stabilization

Before commencing testing, the machine shall be filled and stable at the appropriate temperature as identified in 5.6, including the run-in period described in 6.2.2.

Stability is defined, for these tests, as the difference between the maximum and minimum temperatures measured by any one sensor in the steady state being no more than 2 °C over a 2 h period.

If a machine is found not to be able to achieve stability at the points required in the test procedure then the test is aborted.

6 Energy consumption measurement

6.1 General

Vending machines operate in the following modes:

— **ready mode;**

— **vending mode;**

— **loading and pull down mode;**

— **automatic energy saving mode.**

This standard provides tests for **ready mode, loading and pull down mode** and **automatic energy saving mode**.

NOTE Vending mode is a transient state that is deemed to incur negligible additional electrical consumption over a typical year and is not measured for these tests.

This test takes into account only the automatic energy saving features that are permanently operational on the machine and excludes those that can be adjusted by the machine operating company.

The machine typical weekly energy consumption is calculated by assuming the proportion of time a machine will be in each of these modes during a week as described in 7.1.

Machines shall be tested with controls set such that test products in the cabinet are at the temperature specified in 5.6 during normal (ready mode) operation. Other factory set controls should not be adjusted, except that the energy saving features shall be configured so as to meet the requirements of the test described in 6.2.2.

Before the test is started, any payment systems and telemetry systems that are not permanent features of the vending machine as placed on the market by the manufacturer, shall be disabled so that they draw no measured power during the test.

Before commencing the test the machine temperature shall be stable as described in 5.7 and the **test package**s shall be at temperature as specified in 5.6.

Tests shall be carried out in the order of the clauses.

6.2 Ready mode, energy saving mode and recovery period measurements

6.2.1 General

This test is intended to cover **ready mode, automatic energy saving mode** measurements and **recovery period** test (during which temperatures are restored following any rise in temperature that occurs during the automatic energy saving mode). This test is applicable to all five categories of machine covered by this standard.

6.2.2 Test procedure

The purpose of this test is to measure the energy consumption both while the machine is in “**ready mode**”, in “**automatic energy saving mode**” and in the "**recovery period**".

This test is carried out continuously according to the following schedule overview:

Run-in period prior to start of test	Until product temperatures are stable as per 5.7, or 3 h - whichever is the longer – see below.
Ready mode	hours 1 - 4
Energy saving mode, including defrost cycles if appropriate	hours 5 -16
Recovery period	beginning of hour 17 until both the product temperatures have reached the same as at the start and the temperature has been confirmed stable as defined in 5.7.

NOTE The recovery mode test concludes after 2 h of confirmed temperature stability following the end of the automatic energy saving mode test. If the product temperature has not risen during energy saving mode test, then the recovery mode test consists of only the 2 h confirmation of stability.

The machine and/or test set up shall be configured by the manufacturer such that the machine's automatic energy saving mode is not triggered during the run-in period, ready mode test or during the recovery period, but that it can operate normally during the energy saving mode test. Before the run-in period the machine shall be loaded to capacity as per 5.5.

After initial loading the machine shall be operated for a run-in period of not less than three hours. During this period the product temperatures should be verified as stable as per 5.7 and meeting the temperatures required in 5.6. The run-in period shall be extended as required until a stable condition is reached.

The test commences with the ready mode test once stability has been verified.

At the start of the automatic energy saving mode test, the machine's automatic energy saving mode controls shall be allowed to take effect as per their factory default operation without interruption until

the end of the automatic energy saving mode test. Thus, for example a motion or activity sensor will begin measuring for its default period of inactivity at the beginning of the energy saving mode test period.

At the end of the automatic energy saving mode test the machine shall be stimulated back into ready mode and, if necessary, allowed to recover back to the normal vending temperature situation as at the start of the ready mode test, plus a 2 h period to confirm temperature stability as in 5.7. This is the "**recovery period"** test. Energy consumption during the final 2 h of the recovery period test shall be the same as half of the energy consumption during the 4 h ready mode test, to within ± [5]% or the test shall be extended until this is the case, or aborted.

