9 FUNCTION TESTS

To simplify matters, the model Citiz with core unit "C-range" is used to exemplify throughout this chapter.

9.1 Safety instructions

Some function tests are performed with an energized, partly opened coffee machine.

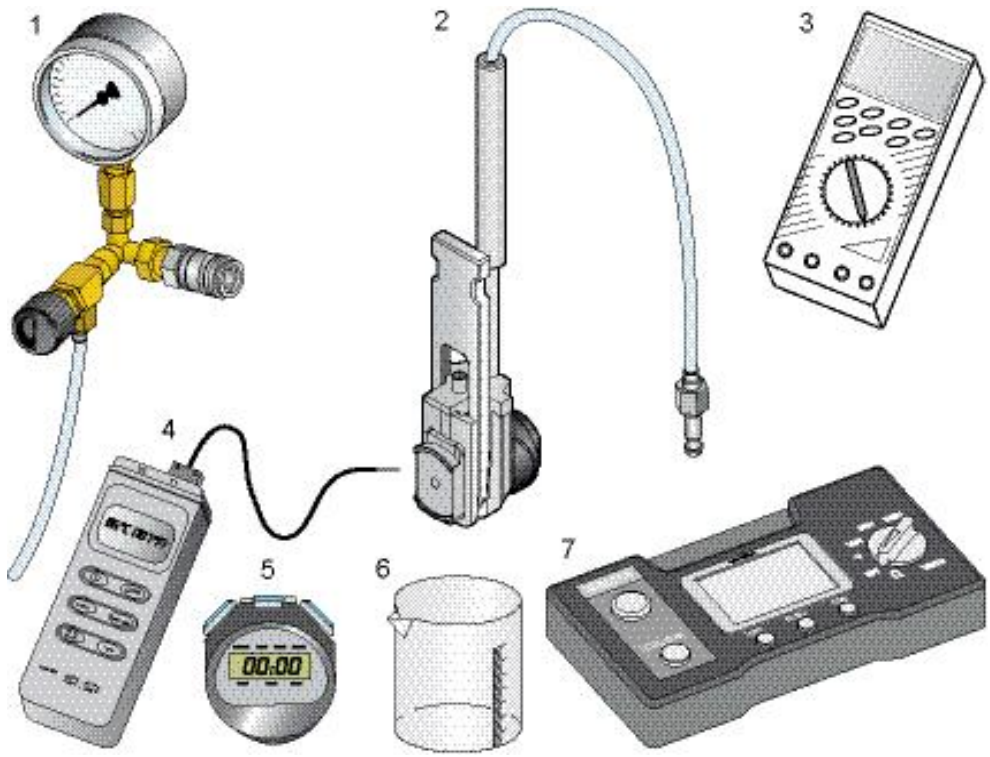
Danger of electrocution!
Mains voltage inside the coffee machine.
Do not touch any live part while performing tests.

Danger of burns!
Hot parts and water under pressure inside the coffee machine.
Do not touch any hot parts while checking for leakages!
Always wear protective goggles.

9.2 Required equipment

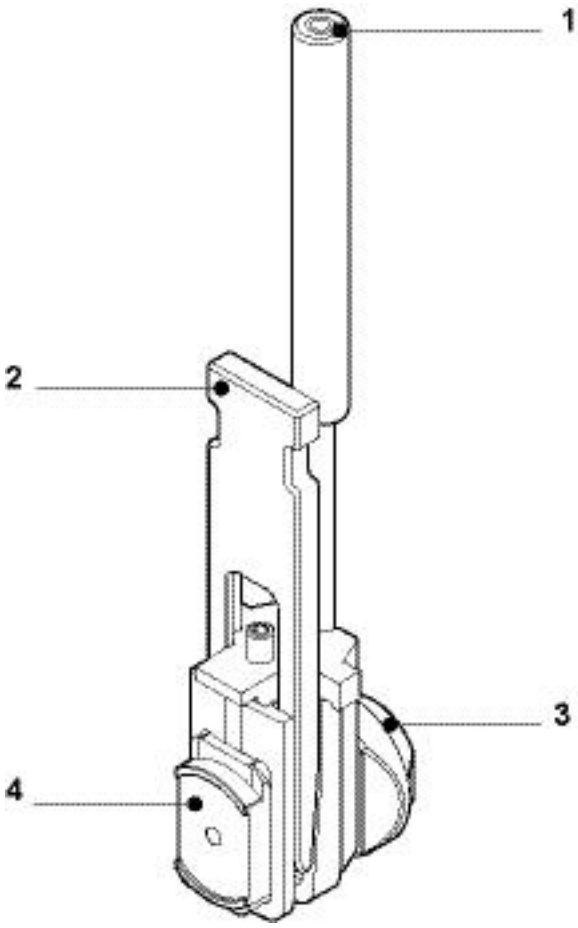
9.2.1 Overview

Symbolic illustration of function test equipment.



1) Pressure gauge (EFR no. 16195)
2) Citiz pressure gauge adapter
3) Digital multimeter (for NTC temperature sensor test)
4) Electronic thermometer (or digital multimeter suitable for temperature measurement)
5) Timer
6) Measuring beaker
7) Test equipment for protective earth continuity test and protective insulation test

9.2.2 Citiz pressure gauge adapter



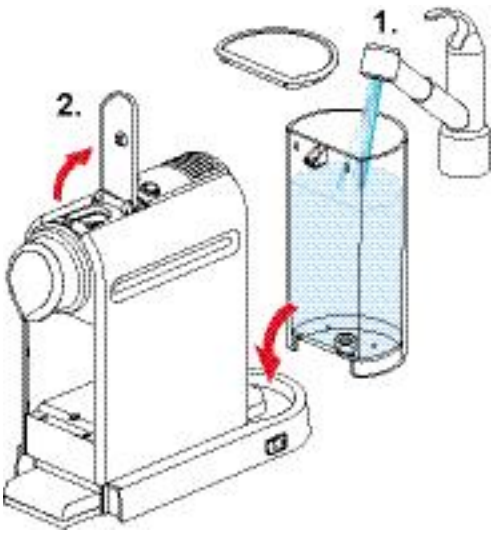
1) Quick action coupling for pressure hose
2) Operating lever
3) Connecting unit
4) Fixation unit

This pressure gauge adapter is designed for the Citiz coffee machines.

