



BSI Standards Publication

Professional and commercial coffee machines — Methods for measuring energy consumption and productivity

National foreword

This British Standard is the UK implementation of EN 50730:2025.

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Professional and commercial coffee machines - Methods for measuring energy consumption and productivity

Machines à café professionnelles et commerciales -
Méthodes pour mesurer la consommation énergétique et la
productivité

Professionelle und gewerbliche Kaffeemaschinen -
Messmethoden für Energieverbrauch und Produktivität

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European foreword

This document (EN 50730:2025) has been prepared by CLC/TC 59X “Performance of household and similar electrical appliances”.

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1 Scope

This document defines methodologies to measure the energy consumption and productivity of coffee machines based on their characteristics.

This document applies to professional and commercial coffee machines used, for example, in kitchens and food preparation areas in restaurants, canteens, hotels, coffee shops, breakfast rooms.

This document does not apply to:

- household appliances;
- machines that use only coffee pods or coffee capsules;
- machines powered by non-electrical energy (i.e. gas);
- vending machines for hot beverages;
- milk refrigerators integrated or not into **traditional machines**;
- accessory equipment provided together with the machine (e.g. cup warmer, milk refrigerator) physically separated from the machine.

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.

ISO 7056:1981, *Plastics laboratory ware — Beakers*

3 Terms and definitions

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

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

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

3.1 Coffee machine types

3.1.1

fully automatic machine

coffee machine, other than a vending machine, in which the preparation of the coffee starting from the ingredients up to the delivered beverage is fully controlled by the machine based on the input of the user

Note 1 to entry: The user typically places a cup underneath and presses a button, and the machine does the rest.

3.1.2

traditional machine

coffee machine in which the preparation of coffee requires pressurized hot water to pass through grinded coffee by one or more interventions of the user in process of preparation and delivery of coffee

EXAMPLES For intervention of the user the examples are manually filling of grinded coffee in the portafilter and manually emptying after the dispensing of the coffee.

Note 1 to entry: The user prepares coffee (properly grounded), put it into portafilter and mounts the portafilter on the coffee machine, then presses the button.

3.1.3

cold machine

switched off machine, mounted inside the testing chamber, left at testing conditions for a time of 16h00 min $\pm$ 10 min from the end of a heating phase of the machine, all delivery groups on, that lasted at least 1h

3.2

end of beverage delivery

time when the continuous flow of the delivery of the liquid beverage stops

Note 1 to entry: This is not the last drop of beverage delivered.

Note 2 to entry: This is not applicable in case of **steam wand hot milk**.

3.3

delivery time

time from when the command to deliver a beverage is given to the machine to the **end of beverage delivery**

EXAMPLE For command to deliver a beverage: press a button, activate a lever.

Note 1 to entry: The delivery time ends when the continuous flow stops, not the last drop, see 3.2.

3.5 Milk

3.5.1

cold milk

UHT cow liquid milk with a level of fat of 2,5 % to 4 %, a temperature of 5 °C $\pm$ 2 °C

Note 1 to entry: UHT means Ultra High Temperature.

3.5.2

direct hot milk

milk delivered by coffee machine by heating up **cold milk**

Note1 to entry: Milk is heated up by steam or by heat exchanger inside the machine.

3.5.3

steam wand hot milk

milk heated up by steam from steam wand inserted into a beaker of **cold milk**

Note1 to entry: In some machines the control of steam from steam wand is automatic, in other machines it is a manual one.