The run-in period, ready mode test, automatic energy saving mode test and recovery period test shall include one or more defrost cycles if this is part of normal operation.

6.2.3 Measurement

Ready mode energy consumption is measured for the first 4 h of the test, e_r in kWh.

Automatic energy saving mode energy consumption is measured from the beginning of the fifth hour until the end of the sixteenth hour, e_s in kWh.

Recovery period energy consumption is measured from the beginning of the seventeenth hour until the temperature recovers to that at the start of the test (e_{rec} with duration t_{rec}). In addition, the energy consumption is recorded during a final 2 h to confirm temperature stability, e_{fin}.

Record the energy consumption (e_r, e_s, e_{rec} and e_{fin}) and duration (4, 16, t_{rec} and 2) of each mode of the test in the test report (see Annex B).

6.3 Reloading and pull down test

6.3.1 Test procedure

This test is only for machines in categories 1-4.

Before commencing the test, remove half of the machine contents. Leave those cans with sensors attached in place. For closed front machines remove the top half of the stacks of cans. For glass fronted spiral or tray machines, remove the rearmost half of every row. For carousel (or drum) machines remove every alternate can on any given level.

Allow the machine to pull down to the required temperature and verify temperature stability has been reached as per 5.7.

With the machine temperature stable, reload the machine, as per the manufacturer's instructions, to capacity as per 6.3.2.

6.3.2 Loading for reloading and pull-down test

Cans for reloading the machine shall be at loading temperatures given in Table 3.

Table 3 — Product loading temperatures for reloading and pull-down test.

Machine Category	Machine type	Temperature of products being reloaded, °C
1	Refrigerated closed can and bottle machines where the products are held in stacks	23 ± 1
2	Refrigerated glass fronted can and bottle, confectionery & snack machines	23 ± 1
3	Refrigerated machines for perishable foodstuffs	3 ± 1
4	Refrigerated multi-temperature glass fronted machines: Perishable food compartment Non-perishable food compartment	 3 ± 1 23 ± 1

During filling the door should be completely open, that is as far as the hinge will allow. Filling shall be completed within the following times. If filling is completed faster than the allotted time, the door shall be left completely open until the time has expired.

Number of cans to be re-loaded	Loading time
300 and over	45 min
225 -299	35 min
125 – 224	25 min
Less than 125	15 min

Close the machine and allow it to pull the temperature down to the temperatures specified in 5.6.

6.3.3 Measurement for reloading and pull-down test

The pull down test duration and energy measurement starts when the door is opened for loading and is completed when the product temperature returns to the required temperature (or temperatures) (see 5.6). Monitor the machine for a further 2 h to confirm that it is stable.

Measure the total time for the loading and pull-down test, t_{pd}, and the total energy consumption during that time e_{pd} in kWh and report within the test report (see Annex B).

NOTE t_{pd} does not include the 2 h monitoring.

6.4 Measurement of the net volume

The net volume is defined in 3.2.1. The net volume is the volume of the largest rectangular cuboid that will fit within the internal walls of the cabinet (see Figure B.2). It is intended to include the volume occupied by products directly available for vending without further operator intervention and the volume through which the products pass during the dispensing process. For multi-temperature machines, the net volume is the sum of the volumes of both compartments.

The net volume does not include:

- the volume into which product is dispensed and is accessible to customers (delivery area);
- any volume within the cabinet that is usable for storage of products that are not immediately available for vending;

- any volume within the cabinet occupied by parts necessary for the proper functioning of the machine such as cooling coils, evaporators, air ducts, fan shrouds and control boxes.

See Figure B.2 for examples of what is included and not included in net volume for different types of machine.

Determine the total net volume (V) to the nearest 1 litre and report within the test report (see Annex B).