The pressure gauge adapter has 2 parts:

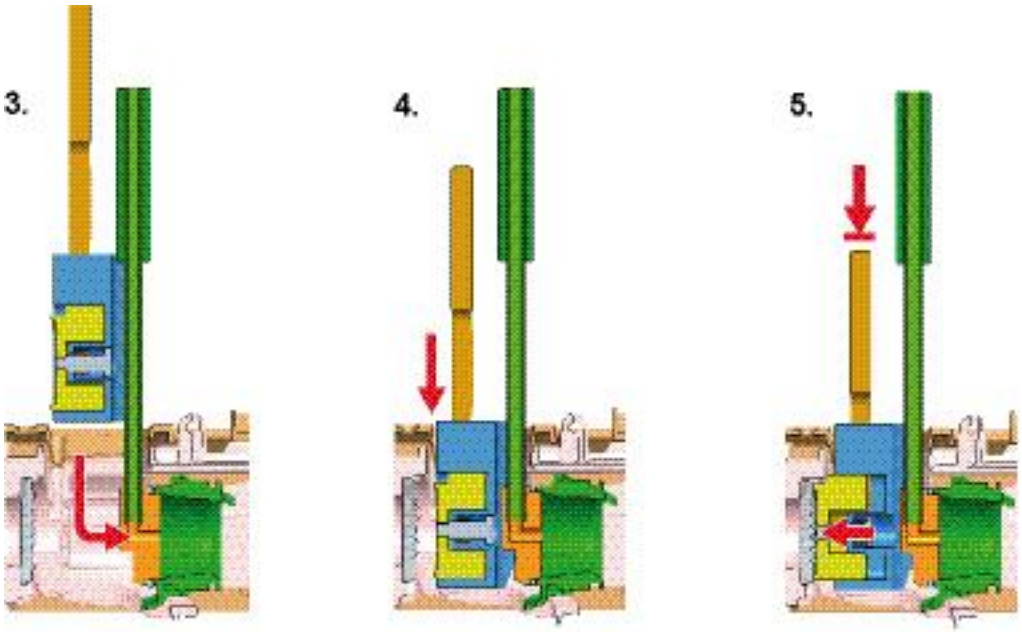
- A connecting unit (3) with a sealing cone that is inserted in the capsule cage of the brewing unit.
- A hand actuated fixation unit (4) to lock and seal the complete pressure gauge adapter in the brewing unit.

9.3 Measure flow rate

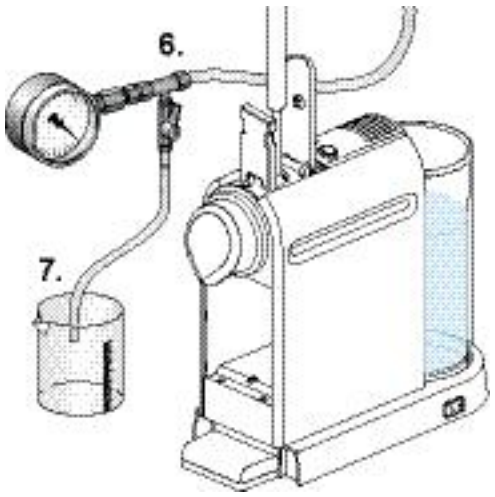


1) Fill and insert water tank.
2) Open closing handle.

The pressure adapter must sit firmly in the capsule bay.



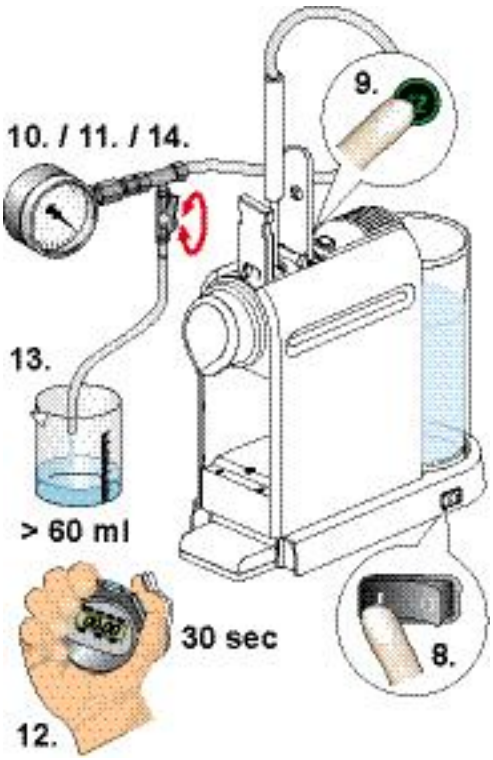
3) Insert connecting unit of pressure adapter into capsule bay. Push back sealing cone into capsule cage.
4) Insert fixation unit of pressure adapter into capsule bay.
5) Press down operating lever.
6) Connect pressure hose to pressure tester.
7) Place a measuring cup under the drain hose of the pressure tester.



8) Switch on coffee machine.
9) After heating up, press the "small cup" button.
10) Open the valve until water begins to flow.
11) Close the valve until the pressure gauge indicates 12 bar.

☞ **Constantly monitor the pressure gauge and if required readjust the valve. As the temperature increases, so does the pressure, readjust the pressure to 12 bar when required.**

12) Carry out measurement for approx. 30 sec.
13) Control measuring cup: at least 60-120 ml of water must be in the measuring cup.
14) Open the valve and let water flow out of the pressure tester.



Notices:

- Should < 60 ml leak out, then the pump is defective or there is a leak in the water system.
- Large deviations in indicated pressure while measuring (± 4 bar) means that the pump is defective.

9.4 Pressure and leakage checks

Check the following parts of the coffee machine for leakages:

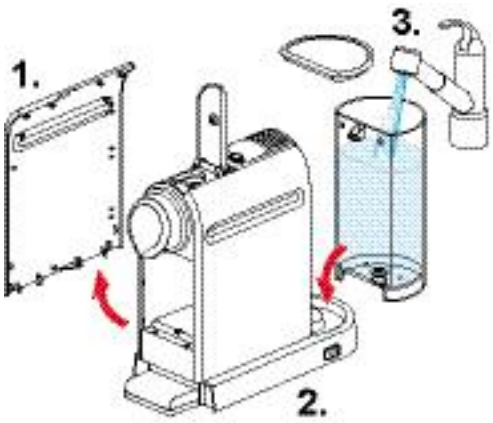
- Compact brewing unit
- Hose connections
- Thermoblock
- Pump
- Self priming device

Dangerous mains voltage inside the coffee machine!
Do not touch any parts under voltage while checking for leakages!

