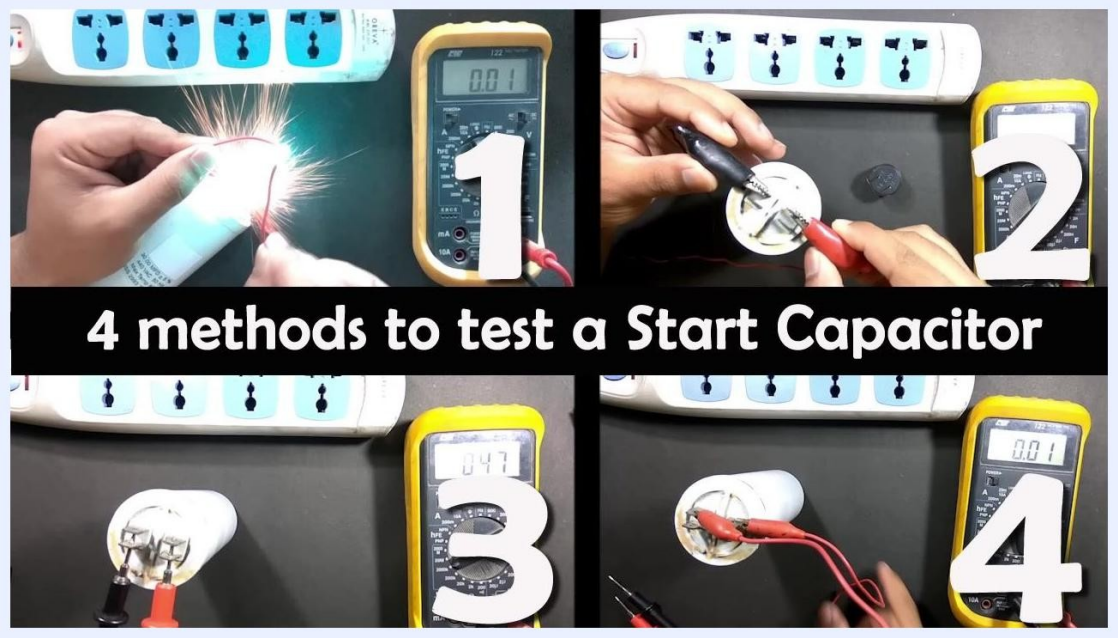
How to Test a Compressor Capacitor: Start Capacitor Testing SOP

This procedure explains how to test a compressor capacitor — specifically the start capacitor used in single-phase induction motors — using four different testing methods. If your motor is not starting or is running at a very low speed, you should check the start capacitor to determine whether it is faulty. Some methods described below require a multimeter, while others do not.



Collage of the four methods used to test a start capacitor, each numbered and shown with its relevant equipment, labeled "4 methods to test a start capacitor"

Purpose

This SOP provides a standardized process for testing a start capacitor in a single-phase induction motor. It covers visual inspection, safety discharge procedures, and four distinct testing methods so you can confirm whether a capacitor is functioning correctly before replacing it or reinstalling it in a motor.

A blurred background with the text "Thank you for Watching...", a red "Subscribe to our channel" button, and "Let me know your Suggestions..." at the bottom.

Scope

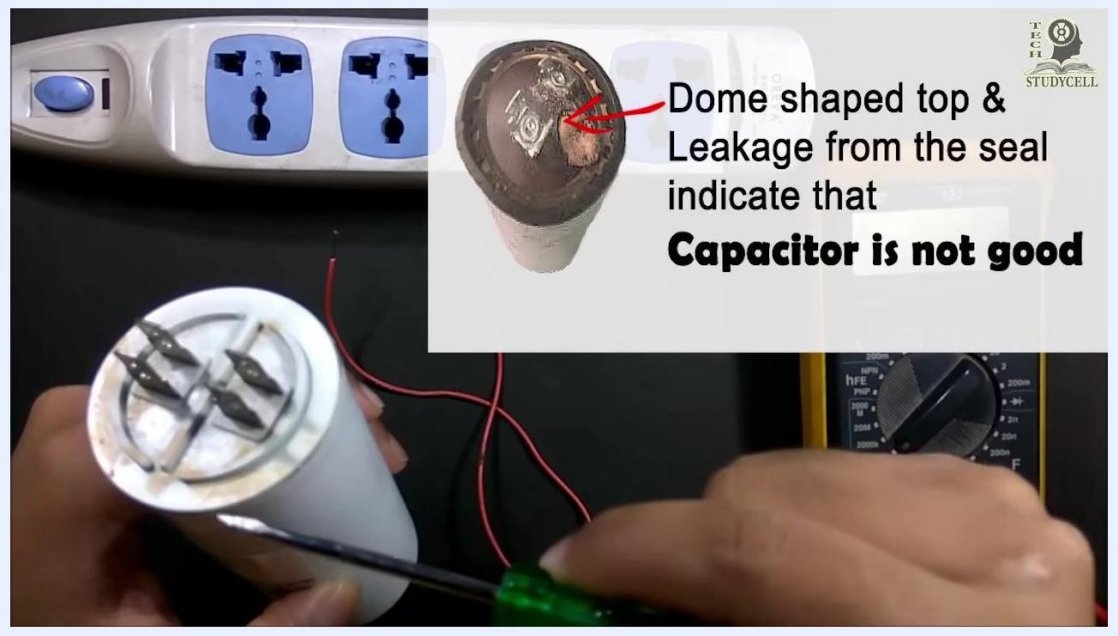
This procedure applies to anyone testing a start capacitor removed from a single-phase induction motor, including compressor motors. It covers testing with and without a multimeter, and includes both resistance-based and direct capacitance measurement approaches.

Required equipment and PPE

Depending on the method you choose, gather the following:

- Start capacitor to be tested
- Digital multimeter (required for Methods 3 and 4)
- Two connecting wires with alligator clips
- Power strip or AC supply (switched off until needed)
- Small DC source, such as a 12V battery (for Method 2)
- Small DC load, such as a buzzer (for Method 2)