3.6 Buffer times and delivery cycles

3.6.1

short buffer time

SBT

2 min between the starting of one delivery and the starting of the next one within the same delivery cycle

3.6.2

medium buffer time

MBT

20 min between the starting of the last delivery of one delivery cycle and the starting of the first delivery of the next delivery cycle or the starting of the next test

3.6.3
long buffer time
LBT

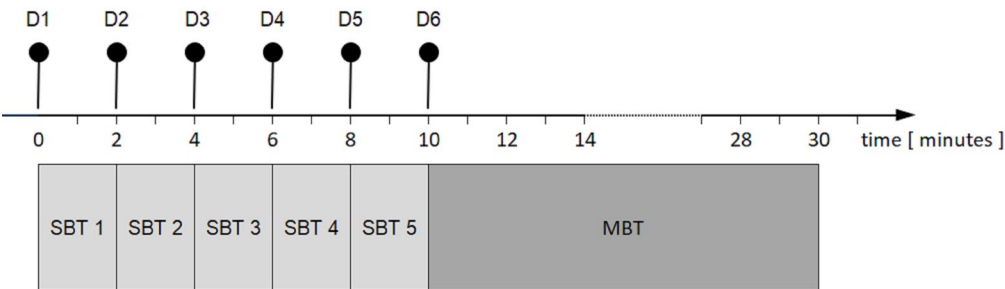
60 min between the starting of the last delivery of one test and the starting of the first delivery of the next test or the starting of the next test

3.6.4
delivery cycle 6-2-20

cycle of 6 deliveries of a beverage, the next delivery starting after 2 min from the start of the previous one, where the cycle ends 20 min after the start of the last delivery

Note 1 to entry: See Figure 1 where each dot identifies the start of each delivery.

Note 2 to entry: Only one type of beverage is delivered within the same cycle.



Key
D1, D2, D3, D4, D5, D6 first delivery, second delivery, third delivery, fourth delivery, fifth delivery, sixth delivery
SBT 1, ... SBT 5 **short buffer time 1, ... short buffer time 5**
MBT **medium buffer time**

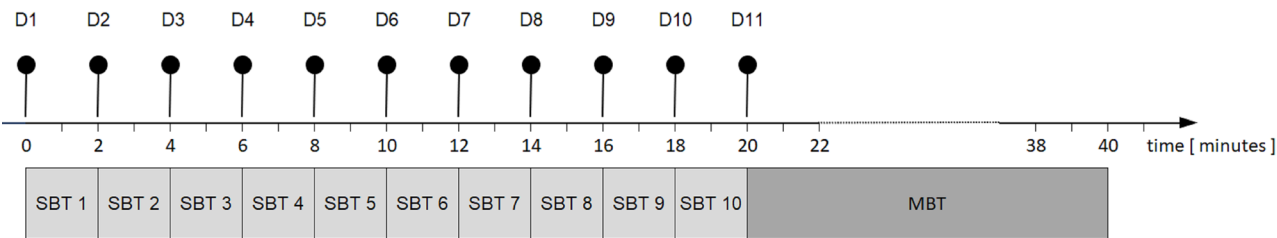
Figure 1 — Delivery cycle 6-2-20

3.6.5
delivery cycle 11-2-20

cycle of 11 deliveries of a beverage, the next delivery starting after 2 min from the start of the previous one, where the cycle ends 20 min after the start of the last delivery

Note 1 to entry: See Figure 2 where each dot identifies the start of each delivery.

Note 2 to entry: Only one type of beverage is delivered within the same cycle.



Key
D1, ... D11 first delivery, ..., eleventh delivery
SBT 1, ... SBT 10 **short buffer time 1, ... short buffer time 10**
MBT **medium buffer time**

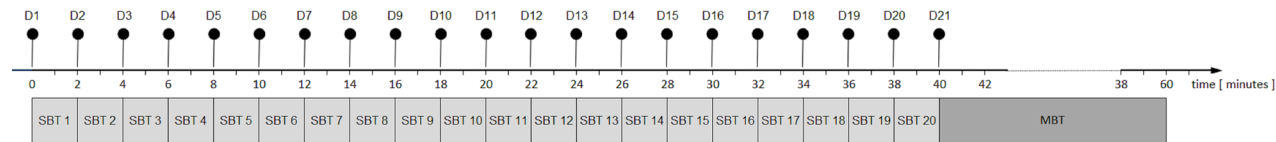
Figure 2 — delivery cycle 11-2-20

3.6.6
delivery cycle 21-2-20

cycle of 21 deliveries of a beverage, the next delivery starting after 2 min from the start of the previous one, where the cycle ends 20 min after the start of the last delivery

Note 1 to entry: See Figure 3, where each dot identifies the start of each delivery.