Dangerous hot parts under pressure inside the coffee machine!
Do not touch any hot/pressurized parts while checking for leakages!
Always wear protective goggles.

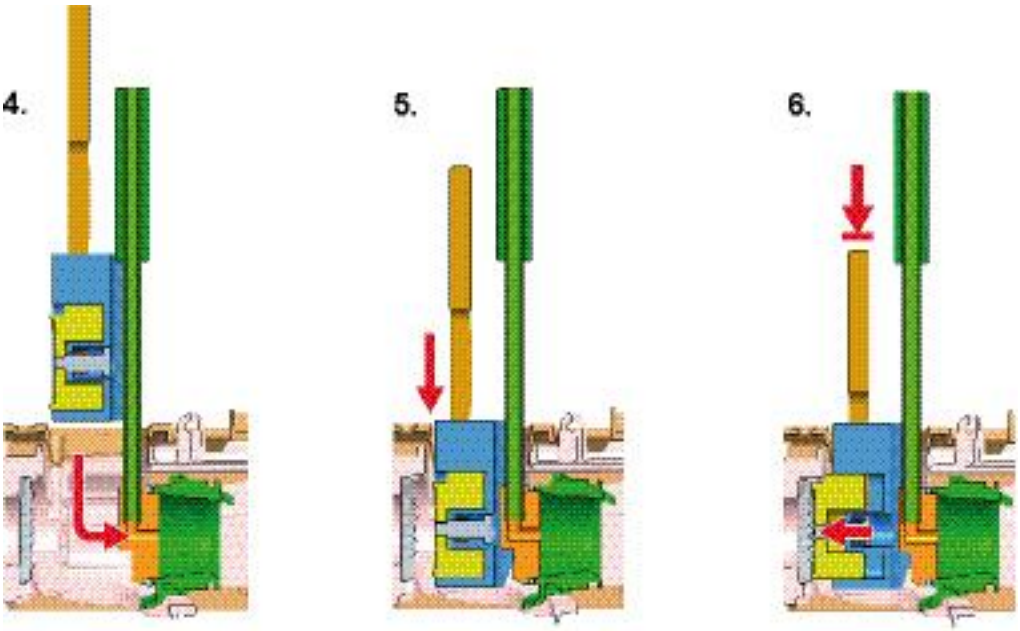
9.4.1 Preparations

Depending on core unit range, refer to "Disassembly of core unit, C-range" on page 91 or "Disassembly of core unit, D-range" on page 109.

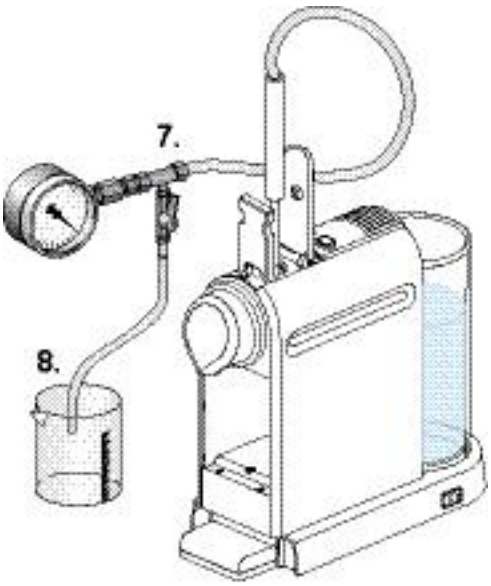


1) Remove left side panel of core unit.
2) Insert core unit back into platform.
3) Fill and insert water tank.

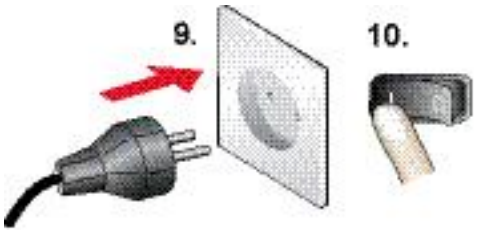
The pressure adapter must sit firmly in the capsule bay.



4) Insert connecting unit of pressure adapter into capsule bay. Push back sealing cone into capsule cage.
5) Insert fixation unit of pressure adapter into capsule bay.
6) Press down operating lever.
7) Connect pressure hose to pressure tester.
8) Place a measuring cup under the drain hose of the pressure tester.



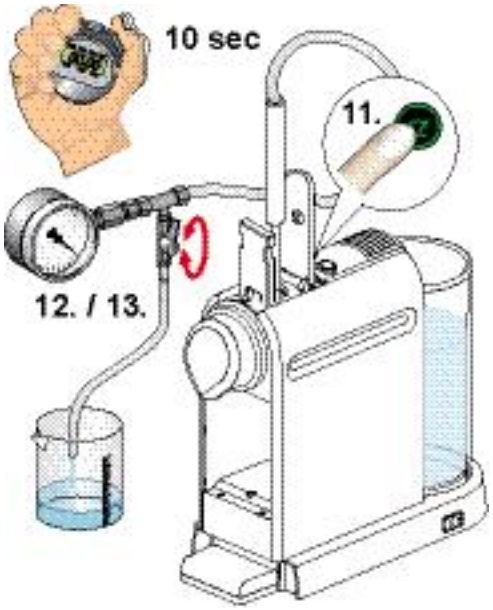
9) Connect mains cable.
10) Switch on coffee machine.



9.4.2 Test run

11) After heating up, press the "small cup" button.
12) Open the valve and let the water flow for approximately 10 sec out of the drain hose.
13) Close the valve completely. The pressure stabilizes after increasing briefly between 16-19 bar (pressure check).