- Insulated screwdriver for discharging terminals
- Non-conductive work surface

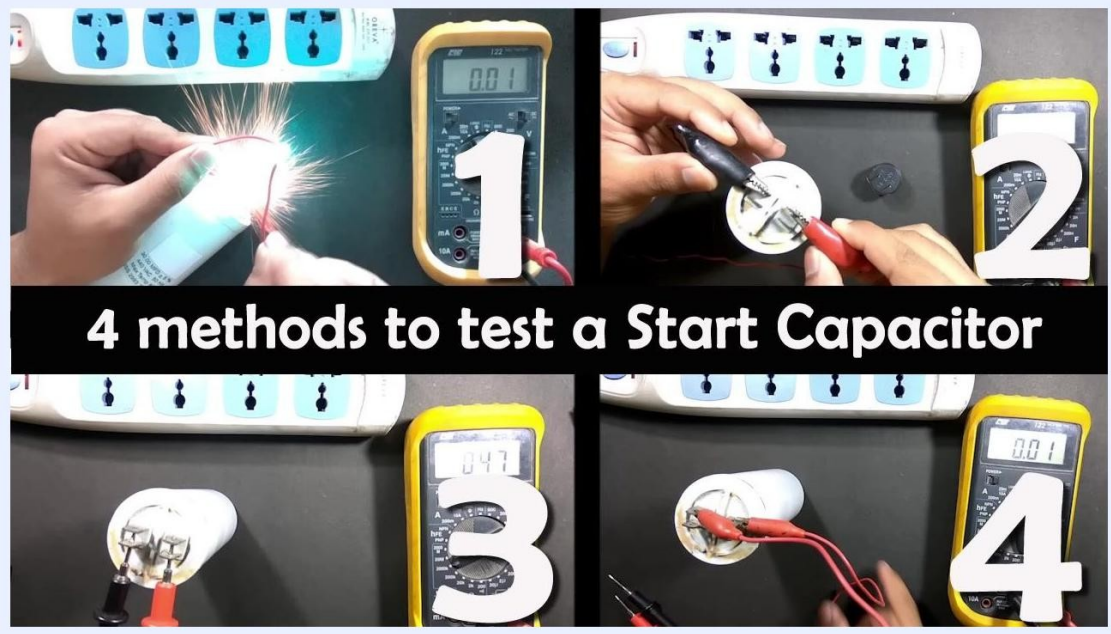


A screwdriver pointing at the capacitor label, showing all technical specifications

Safety precautions

- Always discharge the capacitor before handling or testing it by shorting its two terminals with an insulated screwdriver.
- Never touch the metallic parts of wires or capacitor terminals while the capacitor is charged.
- If you do not have a multimeter or a small DC source, you may use Method 1, but it is not recommended without proper safety precautions. Improper handling can result in severe electric shock.

- Perform any live-wire test at your own risk and only if you are confident in handling electrical components safely.



Start capacitor mounted inside a single-phase induction motor, indicated by a red arrow with the label "Single-phase induction motor capacitor"

Step 1: Locate the start capacitor

Locate the start capacitor inside the single-phase induction motor. It is typically a cylindrical component connected to the motor wiring.

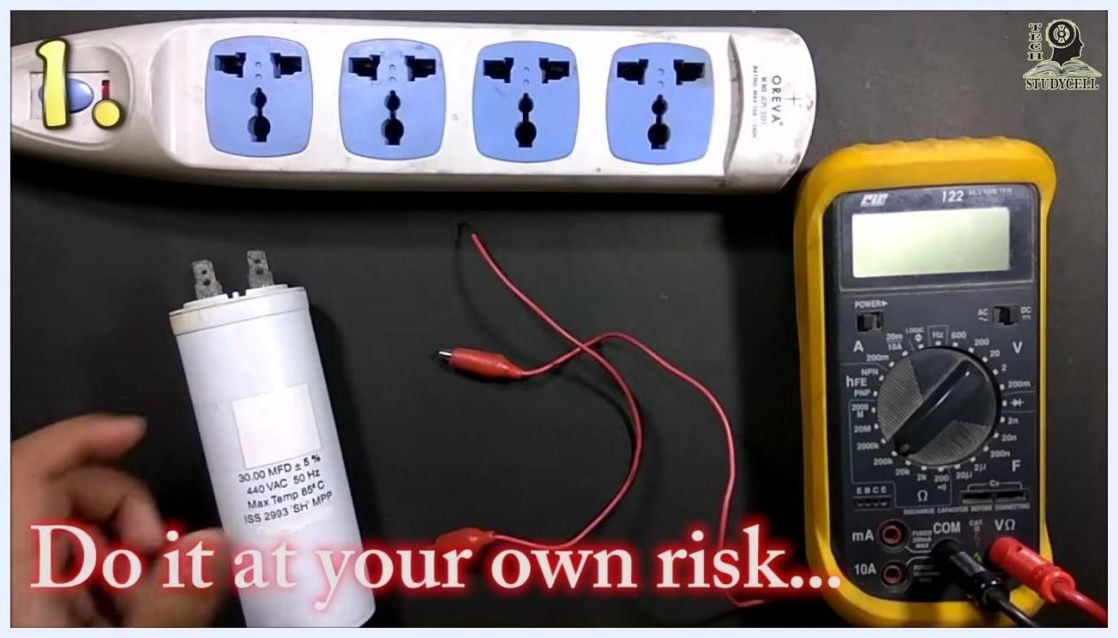
Setup for Method 1 showing the capacitor, wires, and power strip, with the red warning "Do it at your own risk"

Step 2: Discharge the capacitor before inspection

Before handling the capacitor, always short its two terminals using an insulated screwdriver to discharge any stored charge safely.

Step 3: Inspect the capacitor for physical damage

Examine the capacitor body for leakage or a dome-shaped top. A dome-shaped top or leakage from the seal indicates the capacitor is faulty and must not be reused.



Setup with the capacitor, multimeter, and wires on a non-conductive surface, with the red warning text "Do it at your own risk"

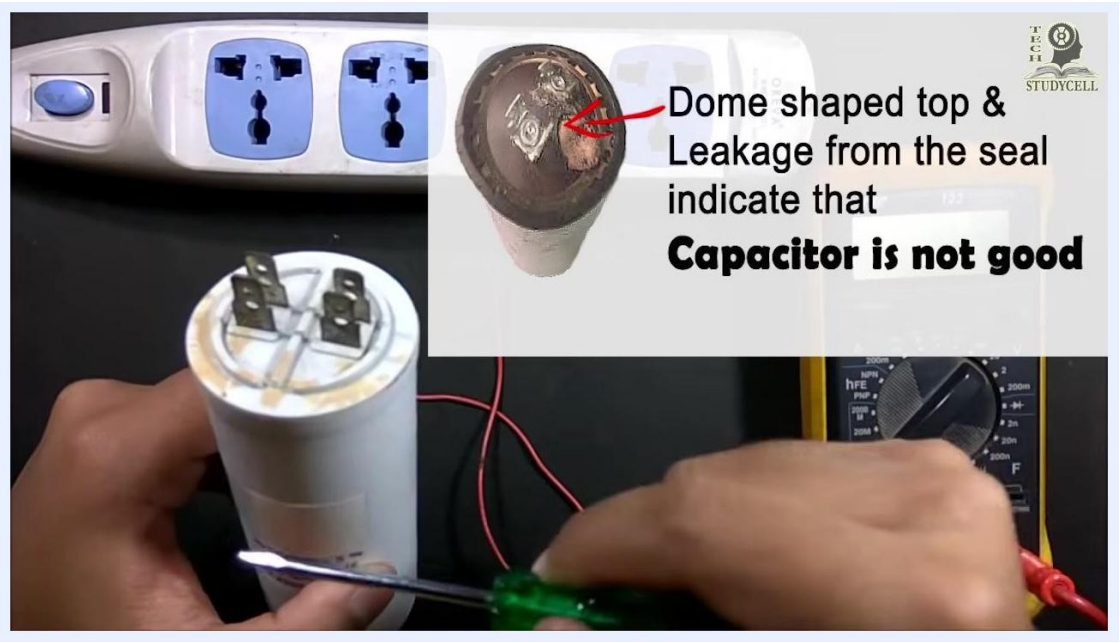
If the capacitor shows no leakage or dome shape, it is physically intact and you can proceed to test it using one of the four methods below.