Note 2 to entry: Only one type of beverage is delivered within the same cycle.



Key
D1, ... D21 first delivery, ..., twenty-first delivery
SBT 1, ... SBT 20 short buffer time 1, ... short buffer time 20
MBT medium buffer time

Figure 3 — delivery cycle 21-2-20

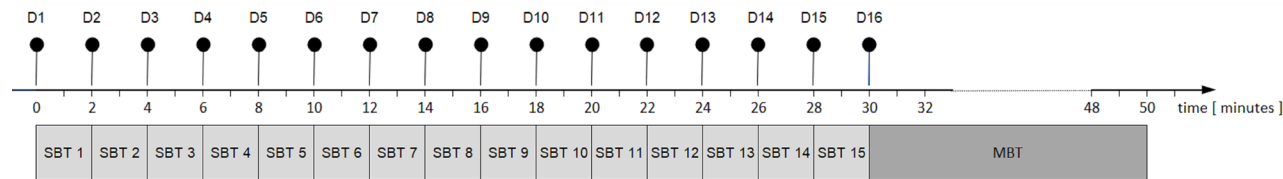
3.6.7
delivery control cycle 16-2-20

cycle of 16 deliveries of beverages, the next delivery starting after 2 min from the start of the previous one, where the cycle ends 20 min after the start of the last delivery

Note 1 to entry: See Figure 4, where each dot identifies the start of each delivery.

Note 2 to entry: Depending only one type of beverage is delivered within the same cycle.

Note 3 to entry: This is the cycle used to control the machine delivers any beverage, sequence and mix depending on the machine, within their ranges in order to consider the machine in ready machine mode. This cycle is used for example on the energy saving test, see 5.3.5.



Key
D1, ... D16 first delivery, ..., sixteenth delivery
SBT 1, ... SBT 15 short buffer time 1, ... short buffer time 15
MBT medium buffer time

Figure 4 — delivery control cycle 16-2-20

3.7 Coffee machine modes

3.7.1
ready machine mode

mode, where each outlet of the coffee machine can deliver each of its deliverable beverages within the ranges at any delivery for **delivery time**, temperature and quantity as specified in 4.2

Note 1 to entry: Applicable ranges according to 4.2: beverage temperature, quantity and **delivery time**.

3.7.2

energy saving mode

mode displayed by the machine where at least one outlet cannot deliver at least one of its deliverable beverages, within the ranges at any delivery for **delivery time**, temperature and quantity as specified in 4.2

Note 1 to entry: Applicable ranges according to 4.2: beverage temperature, quantity and **delivery time**.

Note 2 to entry: The **energy saving mode** is a state of the machine where usually heating elements or other active elements are energized with lower energy in order to save energy. The normal functioning of the machine is not available. Not all coffee machines are provided with an **energy saving mode**.

Note 3 to entry: The machine can display something by a light (by colour, on, off, flashing), a message on a display as described on the user manual.

Note 4 to entry: How the **energy saving mode** is displayed by the machine, is described in the operating instructions.

3.7.3

soft off mode

mode where the machine is electrically energized but not designed to delivery any beverage

EXAMPLE of functions available in **soft off mode**: Network connection, frost protection, timer function, connection of payment systems, lighting, advertising.

Note 1 to entry: The machine is not able to deliver any beverage or not able to perform the intended functions of a coffee machine.

Note 2 to entry: Internal, external, automatic or manual reactivation is required to bring the machine into a **ready machine mode**.

Note 3 to entry: Heating elements are off.

Note 4 to entry: Pumps are off.

Note 5 to entry: The manufacturer shall specify to the laboratory how to identify the **soft off mode** (according to user manual) using the table in Annex C.