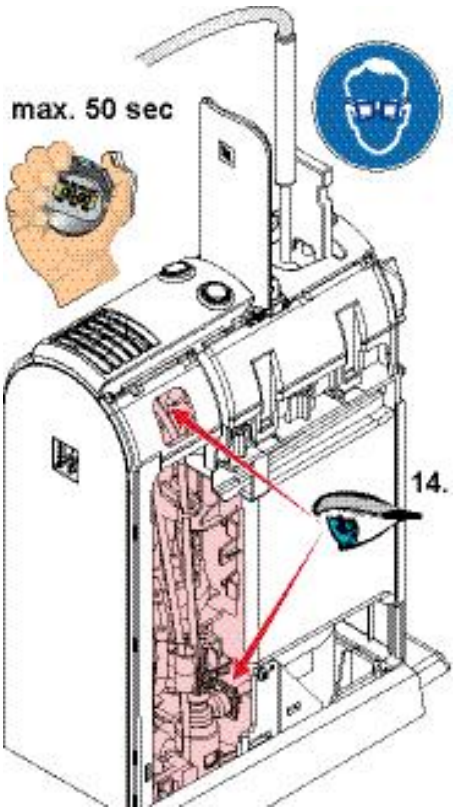
The pressure increases slowly with increasing temperature. Should the pressure exceed 23 bar, switch off the coffee machine and release the pressure by opening the valve.



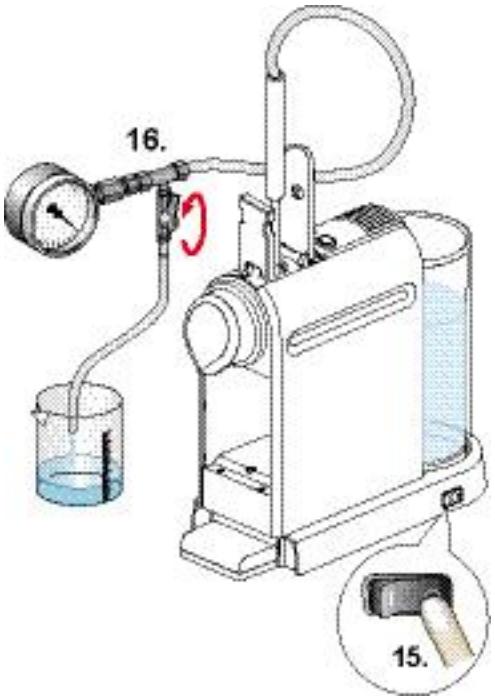
For better visibility use a flashlight.

14) Check all connections under pressure for audible and visible leaks.

Do not run the pump for more than 50 sec with the valve closed.

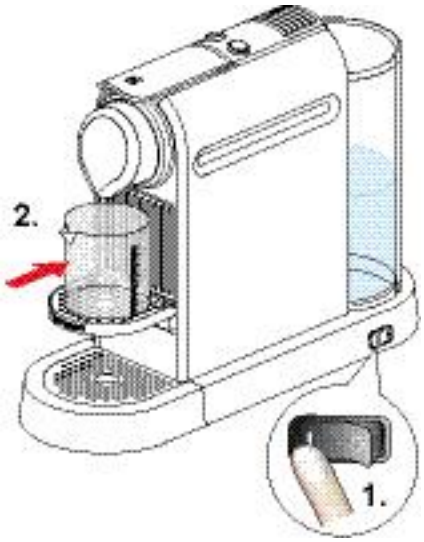


15) Switch off the coffee machine.
16) Open the valve and let water flow out of the pressure tester.

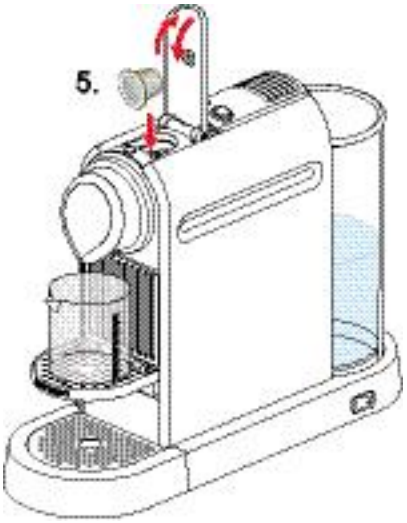


9.5 Measure coffee temperature

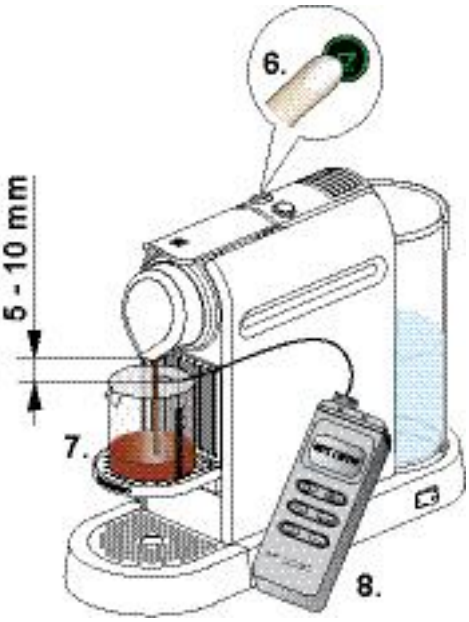
1) Switch on coffee machine.
2) Place a measuring cup on cup support.



3) After heating up, press the "small cup" button for approximately 10 sec to pre-heat the coffee outlet with hot water.
4) Empty measuring cup and place it back on cup support.



5) Insert capsule (Cosi is best suited).



6) Press the "small cup" button again.
7) Wait until the measuring cup contains 20 ml of coffee.
8) Then measure the coffee temperature approx. 5-10 mm under the coffee outlet.

☞ **The coffee temperature should be 86 °C ± 3 °C (187 °F ± 5.4 °F).**

9.6 Milk frother tests

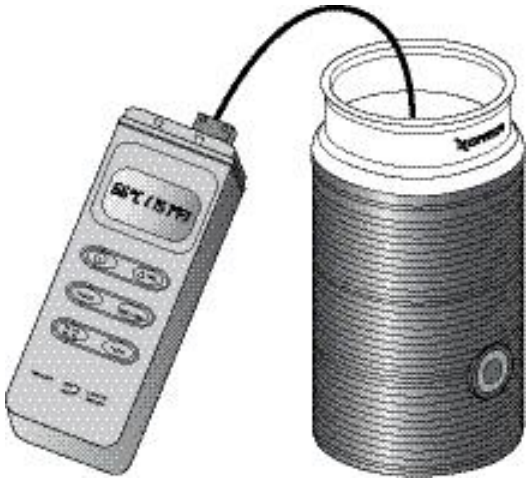
Prerequisite

The disregard of this specification can affect the measuring results.