Step 4: Verify the capacitor's rating label

Read the label on the capacitor to confirm its specifications before testing:

- Capacitance: 30.00 MFD (microfarads) ± 5%
- Voltage: 440 VAC
- Frequency: 50 Hz
- Maximum temperature: 85°C

- Standard: ISS 2993 SH MPP

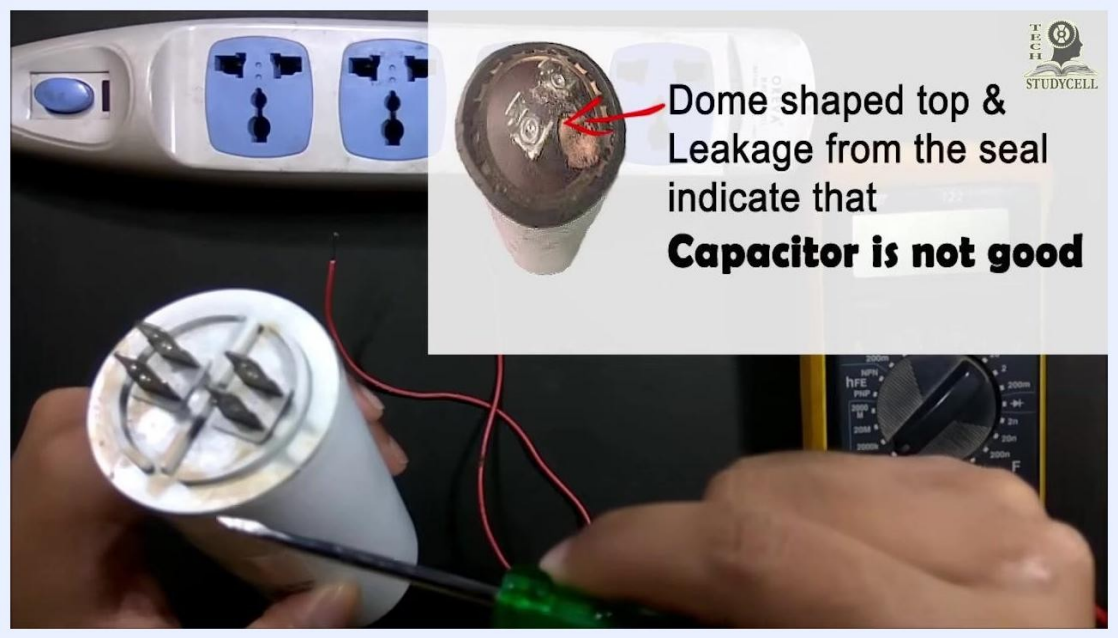


A healthy capacitor being inspected next to a reference image of a damaged capacitor, with the same warning about dome shape and leakage

You are now ready to test the capacitor using one of the four methods described below.

Method 1: Test by charging and discharging (without a multimeter)

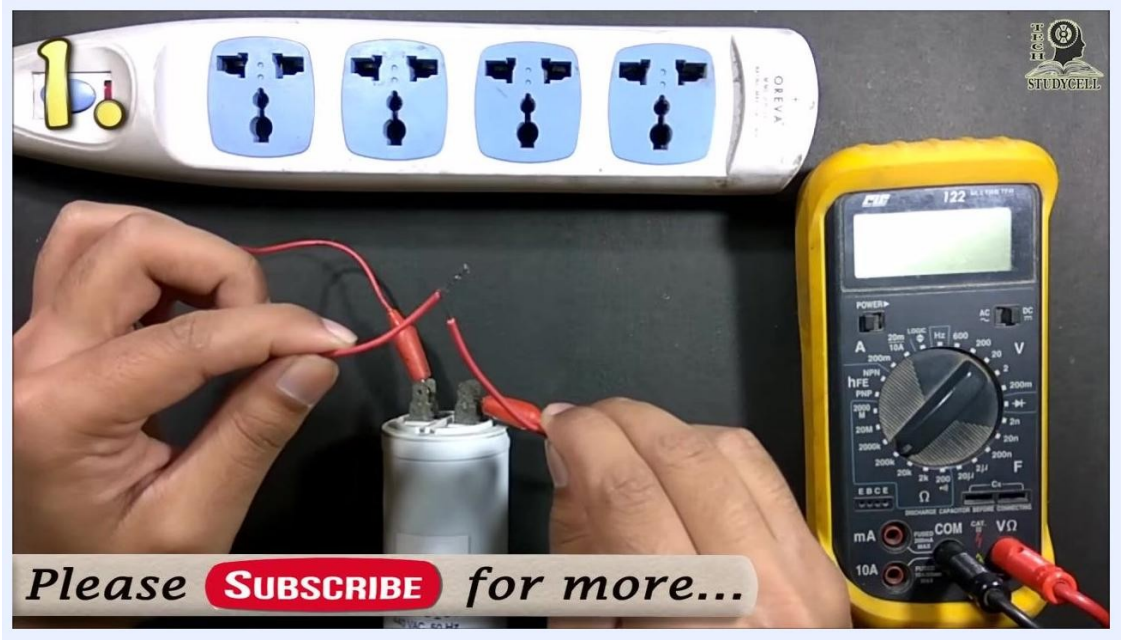
Warning: This method involves briefly connecting the capacitor to a live AC supply. Improper handling can cause severe electric shock. Only proceed if you are confident and take all necessary safety measures.