7 Calculations — Energy consumption

The energy consumption is calculated from the results in the table shown in Annex B according to the formula for the weekly energy consumption

$$E_{wk} = 14e_r + e_{pd} + 7e_{rec} + [7(16- t_{rec})- t_{pd}]e_s /12$$

where

E_{wk} is the calculated weekly energy consumption

e_r is the energy consumption measured in the 4 h of the ready mode test

e_{pd} is the total energy used in the reload and pull down period

e_s is the energy consumption measured in the 12 h of the energy saving mode test

e_{rec} is the energy used in the recovery period

t_{pd} is the time taken for the successful completion of the pull down operation

t_{rec} is the time taken for the successful completion of the recovery period

The annual energy consumption AEC is calculated as:

$$AEC = E_{wk} \times 52$$

Annex A
(informative)

Test timeline

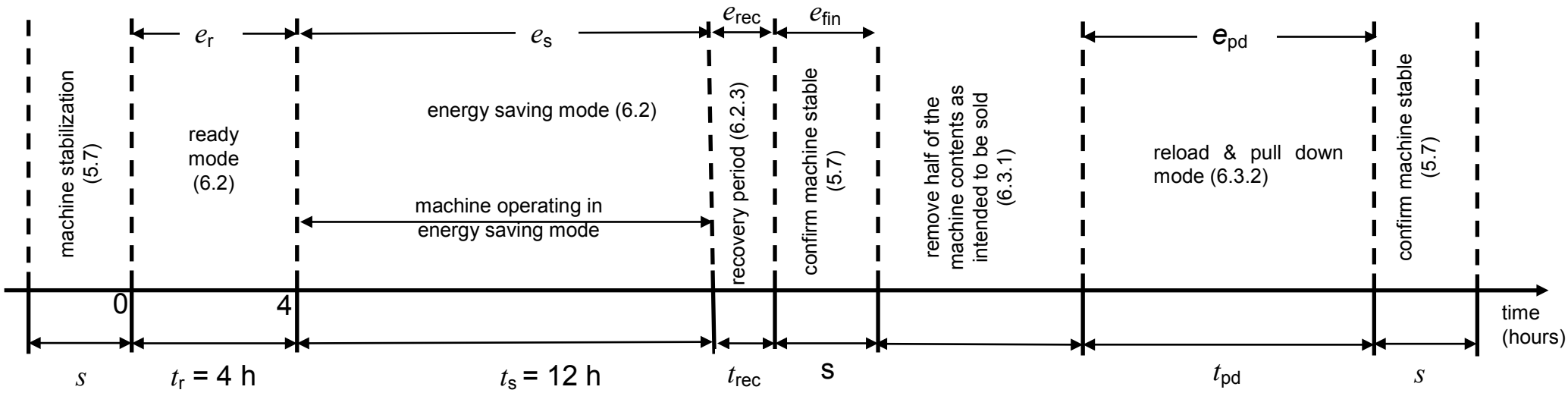


Figure A.1

Annex B
(informative)

List of measurements to be reported

Product under test				
Brand name as identified on machine				
Model identification number				
Climate classification (3.2.1)				
Machine version or serial number				
Machine description				
Declared vending machine category/categories (1, 2, 3 and/or 4)				
Does machine include a health control cutout function (Y/N)				
Name of applicant				
Address of applicant				
Energy saving modes used/available				
Test report number		Test date		
Prepared by		Approved by		
Test results				
Test standard / measurement method applied				
Method used to confirm stabilization had been reached				
Fill capacity of machine (number of cans)				
Intended vending temperature of products (°C)				
Ready mode (6.2)	e_r (watt hours)		4 (hours)	
Energy saving mode (6.2)	e_s (watt hours)		12 (hours)	
Recovery period (6.2)	e_{rec} (watt hours)		t_{rec} (hours)	
Final stabilization period (6.2)	e_{fin} (watt hours)		2 (hours)	
Reload and **pull down** test (6.3)	e_{pd} (watt hours)		t_{pd} (hours)	
Calculated E_{24h} (kWh)				