Use newly opened UHT, full fat or semi-skimmed milk at fridge temperature (+ 8 °C till + 10 °C) for the following tests only.

9.6.1 Measure hot milk temperature

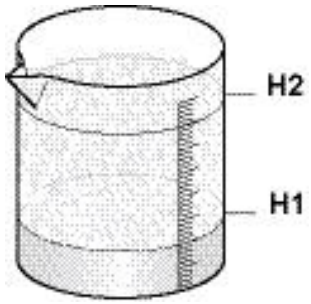
Spattered milk may cause burns. Only use milk frother with lid.



- Prepare 240 ml hot milk in milk frother (use mixer without spring).
- Measure temperature immediately after preparation in jug.

The milk temperature should be between + 60 °C and + 70 °C (140 °F till 158 °F).

9.6.2 Measure milk froth ratio



- Prepare cold milk froth out of 120 ml milk in milk frother (use whisk with spring).
- Empty content of milk frother into measuring beaker.
- Determine the ratio x [%] of milk froth to liquid milk with following formula:

$$x = \frac{H2 \quad H1}{H1} \times 100$$

Approximate values:

direct after preparation .....x = 250

60 sec after preparation .....x = 190

9.7 NTC temperature sensor functionality

The resistance of the NTC temperature sensor must be within a defined range, otherwise the temperature regulation will not work properly and the coffee machine will stay/go into failure mode.

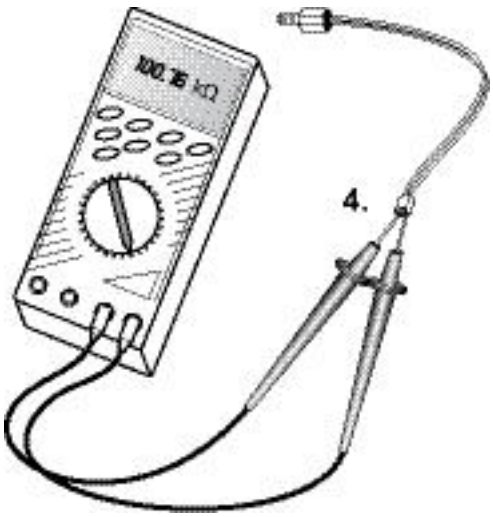
An easy way to check the functionality of the NTC temperature sensor is to measure the ohmic resistance at ambient temperature. With this measurement, most defect NTC temperature sensors can be detected.

Avoid contamination of sensor contact surface during handling.

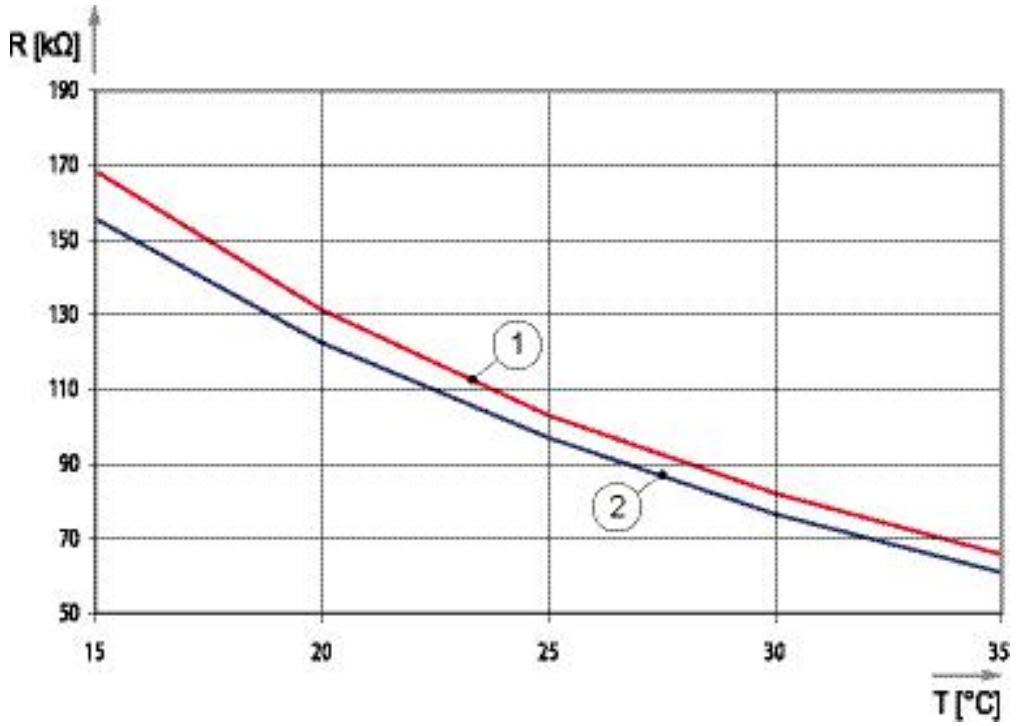
1) Unplug NTC temperature sensor from electronic control board.
2) Remove NTC temperature sensor from thermoblock (refer to page 104 and following).

3) Measure temperature of sensor body (do not touch either temperature or NTC sensor by hand).

4) Measure resistance of NTC temperature sensor by connecting a multimeter at the plug.
5) Compare measuring values with following diagram or table.



NTC Diagram



NTC temperature sensor, R/T characteristics

Graph 1 ..... max. resistance value
Graph 2 ..... min. resistance value

Measurement table

NTC temperature [°C]	NTC temperature [°F]	NTC min. resistance [kOhm]	NTC max. resistance [kOhm]
15	59	155.63	168.48
20	68	122.41	131.23
25	77	97.00	103.00
30	86	76.63	82.12
35	95	60.90	65.86

9.8 Protective earth (PE) continuity test

9.8.1 What coffee machine has to be tested and when?

This test is only necessary

- for class 1 equipment (three-wire power cord with protective earth)
- for **models Citiz & milk, EF 485/486**
- after a repair whenever a general disassembly of the platform and/or core unit was performed.