Close-up of a capacitor showing a dome-shaped top and leakage, with the caption "Dome-shaped top and leakage from the seal indicate the capacitor is faulty"

Step 1: Set up the equipment

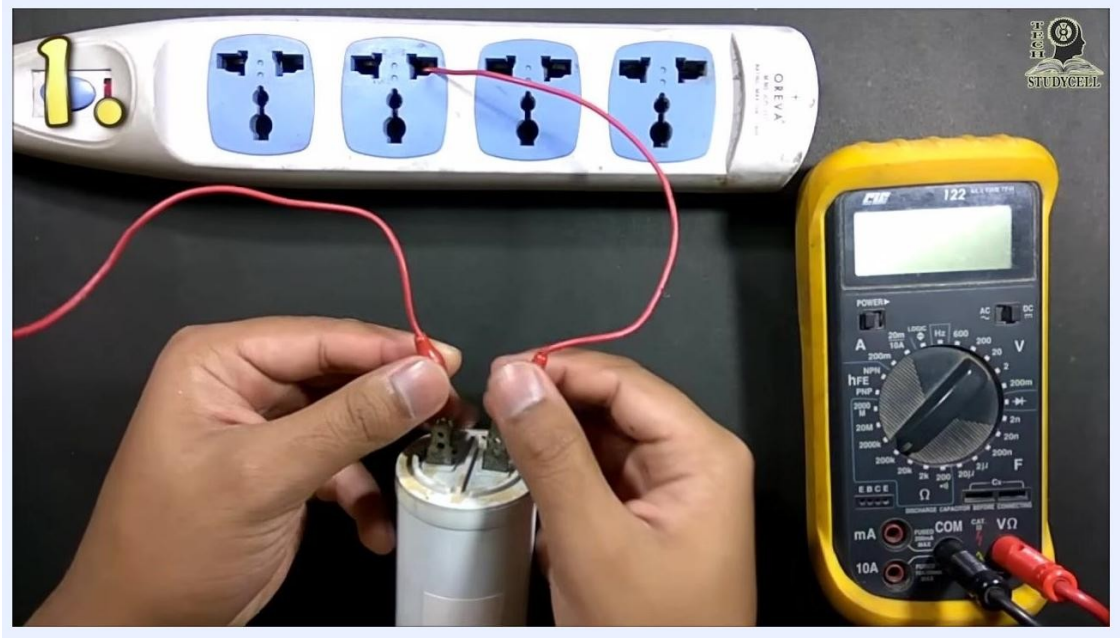
Place the start capacitor, connecting wires with alligator clips, and power strip on a non-conductive surface. Confirm the power supply is switched off before making any connections.



The wires held apart after discharging, marking the completion of the test

Step 2: Connect wires to the capacitor terminals

Attach one end of each connecting wire to the two terminals of the capacitor using alligator clips. Ensure the connections are secure and the wires are not touching each other. Confirm the power supply remains off.



Both wires connected to the capacitor, with the free ends about to be connected to the power strip to charge the capacitor

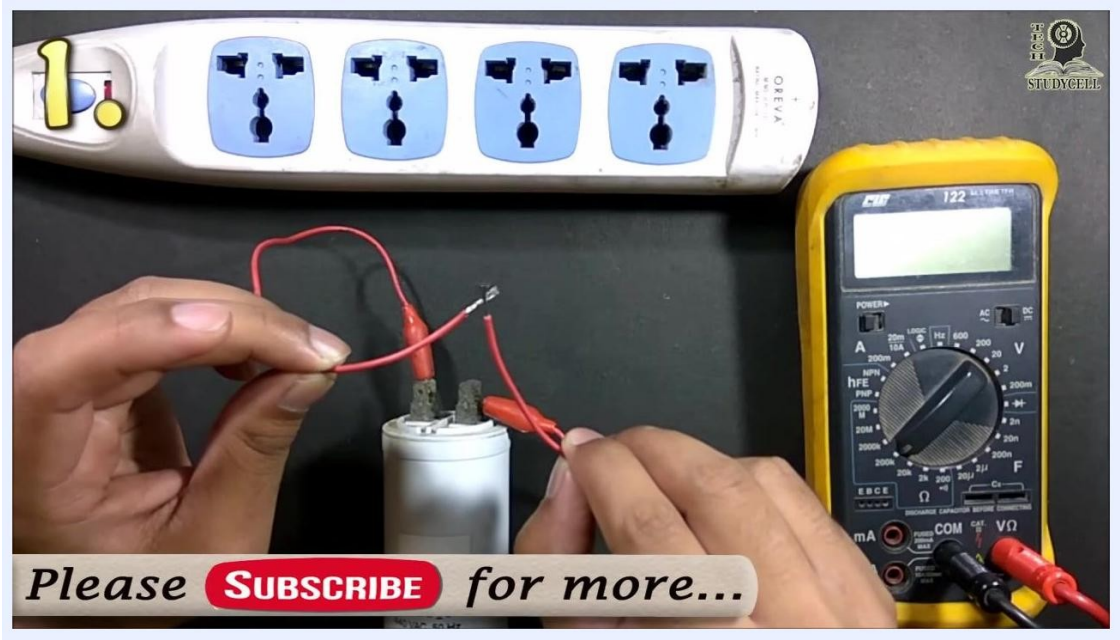
Step 3: Position the wires for charging

Hold the free ends of the two wires without touching any metallic part of the wires or the capacitor terminals directly.

Step 4: Charge the capacitor

Briefly connect the free ends of the wires to the live and neutral sockets of the power supply for less than one second, then disconnect immediately.

Warning: Do not keep the capacitor connected to the supply for more than a fraction of a second, and do not touch any metallic parts during this process.



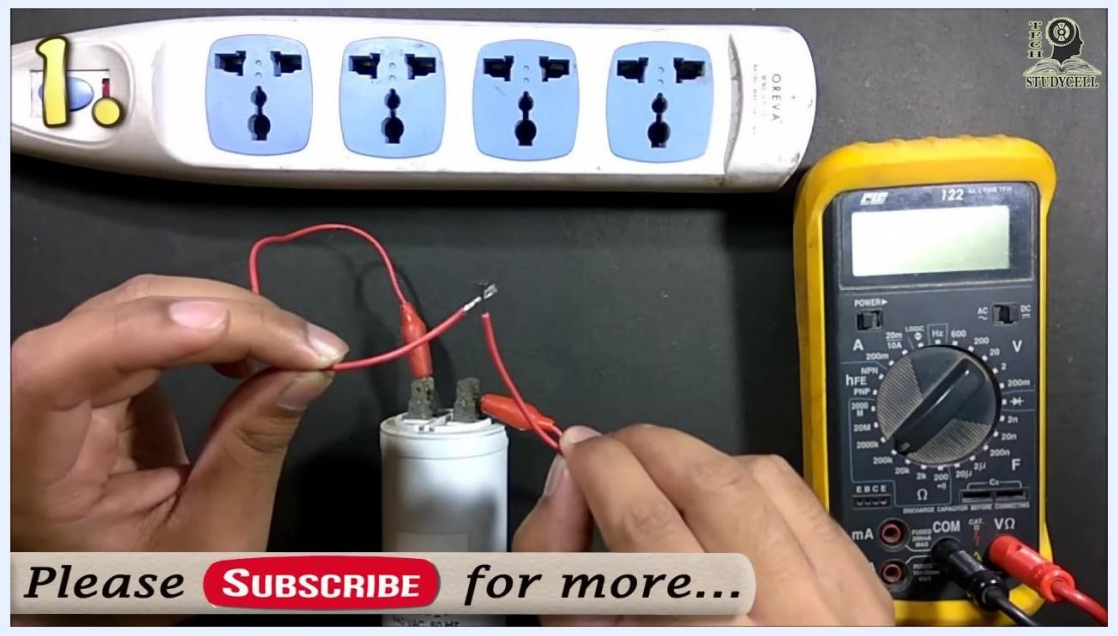
The user holding the two wires, preparing to short them together to discharge the capacitor

Step 5: Prepare to discharge the capacitor

After charging, remove the wires from the power supply immediately. Hold the insulated part of the wires and bring the free ends together to short them.