3.8 Ready machine energy at heating, ready test, delivery of café crème and delivery of 2espr

3.8.1

E_{Ready,Heating}

energy used by the coffee machine as measured in the last 30 min of the heating test

Note 1 to entry: Heating test according to 5.3.3

3.8.2

E_{Ready,Crème,1},

E_{Ready,Crème,2},

E_{Ready,Crème,3}

energy used by the coffee machine as measured in the last 10 min of the **medium buffer time** of each of the first, the second and the third correspondent **delivery cycle 6-2-20** of café crème delivery test

Note 1 to entry: There are three delivery cycles for café crème, see 5.3.4.2

3.8.3

$E_{\text{Ready,2espr,1}}$,

$E_{\text{Ready,2espr,2}}$,

$E_{\text{Ready,2espr,3}}$

energy used by the coffee machine as measured in the last 10 min of the **medium buffer time** of each of the first, the second and the third correspondent **delivery cycle 21-2-20** of 2espr delivery test

Note 1 to entry: There are three delivery cycles for 2espr, see 5.3.4.3

3.8.4

$E_{\text{Ready,Ready Condition}}$

energy used by the coffee machine as measured during the ready condition test

Note 1 to entry: Ready condition test according to 5.3.9.

3.9

waking up time

elapsed (interval) time from when the command to exit from **energy saving mode** is given to the machine, to the time when the machine is back into **ready machine mode**

EXAMPLE: For command to deliver a beverage are: press a button, activate a lever.

Note 1 to entry: Usually, the waking up time is indicated by the manufacturer, at least to the laboratory for testing. If not indicated it is assumed to be 30 min.

3.10

coffee and milk

half of a “2espr” and half of **steam wand hot milk** or half of a “2espr” and half of a **direct hot milk**

Note 1 to entry: Made of 30 g of espresso and 100 g of hot milk.

Note 2 to entry: No test performed for this beverage, only calculation based on measurements and calculations for “2espr” and **steam wand hot milk** or **direct hot milk**.

Note 3 to entry: It is intended to represent several types of coffee with milk beverages such as cappuccino, caffè latte, latte macchiato, café con leche.

4 Requirements

4.1 General

Nominal values of mass of ground coffee as an ingredient of café crème and 2espr are according to Table 1.

Table 1 — Nominal values for ground coffee as an ingredient

Type of beverage	Quantity (mass) [g]
café crème	8
2espr	12

The quantity of ground coffee as an ingredient is verified only during set up of a machine before start testing, both for **fully automatic machines** and for stand-alone coffee grinders used for **traditional machines** according to Table 2.

Table 2 — Verification of quantity of ground coffee

Type of beverage	Number of shots of ground coffee	Total Quantity (mass) [g]
café crème	10	80 ± 5
2espr	10	120 ± 5

For **fully automatic machines**, the calibration procedure for café crème and 2espr is specified in the service manual and this information shall be given to the laboratory by Annex C “Information to be provided by the manufacturer to the laboratory” and stated in the test report.

4.2 Beverage temperature, quantity and delivery time

4.2.1 General

The three parameters to evaluate the delivery of any beverage are:

- temperature;
- quantity;
- delivery time.

4.2.2 Quantity of beverage (mass)

4.2.2.1 General

At any delivery i , the quantity m_i , measured in g, of the delivered beverage, shall be according to 4.2.2.2 (Table 3).

The value of the average quantity per delivery cycle, m_{av} , calculated according to Formula (1), shall be according to 4.2.2.2 (Table 3).