9.8.2 General

Legal regulation

In case of a repair/modification of the coffee machine, the repair centre is bound by law to protect the user/consumer by

- restoring the regular condition of the appliance and
- performing the respective tests according to EN/IEC 60335-1 “Safety of household and similar electrical appliances” and national regulations (e.g. DIN VDE 0701).

Description

Protective earth continuity measurements are made between the protective earth terminal and conductive, touchable parts of the coffee machine where dangerous voltage could occur if the basic insulation was to fail.

This test assures that

- the ground (earth) connection does not have an interruption between the plug and touchable, conductive housing parts
- the permissible ground resistance of those conductive, touchable parts is less than 0.3 Ohms (with a test current of 200 mA DC).

Test equipment

Special test equipment is needed that complies with the regulations to perform protective earth continuity measurements. Detailed requirements and tolerances must be verified by your local authorities or measurement supplier in any case.

Ask *Nespresso* for recommendations about test equipment.

Test report

For legal reasons a repair or test report should be prepared and filed with following information

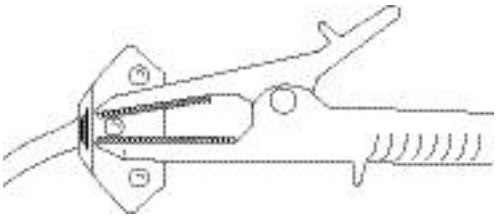
- customer (name, address)
- type and serial number of coffee machine
- date of repair/test(s)
- performed test(s)/measuring value(s)
- used test equipment
- signature

9.8.3 Test sequence

This test sequence is not applicable for coffee machines with two-wire power cords (without ground pin).

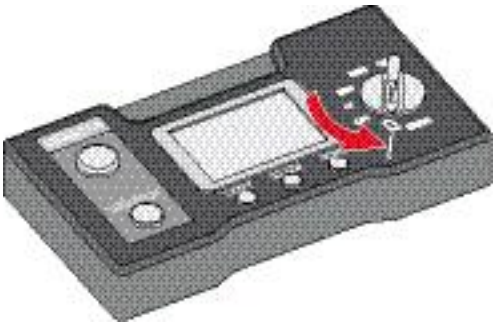
Danger of electrocution!
Do not plug in the coffee machine during the protective earth continuity test.
Read and observe safety instructions in user manual of test equipment.

1) Connect black measuring cable to ground pin of power plug with an alligator clip (example shown: Swiss power plug).

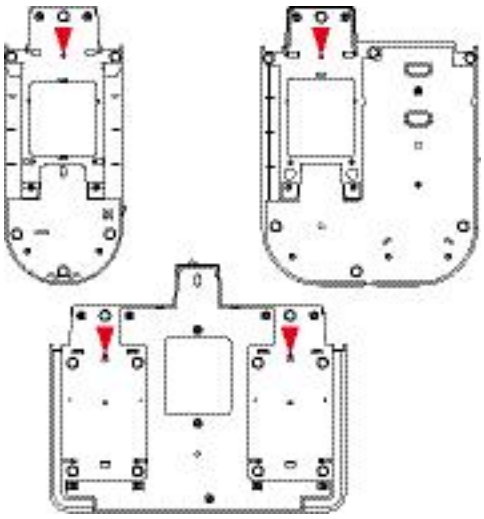


Symbolic illustration of test equipment.

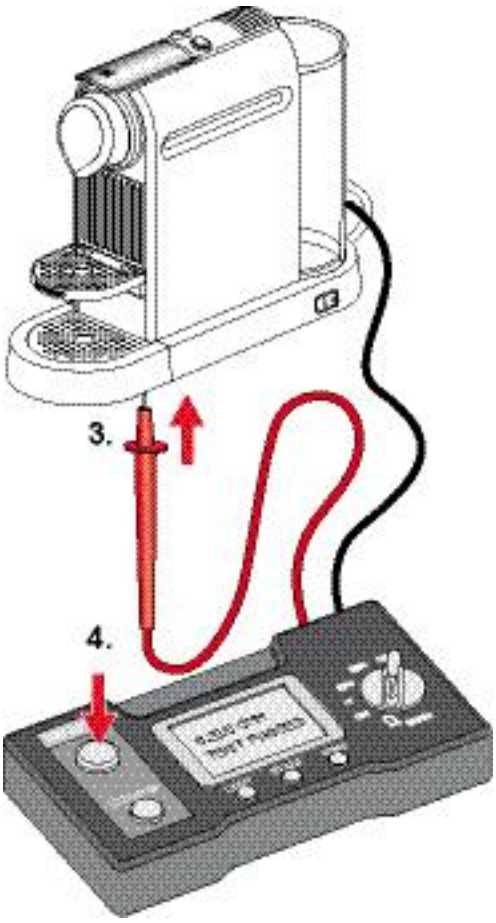
2) Switch on test equipment and select protective earth continuity test.



The coffee machine Citiz & Co has 2 test holes to check both thermoblocks.



Test holes on bottom of Citiz / Citiz & milk / Citiz & Co platforms



3) Insert tip of red test probe in test hole and touch thermoblock.
4) Press "measure" button and read off displayed resistance.

☞The resistance must be lower than 0.3 Ohm.

5) Fill in measured value(s) in a test report.

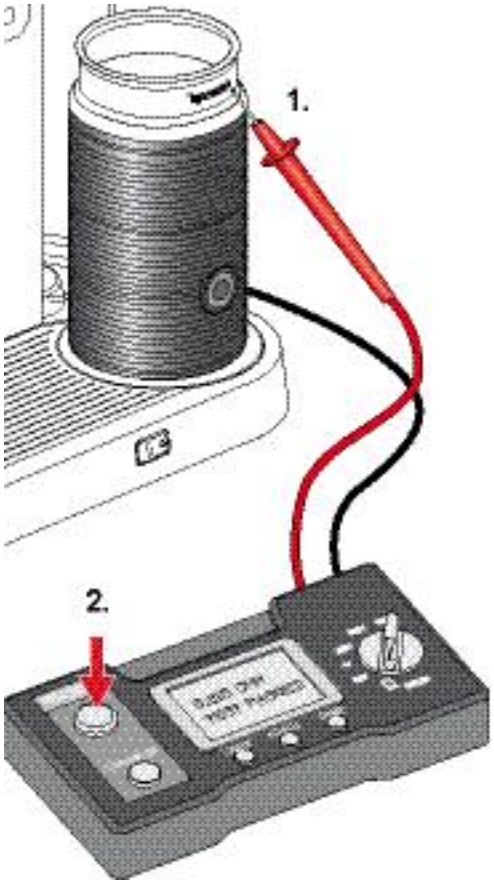
⚠ **Do not damage inside coating of milk frother jug with the probe tip.**

Additional test for coffee machine Citiz & milk:

1) Touch upper metallic part of milk frother with red test probe.
2) Press "measure" button and read off displayed resistance.
3) Repeat measurement on another metallic spot of milk frother for verification.