Step 6: Discharge the capacitor and observe the result

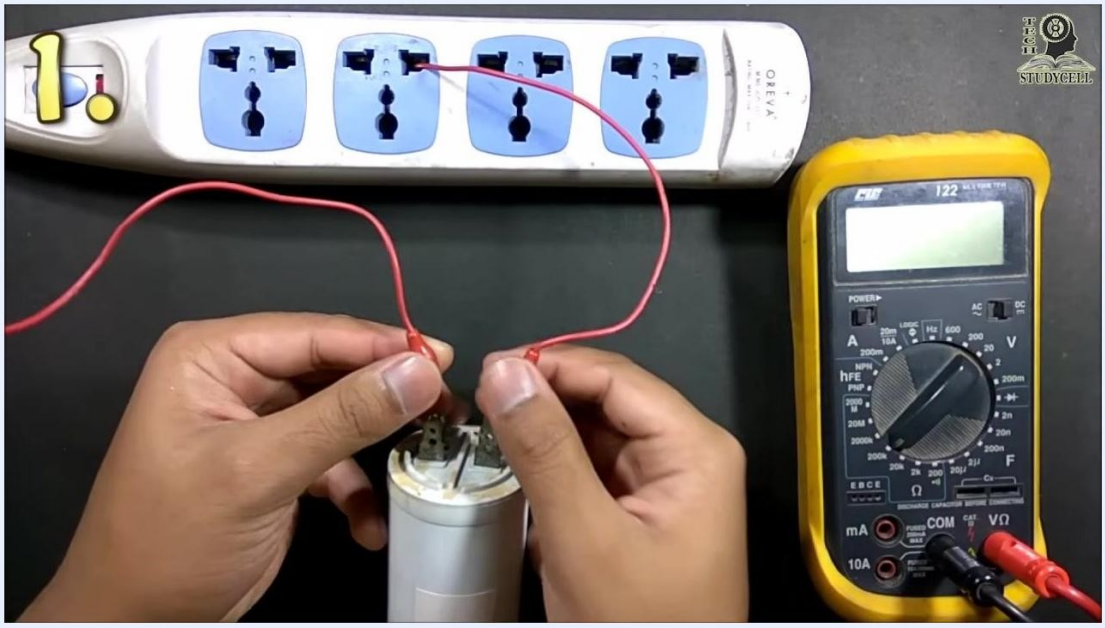
Touch the free ends of the wires together to short them, discharging the capacitor. Listen for a spark sound or observe a visible spark at the point of contact.



The wires being shorted together, discharging the capacitor

Step 7: Interpret the results

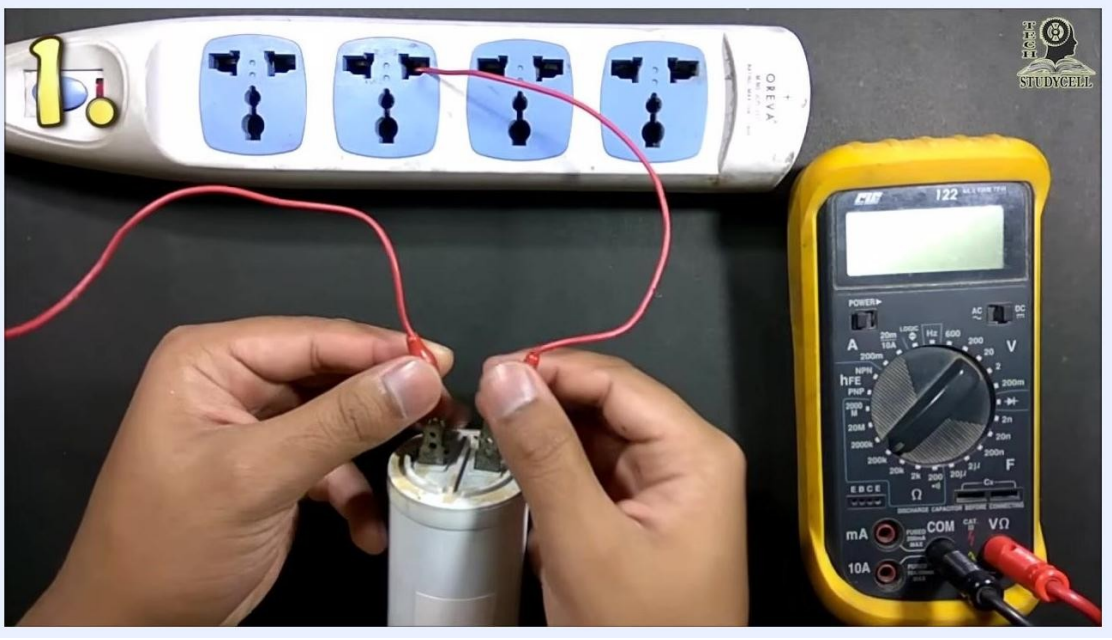
If you hear a spark sound or see a spark when shorting the wires, the capacitor is charging and discharging correctly, indicating it is functional. If there is no spark or sound, the capacitor may be faulty and should be replaced.



The free ends of the wires being connected to the power strip sockets to charge the capacitor

Step 8: Complete the test safely

You may repeat the charging and discharging process once more for added confidence, always connecting the capacitor to the supply for only a fraction of a second each time. Never touch metallic parts during charging or discharging.



A start capacitor with two red wires attached to its terminals using alligator clips, on a black surface, with a power strip and yellow multimeter visible

Note: This method confirms only that the capacitor charges and discharges; it does not measure the capacitance value.

Method 2: Test using a DC source and DC load

Step 1: Gather the equipment

Prepare a start capacitor, a small DC source (such as a 12V battery), a small DC load (such as a buzzer), and connecting wires with alligator clips.

