

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Energy consumption of vending machines

Consommation d'énergie des distributeurs automatiques

[IEC 63252:2020](https://standards.iteh.ai/catalog/standards/sist/8fd26ee1-2513-4f1e-a1d7-8a91c12b286c/iec-63252-2020)

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ENERGY CONSUMPTION OF VENDING MACHINES

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
59/730/FDIS	59/736/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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ENERGY CONSUMPTION OF VENDING MACHINES

1 Scope

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

The standard applies (but is not limited) to the categories of machines shown in Table 1.

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 and snack machines
3	Refrigerated glass-fronted machines entirely for perishable foodstuffs
4	Refrigerated dual-temperature glass-fronted machines
5	Confectionery and snack machines that are not refrigerated
6	Combination machines consisting of two different categories of machine in the same housing and powered by one chiller

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

- drink machines dispensing hot and/or cold drinks into cups;
- machines with a food-heating function;
- vending machines operating at temperatures below 0 °C; or
- any machine including one or more of these compartments.

For verification purposes, it is essential to apply all of the tests specified to a single unit. The tests can also be made individually for the study of a particular characteristic.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60335-1, *Household and similar electrical appliances – Safety – Part 1: General requirements*

IEC 60335-2-75, *Household and similar electrical appliances – Safety – Part 2-75: Particular requirements for commercial dispensing appliances and vending machines*

ISO 5149-2, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation*

ISO 5149-3, *Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site*

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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms relating specifically to the vending process

3.1.1

cabinet

enclosure within a vending machine in which the product is held ready to be sold

3.1.2

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 could include light or movement sensors.

Note 2 to entry: Timers or other controls that can be adjusted by the company operating the machine do not qualify as automatic, unless they have a permanent minimum configuration level that cannot be overridden by the company, in which case they may be operational at their minimum configuration for the automatic energy-saving mode test.

3.1.3

health control cut-out function

function fitted in machines intended entirely for the storage and vending of perishable foodstuffs, or with a compartment for the storage and vending of such foodstuffs, that prevents vending of foodstuff if the machine or compartment experiences a time/temperature condition outside that permitted under food safety regulations

3.1.4

loading filling

process of putting products into the vending machine

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

3.1.5

manufacturer's instructions

instructions that accompany the machine, including advice on installation of the machine at the final operating location

3.1.6

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 countries.

3.1.7

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

Note 1 to entry: For example, as required following the loading operation.

3.1.8

ready mode

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

Note 1 to entry: In this mode, products on sale are available for immediate delivery.

3.1.9

refrigerated dual-temperature glass-fronted machines

machines that 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 cut-out 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.

Note 3 to entry: If the machine includes a food safety thermal cut-out functionality, then for the purposes of testing, that compartment with the safety cut-out is deemed for storage of perishable foodstuff.

3.1.10

vending mode

transient mode of a vending machine during which products are dispensed

3.1.11

zone-cooled vending machine

vending machines for which the cabinet is not fully cooled throughout its volume and in which the product is cooled to the final vending temperature only as it reaches close to the dispensing mechanism (this is the usual configuration for category 1 machines)

Note 1 to entry: Zone-cooled machines are not appropriate for perishable foodstuffs.

3.2 Terms relating to the tests

3.2.1

M-can

test can used to simulate a product during tests, fitted with a temperature-measuring device

3.2.2

net volume

net internal refrigerated volume of the cabinet within which the products directly available for vending are contained, measured in accordance with 6.4

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 shall be commercially available, unopened, 330 ml cans of drinks. The difference in heat capacity of different drinks is insignificant.

4 General requirements

4.1 Applicability

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

The document relates to the categories of vending machines described in Table 2 and to any combination of them.

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 and snack machines	These machines are for foodstuffs which are refrigerated for 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 cut-out function.
4	Refrigerated dual-temperature glass-fronted machines	These machines have two compartments, 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 cut-out function.
5	Confectionery and snack machines that are not refrigerated	These machines store product at ambient temperature without cooling.
6	Combination machines consisting of two different categories of machine in the same housing and powered by one chiller	The machines usually consist of two machine modules separated by a vertical panel but could also be two units mounted one above the other. Typical combination machine would consist of a closed-fronted bottle machine and a glass-fronted snack machine, or two separate food and snack machines.

The machine manufacturer shall provide adequate information to confirm that the machine is suitable for testing in accordance with this specification, and that it can perform the tests as required, if necessary with minimum intervention by the manufacturer's 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 climate class 3, defined in ISO 23953-2 as $(25 \pm 1) ^\circ\text{C}$ and $(60 \pm 5) \%$ 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.

Air movement shall be provided. The air movement shall be, as far as practicable, parallel to the plane of the cabinet's 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. The time interval between temperature measurements should be no greater than 1 min.

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 $\pm 0,01$ kWh and with an accuracy of ± 1 %.