4.2.2.2 Ranges of values for quantity

Table 3 — Quantity ranges

Beverage type	Reference value [g]	Average Quantity per Delivery Cycle minimum value [g]	Quantity at any Delivery minimum value [g]	Quantity at any Delivery MAXIMUM value [g]	Notes
café crème	130	125	100	150	
2espr	60	50	40	90	
coffee and milk	130	not applicable	not applicable	not applicable	Made of 30 g of espresso and 100 g of hot milk, see definition for more information.
hot water	200	190	180	220	
powdered	200	190	180	220	
direct hot milk	200	not applicable	192	not applicable	No upper limit due to different ways of adding steam available.
steam wand hot milk	200	not applicable	192	not applicable	Starting from 180 g ± 5 g. If it does not deliver at least 192 g, start from 192 g to 195 g.
2 × direct hot milk	400	not applicable	384	not applicable	No upper limit due to different ways of adding steam available.
2 × steam wand hot milk	400	not applicable	384	not applicable	Starting from 360 g ± 10 g. If it does not deliver at least 384 g, start from 384 g to 390 g
NOTE 1 “2 x direct hot milk ” and “2 x steam wand hot milk ” are only for productivity testing.					
NOTE 2 No test performed for coffee and milk beverage, only calculation based on measurements and calculations for “2espr” and steam wand hot milk or direct hot milk					

4.2.2.3 Average quantity per delivery cycle, m_{av}

The average quantity per delivery cycle is calculated as

$$m_{av} = \frac{1}{n} \sum_{i=1}^n m_i \quad (1)$$

where

- m_i is the quantity at the delivery “i”;
- n is the total number of deliveries in a cycle;
- m_{av} is the average quantity.

4.2.3 Temperature of beverage

4.2.3.1 General

At any delivery i , the temperature T_i of the delivered beverage, shall be according to 4.2.3.2 (Table 4)..

The value of the arithmetic average temperature per delivery cycle T_{av} , calculated according to Formula (2), shall be according to 4.2.3.2 (Table 4).

4.2.3.2 Ranges of values for temperature

Table 4 — Temperature ranges

Beverage type	Reference value [°C]	Arithmetic Average Temperature per Delivery cycle minimum value [°C]	Temperature at any delivery minimum value [°C]	Temperature at any delivery MAXIMUM value [°C]
café crème	75°C	70°C	60°C	not applicable
2espr	75°C	70°C	60°C	not applicable
coffee and milk	not applicable	not applicable	not applicable	not applicable
hot water	80°C	80°C	70°C	not applicable
powdered	65°C	60°C	60°C	not applicable
direct hot milk	60°C	60°C	50°C	not applicable
steam wand hot milk	60°C	60°C	50°C	70°C
2 × direct hot milk	60°C	60°C	50°C	not applicable
2 × steam wand hot milk	60°C	60°C	50°C	70°C
NOTE 1 “2 x direct hot milk ” and “2 x steam wand hot milk ” are only for productivity testing.				
NOTE 2 No test performed for coffee and milk beverage, only calculation based on measurements and calculations for “2espr” and steam wand hot milk or direct hot milk .				

4.2.3.3 Average temperature per delivery cycle, T_{av}

The average temperature per delivery cycle of a specific beverage is the arithmetic average temperature on each delivery cycle calculated as

$$T_{av} = \frac{1}{n} \sum_{i=1}^n T_i \quad (2)$$

where

- T_i is the temperature at the delivery “ i ”;
- n is the total number of deliveries in a cycle;
- T_{av} is the arithmetic average temperature.

4.2.4 Delivery time for a beverage

4.2.4.1 General

At any delivery, the **delivery time** shall be according to 4.2.4.2 (Table 5).

4.2.4.2 Ranges of values for delivery time

Table 5 — Time ranges

Beverage type	Traditional machines	Fully automatic machines
café crème	from 15 s to 30 s	from 20 s to 60 s
2espr	from 15 s to 30 s	from 10 s to 50 s
coffee and milk	Not applicable	Not applicable
hot water	≤ 120 s	≤ 120 s
powdered	≤ 120 s	≤ 120 s
direct hot milk	≤ 120 s	≤ 120 s
steam wand hot milk	≤ 120 s	≤ 120 s
2 × direct hot milk	≤ 120 s	≤ 120 s
2 × steam wand hot milk	≤ 120 s	≤ 120 s
NOTE 1 For all beverages except café crème and 2espr, the limit of 120 s is just to align with correspondent delivery cycles and for the control of deliveries after energy saving mode. NOTE 2 “2 x direct hot milk” and “2 x steam wand hot milk” are only for productivity testing. NOTE 3 No test performed for coffee and milk beverage, only calculation based on measurements and calculations for “2espr” and steam wand hot milk or direct hot milk.		