The capacitor being charged with a DC source using black and red probes, with the buzzer placed on the table ready for use as a load

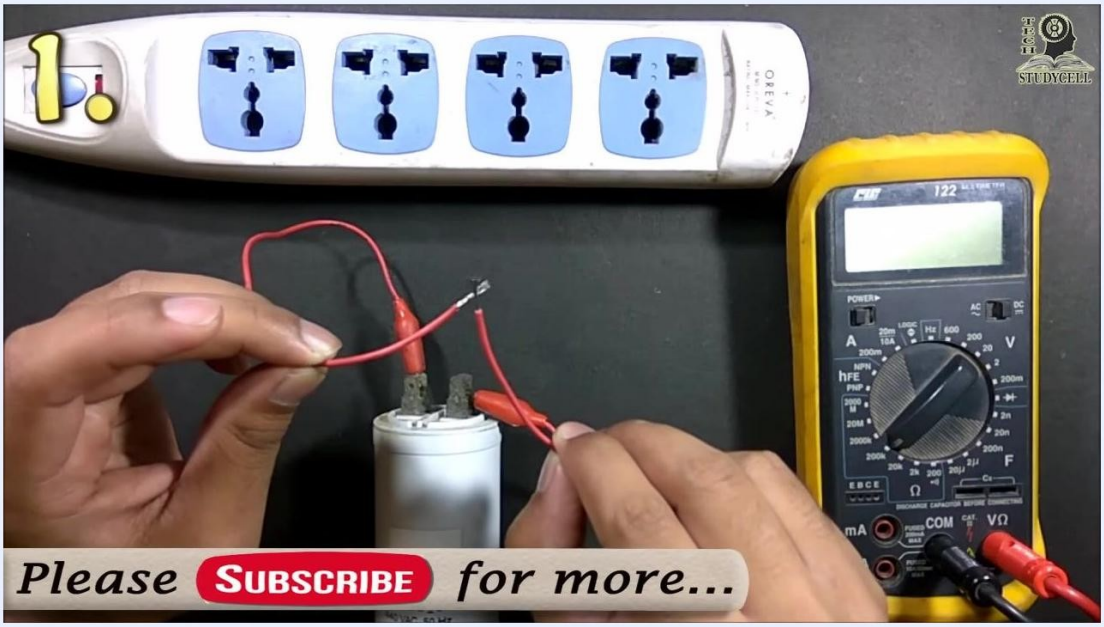
Step 2: Connect the capacitor to the DC source

Attach the alligator clips to the capacitor terminals, ensuring the connections are secure and the wires are not touching each other.

The user holding a start capacitor in one hand and a small blue-and-black buzzer in the other, preparing to use the buzzer as a load

Step 3: Charge the capacitor

Briefly connect the free ends of the wires to the positive and negative terminals of the DC source. Hold the wires by their insulated parts and avoid touching any metallic parts. Allow the capacitor to charge for a few seconds.



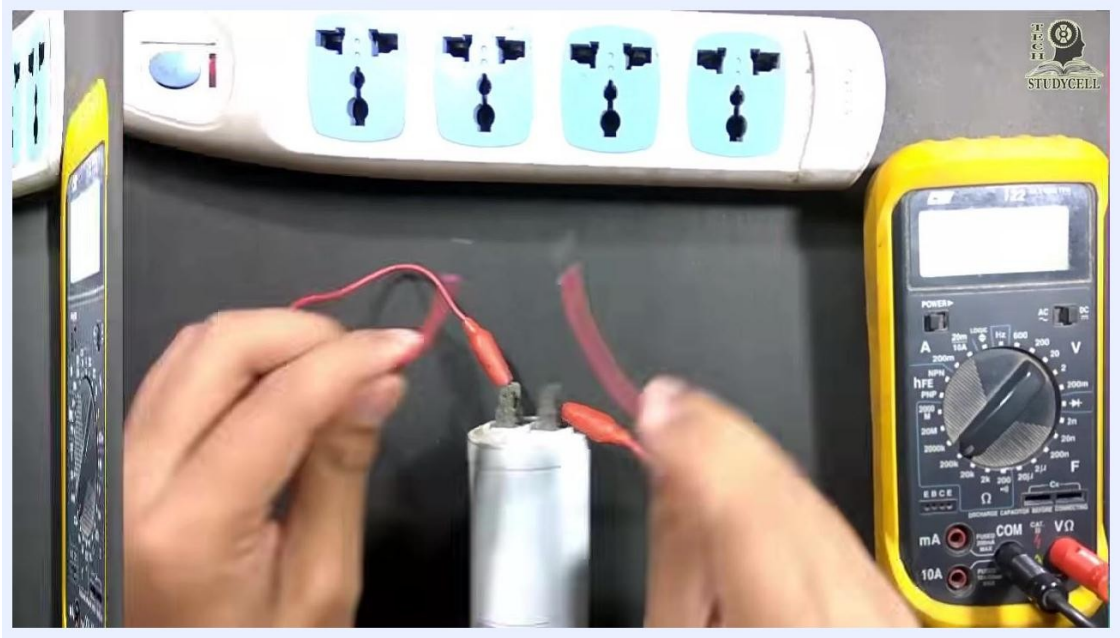
The wires being shorted, confirming the spark and a good capacitor

Step 4: Prepare the DC load

Hold the buzzer and get ready to connect it across the capacitor terminals.

Step 5: Connect the load and observe

After charging, disconnect the capacitor from the DC source. Immediately connect the buzzer across the capacitor terminals, ensuring correct polarity — the positive terminal of the buzzer to the positively charged terminal of the capacitor.



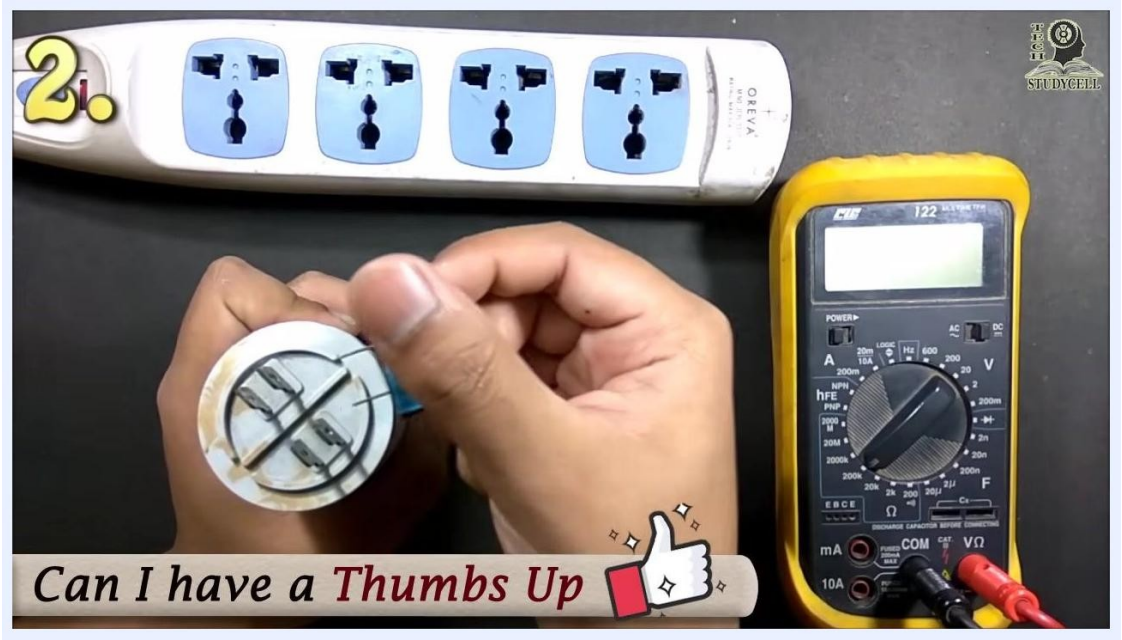
A start capacitor with two red wires attached to its terminals using alligator clips, with hands holding the wires above the capacitor and a power strip and multimeter visible on the table

Step 6: Confirm discharge through the load

Listen for the sound from the buzzer, which indicates the capacitor is discharging through the load.