☞ **The resistance must be lower than 0.3 Ohm.**

4) Fill in measured value(s) in a test report.



9.8.4 What to do if the protective earth continuity test fails

- Check/measure ground connection in platform (refer to page 75).
- Check/measure ground connection on milk frother connector (refer to page 73 and page 124 for wiring diagram). Replace milk frother connector if necessary.
- Clean ground contact on milk frother. Measure resistance between ground contact and jug of milk frother. Replace milk frother if necessary.

9.9 Protective insulation test

9.9.1 What coffee machines have to be tested and when?

This test is necessary
- for class 1 and 2 equipment (with/without protective earth)
- after a repair whenever a general disassembly of the platform and/or core unit was performed.

9.9.2 General

Legal regulation

In case of a repair/modification of the coffee machine, the repair centre is bound by law to protect the user/consumer by
- restoring the regular condition of the appliance and
- performing the respective tests according to EN/IEC 60335-1 “Safety of household and similar electrical appliances” and national regulations (e.g. DIN VDE 0701).

Description

The insulation test
- assures that wiring and insulation of the coffee machine fullfill the normative requirements after a repair,
- rates the insulation capability of the coffee machine,
- is a very dangerous test because of a high test voltage (500 V DC).

For the insulation test, phase and neutral wire are shunted at the power plug. Then a test voltage is applied between phase/neutral and selected parts of the coffee machine.

Test equipment

Ask *Nespresso* for recommendations about test equipment.

Special test equipment is needed that complies with the regulations to perform insulation and withstanding voltage tests. Detailed requirements and tolerances must be verified with your local authorities or measurement supplier in any case.

Ideally the test equipment has a national power socket for testing, so that the coffee machine can plugged in directly. Otherwise a special shunt is necessary to connect the phase and neutral pin of the coffee machine’s power plug.

Test report

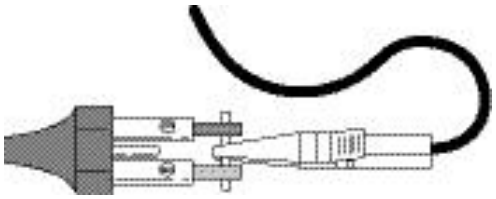
For legal reasons a repair or test report should be prepared and filed with following information
- customer (name, address)
- type and serial number of coffee machine
- date of repair/test(s)
- performed test(s)/measuring value(s), test points
- used test equipment
- signature

9.9.3 Test sequence

Danger of electrical shock/short circuit!
Do not plug in the coffee machine during insulation test.

Danger of electrical shock!
Do not touch tip of test probes.
Do not touch metallic parts of coffee machine during test.
Read and observe safety instructions in user manual of test equipment.

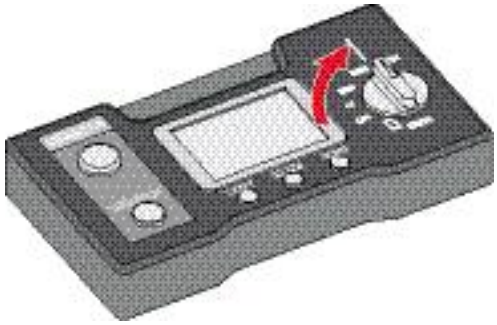
1) Connect the phase and neutral pin of the power plug together with a test adapter (procured by the repair centre).
2) Connect the black measuring cable to the test adapter (see image).
3) Turn the ON-OFF machine's main switch on position I (ON).



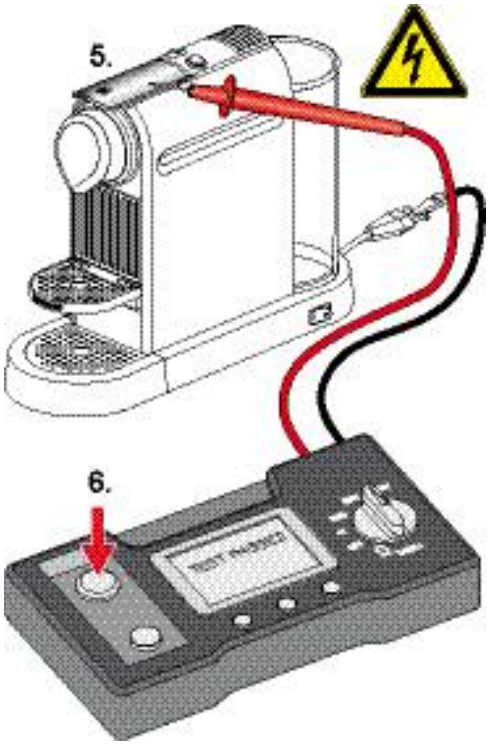
A Swiss power plug is shown here as an example.

Use a short circuit plug or special alligator clips etc. as substitute for this test adapter.

4) Switch on test equipment and select an insulation test voltage of 500 V DC.



Symbolic illustration of test equipment.

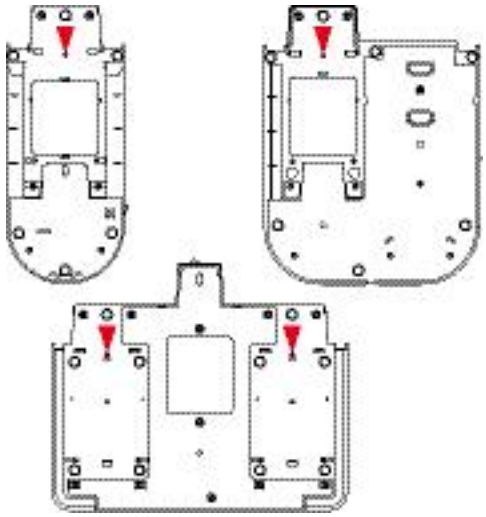


Some test equipment displays test passed or failed instead of the insulation resistance.