Calculated AEC (kWh)	
Net volume of cabinet, V, in litres (see 6.4)	
Test conditions	
Ambient temperature in °C	
Test voltage in Volts	
Test frequency in Hz	
Total harmonic distortion of the supply system in % Information and documentation on the instrumentation, set-up and circuits used for electrical testing	
Test equipment information	
Test equipment description	
Test equipment model numbers	
Test equipment serial numbers	
Calibration due dates	

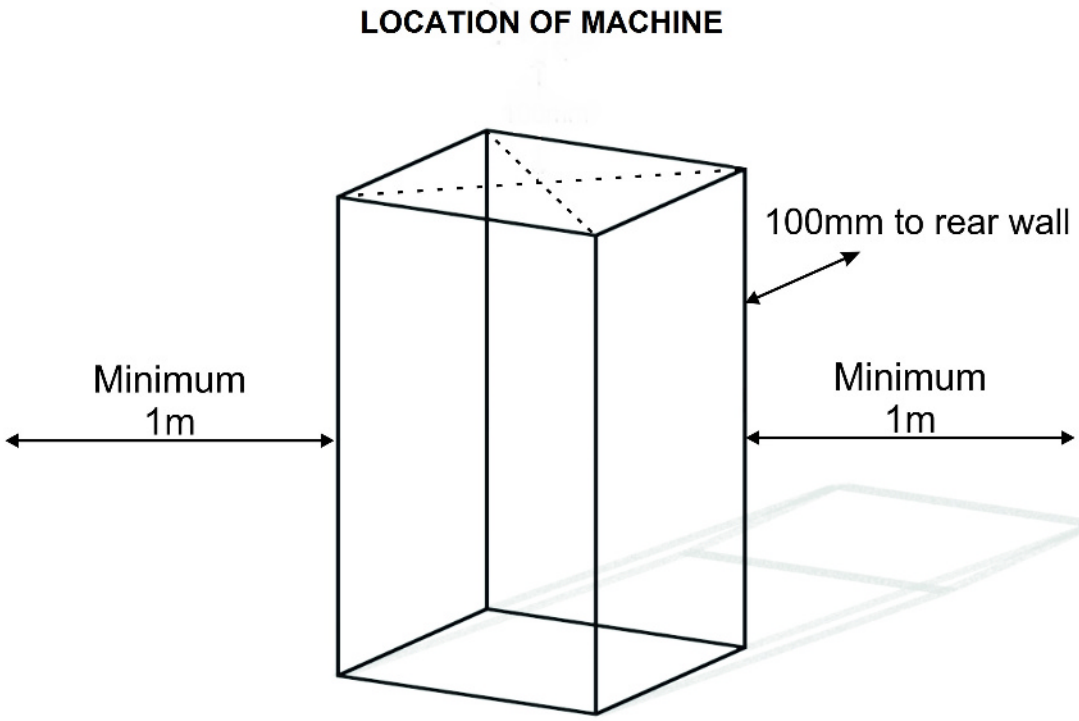
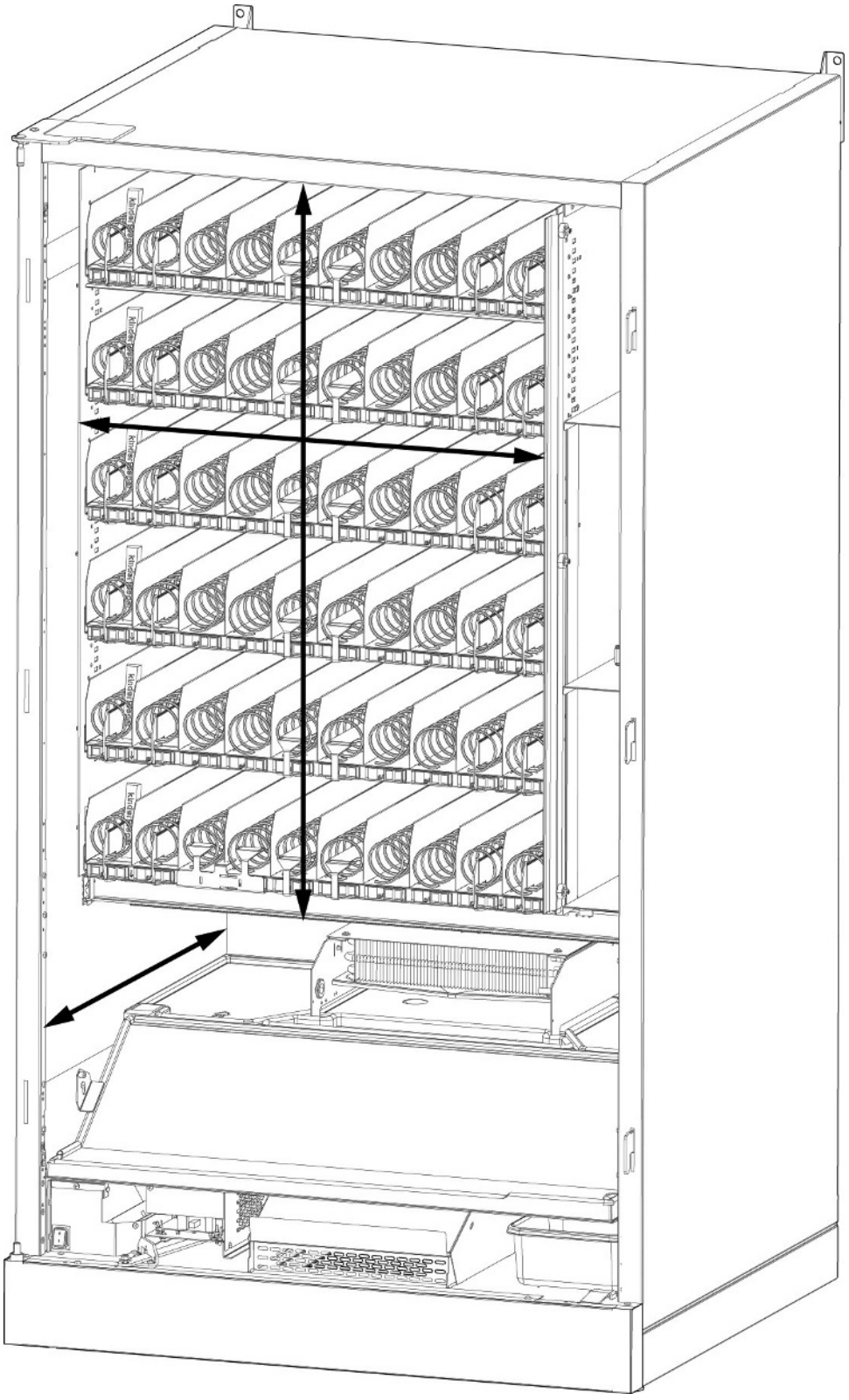
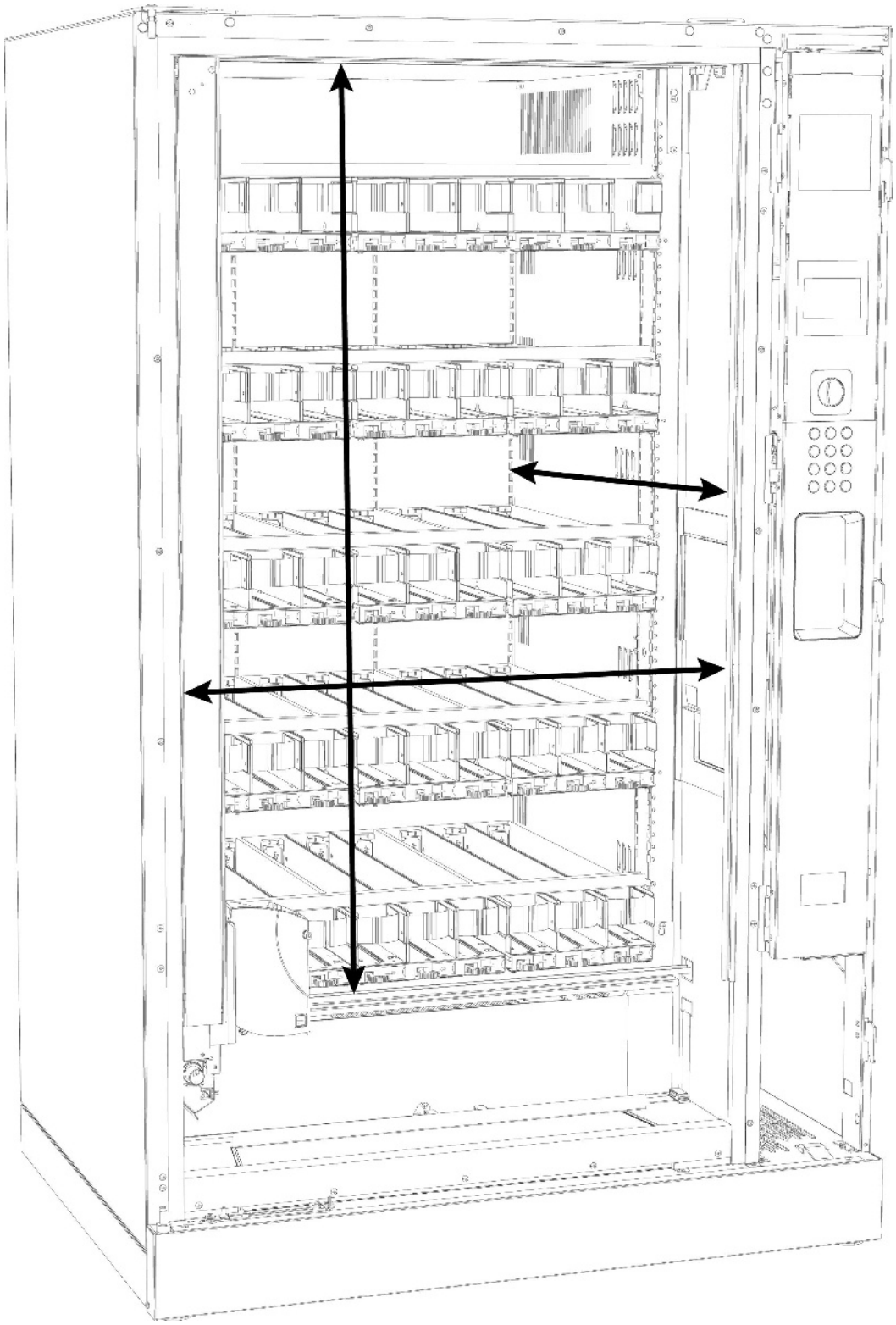