4.2.4.3 Average delivery time per delivery cycle

The average delivery time per delivery cycle of a specific beverage is the arithmetic average of the delivery time of each delivery in that cycle for that specific beverage, calculated as

$$t_{del,av} = \frac{1}{n} \sum_{i=1}^n t_{del,i} \quad (3)$$

where

- $t_{del,i}$ is the delivery time at the delivery “i”;
- n is the total number of deliveries in a cycle;
- $t_{del,av}$ is the average delivery time.

NOTE The average delivery time is used to determine the minimum clock time for the productivity testing in case a clock method is used for either café crème or 2espr.

5 Testing

5.1 General

These are professional and commercial machines for which the set-up is done by trained personnel.

The machine is to be set up by the manufacturer's trained personnel prior to the start of testing (see also Annex C).

The set-up of the machine cannot be changed any time during the test nor between one test and the next one.

In case set-up of the machine changes, all tests shall be repeated.

Beverage type named "powdered" is tested without ingredients and only by delivering hot water at conditions specified in 4.2.2 for quantity, 4.2.3 for temperature and 4.2.4 for delivery time.

5.2 Testing conditions

5.2.1 General

The machine shall not be in contact with any surfaces (except the horizontal surface of the supporting structure). The minimum distance from any side surface shall be at least 0,5 m. The space above coffee machine shall be free up to the ceiling of the testing ambient where the machine is mounted. The distance from the top of machine to the ceiling of the testing ambient shall be at least 0,5 m.

All ingredient reservoirs are filled with a quantity of ingredient of at least 50 % the nominal capacity (e.g. coffee beans, powdered, cold milk); exception for reservoirs of prepared beverages that shall be empty before starting testing.

All covers and doors shall be mounted and closed properly.

The machine is not to be covered; air inlet openings and integrated fans shall be able to operate properly according to the normal operating conditions described in the user manual.

During all testing, any cup warmer shall be empty of cups or any other element that could absorb heat or obstruct the flow of heat.

In case a coffee machine is provided with an active cup warmer, that shall be switched off during all testing.

NOTE An electric cup warmer is an example of an active cup warmer.

For **traditional machines**, all the portafilters shall be engaged on correspondent delivery group of the machine at any stage of testing except when used to be empty or refilled with coffee.

For traditional machines: ground coffee is to be pressed into portafilter, with a coffee tamper (see Figure 5 example of coffee tamper) properly coupled with portafilter, using a force between 150 N and 200 N (a dynamometric coffee tamper can be used).

In order to keep delivery time as constant as possible it helps to use a similar force value across all testing for 2espr or across all testing for café crème.



Key

- A coffee tamper
- B portafilter

Figure 5 — Example of coffee tamper

5.2.2 Ambient Conditions

Ambient temperature: 23 °C ± 2 °C.

All tests are carried out in a draught-free location.

Relative humidity: 55 % $\pm$ 20 %.

The rationale for the tolerance of the relative humidity is:

- a) The level of humidity does not have a significant impact on energy consumption;
- b) A change of humidity might impact ground coffee therefore time of delivery therefore humidity shall be as stable as possible during all testing.

5.2.3 Power Supply Voltage according to rated voltage

- a) Single phase 230 V with a tolerance of $\pm$ 1 %, 50 Hz with a tolerance of $\pm$ 1 % or
- b) tri-phase 400 V with a tolerance of $\pm$ 1 %, 50 Hz with a tolerance of $\pm$ 1 %.

5.2.4 Water

Pressure: 2,5 bar $\pm$ 0,5 bar only for machines connected to the water mains.

Hardness: 3 °f – 15 °f.

Inlet temperature: 23 °C $\pm$ 1 °C.

This is for machines with or without internal water tank. In case of internal water tank, those are the values to be respected at the beginning of testing, prior to start testing. In case of re-filling, the same limits should be respected.