5) Touch closing handle with red test probe.
6) Press "measure" button.
7) Read off displayed insulation resistance or test result.

The insulation resistance must be higher than 300 kOhm (300,000 Ohm).

The coffee machine Citiz & Co has 2 test holes to check both thermoblocks.

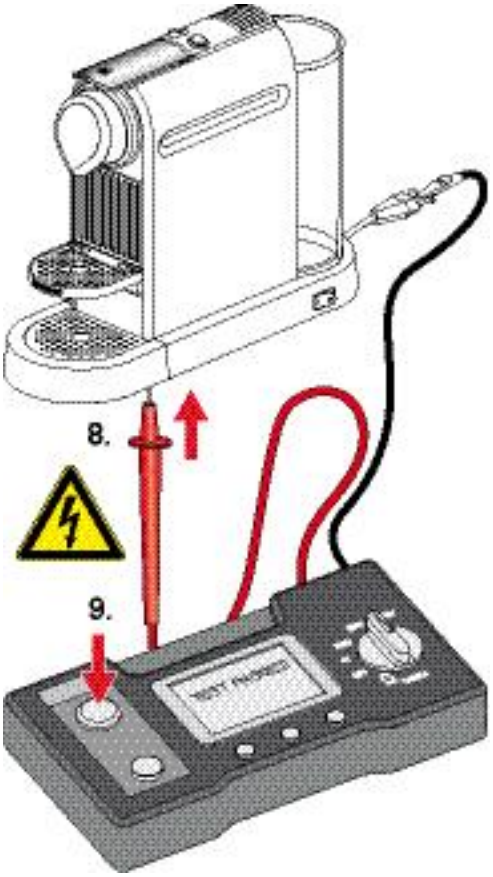


Test holes on bottom of Citiz / Citiz & milk / Citiz & Co platforms

8) Insert tip of red test probe in test hole and touch thermoblock.
9) Press "measure" button.
10) Read off displayed insulation resistance or test result.

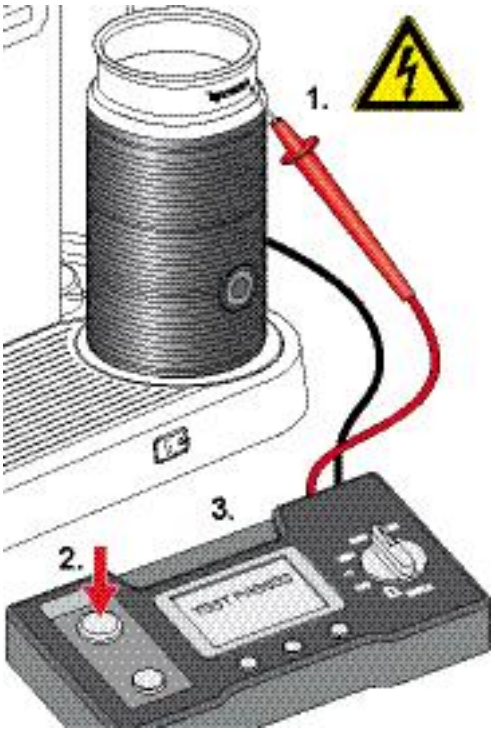
☞The insulation resistance must be higher than 300 kOhm (300'000 Ohm).

11) Switch off test equipment.
12) Short red with black test probe to make sure that test voltage is discharged.
13) Fill in results in a test report.

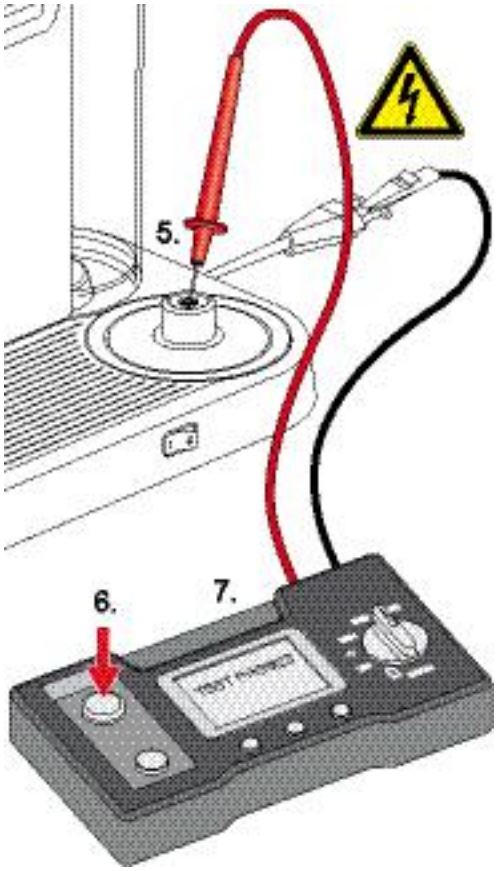


Additional tests for coffee machine Citiz & milk:

1) Touch upper metallic part of milk frother with red test probe.
2) Press "measure" button.
3) Read off displayed insulation resistance or test result.



4) Remove milk frother from platform.
5) Insert red test probe in central opening of milk frother connector (ground connection).
6) Press "measure" button.
7) Read off displayed insulation resistance or test result.
8) Switch off test equipment.
9) Short red with black test probe to make sure that test voltage is discharged.
10) Fill in result in test report.



9.9.4 What to do if the insulation test fails

Risk of damage!
A sparkover can damage the electronic control board and sensors etc.

- Assume that the coffee machine is defect after a failed insulation test.
- Check wiring and locate fault. After fault clearance proceed with troubleshooting check list (see page 49).
- In case of doubt an insultation test on the milk frother alone can be carried out on the coffee machine Citiz & milk: touch phase and neutral contacts at the bottom with one test probe successively and the metallic upper part with the other test probe. If insulation test fails, replace milk frother.