NOTE See EN 50564 for guidance on power measurement.

4.4 Power supply

The tolerance that applies to the 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 representative of 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 6.3.

Machines are to be prepared in accordance with 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 are carried out in the order given in this document.

Machines are to be categorised in accordance with the information in the manufacturer's brochure.

A machine described as being capable of being operated as a chilled food machine and fitted with a health cut-out function shall be tested as a category 3 machine.

A machine described as providing the facility for a compartment to sell perishable food, and whose compartment is fitted with a health control cut-out function, shall be tested as a category 4 machine.

Where a machine is fitted with a chiller but where 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 are to be tested as category 3 machines.

As far as possible, combination machines shall be supplied by the manufacturer with half the total volume set up for each category of machine, e.g. half as can/bottle and half as snack.

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

NOTE For 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 is to be installed so that the rearmost part of the cabinet is at 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 M-cans

M-cans shall be commercial 330 ml cans having height of 115 mm and a diameter 66 mm and shall be filled with water or a liquid of similar heat capacity and with a temperature sensor at the geometric centre of the can.

NOTE If a different can size is used, this is stated in the test report. Only results determined with the same can size are comparable.

For category 1 machines, two M-cans are placed in the columns adjacent to the outer columns of the product stack. Thus, they shall be placed in columns 2 and 4 of a 5-column machine. They shall be placed in the fourth row from the bottom of the stack, or if there are fewer than 4 rows, in the top row.

For category 2 and 3 and 5 machines, 12 M-cans shall be placed at the extremes of the cabinet and in the middle row. For category 4 machines, M-cans shall be placed at the extremes of the uppermost and lowest rows of each compartment, for a total of 16 M-cans. For category 6 machines, M-cans shall be placed as appropriate for the two individual sections.

Glass-fronted carousel vending machines shall be set up with 12 M-cans, four located equidistant in each of the top, middle and bottom rows.

M-cans are required for the testing of category 5 machines to ensure that the product is at the correct temperature before testing starts.

5.5 Product loading for test

Glass-fronted spiral or tray machines shall be set up entirely with spirals or trays so as to vend only 330 ml cans. Carousel or drum machines are to be set up with the maximum number of sectors that are large enough to contain a 330 ml can. Closed-fronted can/bottle machines are to be set up to contain the maximum number of 330 ml cans.

Machines are to be filled with the maximum capacity number of 330 ml cans. The capacity shall be reported in the test report (see Annex B).

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

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 foodstuffs), 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. 50 % of the volume shall be allocated to each temperature condition.

Category 5 machines shall be tested in ready mode with cans at 25 °C.

Category 6 machines shall be tested in the conditions appropriate for each compartment.

In the case of a **zone-cooled vending machine**, the temperature of products further away from the dispensing mechanism may be above the vending temperature, but temperature requirements apply to M-cans as described in 5.4.

NOTE The factory-set temperature or the compartment-airflow settings may need to be adjusted to achieve these temperatures.

The mean temperature recorded by each sensor shall be recorded and the average of these means recorded in Table B.1.

5.7 Stabilization

Before commencing testing, the machine shall be filled to half capacity and stabilized at the appropriate temperature as identified in 5.6, including during the run-in period described in 6.2.1.

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-hour 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:

- loading and pull-down mode;
- ready mode;
- automatic energy-saving mode (including recovery period);
- vending mode.

This document provides tests for loading and pull-down mode, ready 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 company operating the machine.

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 Clause 7.

Machines shall be tested with controls set such that test product in the cabinet is 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 6.3.

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 are to 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 packages shall be at the temperature specified in 5.6.

Tests shall be carried out in the order of the clauses. A timeline of the order of all the tests is provided for information in Figure A.1.

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6.2 Loading and pull-down test IEC 63252:2020

6.2.1 Test procedure

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This test is only for machines in categories 1, 2, 3, 4 and 6. Testing of category 5 machines begins at 6.3.

Before commencing the test, machines in categories 2, 3 and 4 are loaded to half capacity with cans in the front half of every row, except M-cans, which should be in place as specified in 5.4. Machines in category 1 are loaded to half capacity with the M-cans in place as specified in 5.4. The two compartments in category 6 machines are loaded as appropriate for the two individual compartments.

For carousel (or drum) machines in category 3, a can is placed in every alternate sector on every level.

After initial loading, the machine shall be operated for a run-in period of not less than 3 h. During this period, the product temperatures should be verified as being stable, as per 5.7, and meet the temperatures required in 5.6. The run-in period shall be extended as required until a stable condition is reached.

With the machine temperature stable, open the door and load the machine, as per the manufacturer's instructions, to capacity as per 6.2.2.

6.2.2 Loading for loading and pull-down test

Cans for loading the machine shall be at loading temperatures given in Table 3. Cans loaded into category 4 and 6 machines shall be at the loading temperatures appropriate for each compartment.