Step 7: Interpret the results

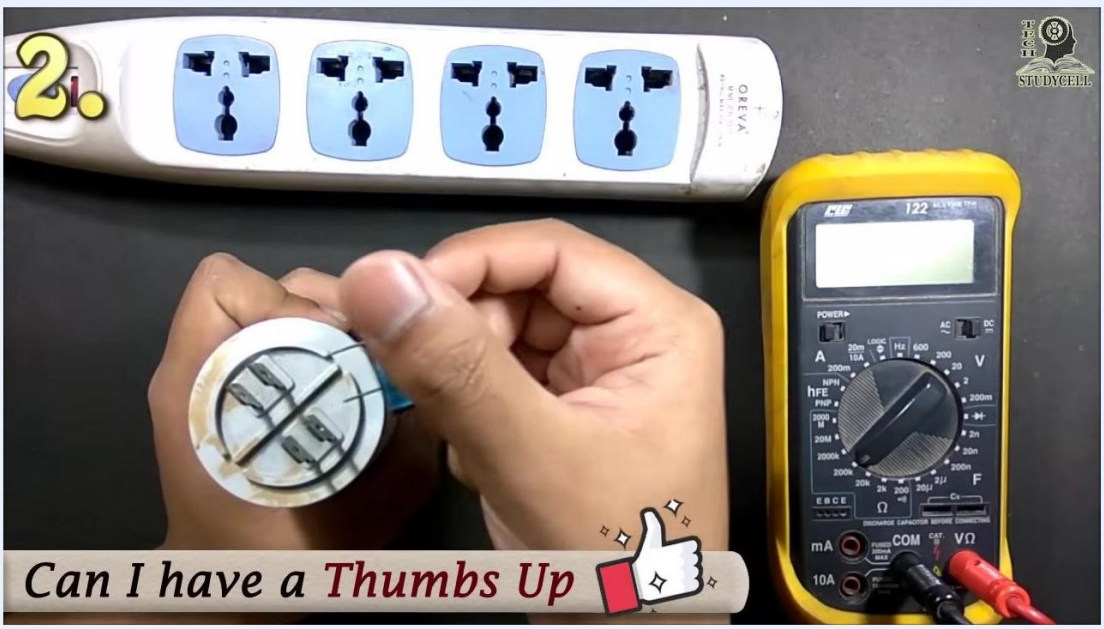
If the buzzer sounds for a short period, the capacitor is charging and discharging correctly, indicating it is functional. If there is no sound, the capacitor may be faulty and should be replaced.



The buzzer connected across the capacitor terminals, discharging the capacitor

Limitation: This method only confirms whether the capacitor is charging and discharging. It does not provide an accurate measurement of the capacitance value.

The user holding the capacitor and buzzer after the test, confirming the buzzer sounded and the capacitor is functional



The capacitor held upright, showing its label with specifications: 30.00 MFD ± 5%, 440 VAC, 50 Hz, max temp 85°C, ISS 2993 SH MPP

Method 3: Test using a multimeter (resistance/ohmic scale)

Step 1: Discharge the capacitor

Before testing, fully discharge the capacitor by shorting its terminals with an insulated screwdriver. Hold the capacitor securely and touch the screwdriver blade across both terminals.

The capacitor terminals being shorted with a screwdriver to discharge it, with the multimeter and power strip visible

Step 2: Set up the multimeter

Insert the red lead into the VΩ port and the black lead into the COM port on the multimeter. Turn the dial to a high resistance range, such as 200kΩ.

A digital multimeter with its dial set to the 200kΩ resistance range, red lead in the VΩ port, black lead in the COM port, with a screwdriver pointing at the dial and a start capacitor and power strip visible

Step 3: Connect the probes and observe the initial reading

Touch one probe (black) to one terminal and the other probe (red) to the other terminal of the capacitor. The display initially shows "OL" (over limit), indicating no continuity at the start.

Both probes connected to the capacitor terminals, with the multimeter display showing "225"

Step 4: Observe the reading as the capacitor charges

Keep the probes connected and watch the display as the value increases (for example, from "OL" to "225"), indicating the capacitor is charging.

The swapped probes connected to the capacitor, with the multimeter display reading "OL"

Step 5: Wait for the reading to return to over limit

After a short time, the display returns to a high value or "OL," such as "1947," confirming the capacitor is holding a charge.

Step 6: Reverse the multimeter leads

Remove the probes from the capacitor and swap their positions — red to the terminal where black was, and vice versa. Touch the probes to the terminals again; the display should initially show "OL."

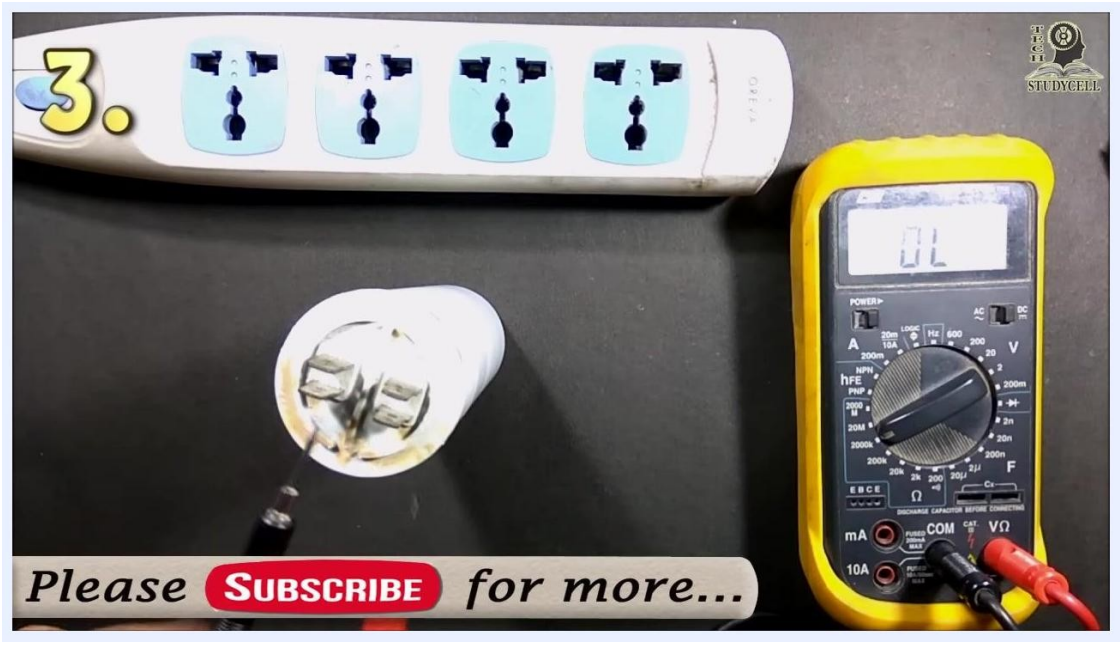
Both probes remaining on the capacitor terminals, with the multimeter now showing "1947"

Step 7: Reconnect the reversed probes

With the leads reversed, touch the probes to the capacitor terminals again.