5.2.5 Laboratory Measurement Equipment

- Temperature measurement equipment: 0,5 K accuracy, sampling rate $\geq$ 1Hz;
- Energy measurement equipment: 1 % accuracy, sampling rate $\geq$ 1 kHz;
- Voltage measurement equipment: 0,5 % accuracy;
- Weight measurement equipment: 0,1 g accuracy;
- Time measurement equipment: 0,1 s accuracy;
- Electrical energy consumption is measured in kWh at the three decimal digit.

NOTE In other words, measured in Wh.

5.2.6 Beakers for testing

5.2.6.1 General

For testing, use plastic laboratory beakers according to Table 6:

Table 6 — Beverages and beakers

Type of beverage	Beverage Nominal quantity [g]	Nominal capacity of beaker according to ISO 7056:1981 [ml]	Maximum acceptable mass of beaker [g]	Handle
2espr	60	100	20	Without handle
Café Crème	130	250	40	Without handle
Coffee and milk	Not applicable	Not applicable	Not applicable	Not applicable
Hot water	200	250	40	Without handle
Hot water	200	250	70	With handle
Powdered	200	250	40	Without handle
Powdered	200	250	70	With handle
direct hot milk	200	250	40	Without handle
steam wand hot milk	200	250	70	With handle
2 × direct hot milk	400	500	60	Without handle
2 × steam wand hot milk	400	500	90	With handle
NOTE No test performed for coffee and milk beverage, only calculation based on measurements and calculations for “2espr” and steam wand hot milk or direct hot milk .				

Beakers shall be made of Polypropylene PP or PMP.

Height and diameter of beakers shall be in accordance with ISO 7056:1981, 7.4, i.e. the ratio of overall height to maximum body diameter shall lie between 1,0 and 1,4.

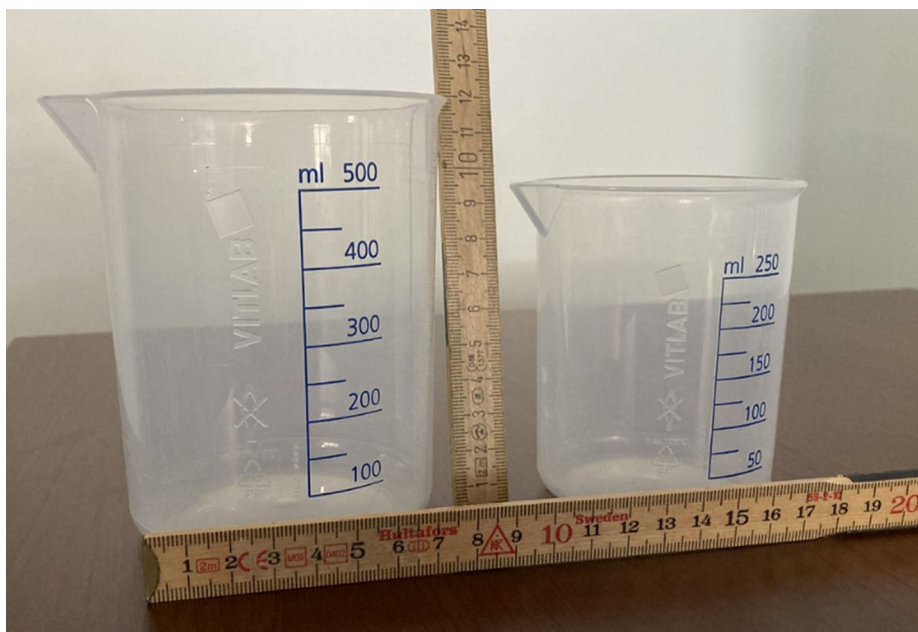
NOTE The 500 ml beaker provided with handle is helpful for the safety for the user in the lab.

5.2.6.2 Examples of beakers

For examples of beakers, see Figure 6.



a)



b)

Figure 6 — Examples of beakers

5.2.7 Beverage temperature measurement

5.2.7.1 General

The temperature of beverages shall be measured according to 5.2.7.2 to 5.2.7.6.