LOCATION OF MACHINE
100mm to rear wall
Minimum
1m
Minimum
1m

Figure B.1



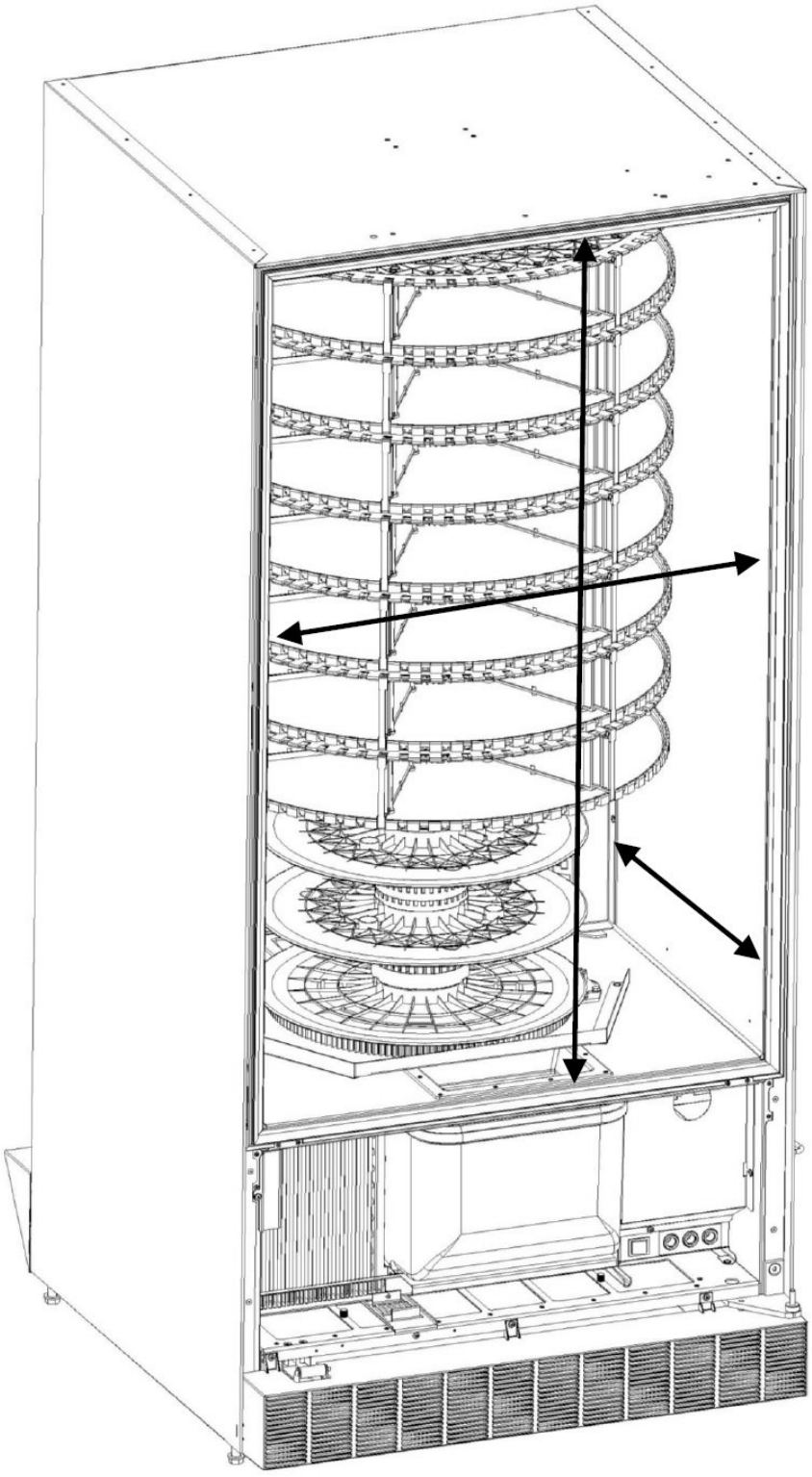
a) Spiral Machine

Figure B.2 ***(continued)***



b) Glass fronted can/bottle machine

Figure B.2 ***(continued)***



c) Carousel or drum machine

Figure B.2 ***(end)***

Bibliography

[1] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

[2] IEC 62552 (all parts), *Household refrigerating appliances — Characteristics and test methods*

[3] EN ISO 23953-1, *Refrigerated display cabinets — Part 1: Vocabulary (ISO 23953-1)*

[4] EN ISO 23953-2, *Refrigerated display cabinets — Part 2: Classification, requirements and test conditions (ISO 23953-2)*

[5] EN ISO 15502, *Household refrigerating appliances — Characteristics and test methods (ISO 15502)*

[6] CENELEC Internal Guide: TC59X/WG16/(Sec)008/INF, Method for calculation of uncertainty of measurements

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