Step 8: Monitor the discharge process

Continue observing the multimeter as the value decreases (for example, from "206" down to lower numbers), confirming the capacitor is discharging.



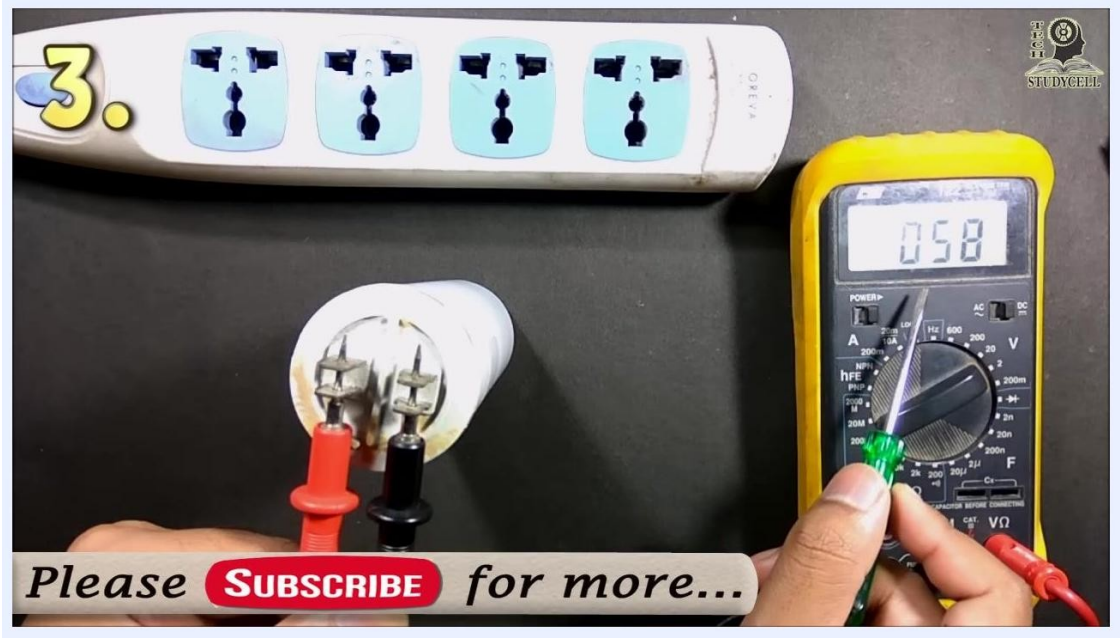
The probes removed and about to be swapped, with the multimeter display reading "OL"

Both probes connected to the capacitor with the multimeter showing "206" and a hand holding a screwdriver nearby

Step 9: Confirm full discharge

Wait until the reading drops to a low value, such as "058," indicating the capacitor is nearly fully discharged. Use an insulated screwdriver to short the terminals if necessary to ensure complete discharge.

A hand holding a large cylindrical capacitor while touching its terminals with the black and red probes of a digital multimeter, with the display reading "OL"



The multimeter showing "058," with a hand holding a screwdriver near the terminals

Step 10: Repeat the test if needed

You may repeat the charging and discharging process to confirm the capacitor's behavior. The reading should increase while charging and decrease while discharging.

Both probes connected to the capacitor with the multimeter showing "1323" and the on-screen indicator "in 4X" showing the footage is sped up

Method 4: Test using a multimeter (capacitance scale)

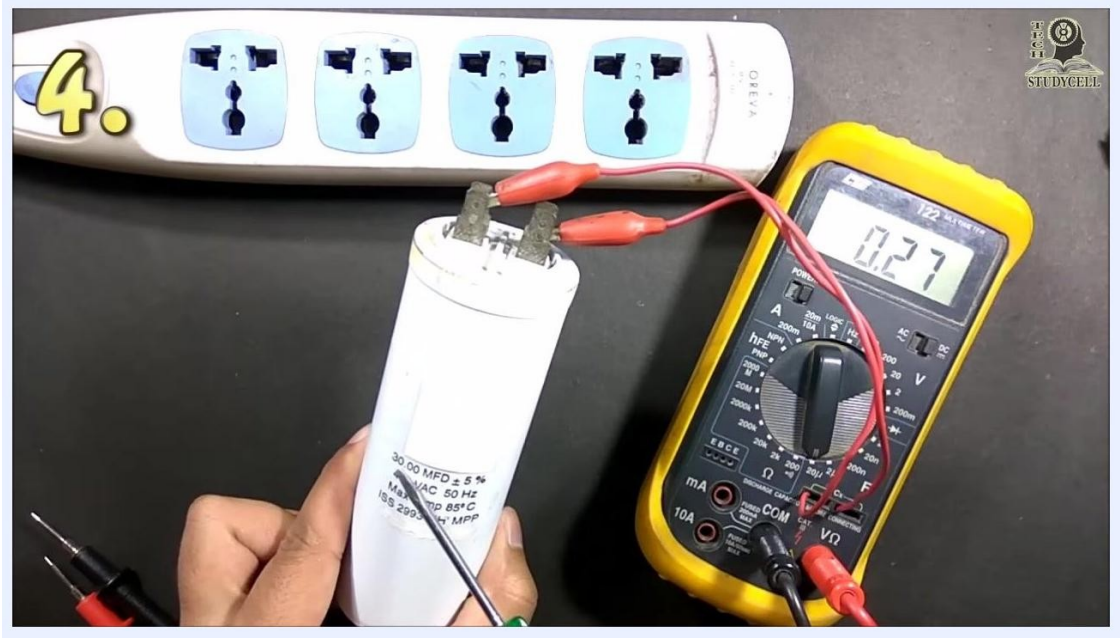
Measuring capacitance directly with a multimeter is the most accurate and recommended method for testing a compressor capacitor.

Step 1: Discharge the capacitor

Before testing, use an insulated screwdriver to short the two terminals of the capacitor and fully discharge it.

Step 2: Set the multimeter to capacitance mode

Turn the multimeter dial to the capacitance (F) setting. On this model, the range is marked "20µF" (microfarads). Confirm the display shows "OL," indicating it is ready for measurement.



The multimeter display showing "9.30" while the alligator clips remain attached to the capacitor

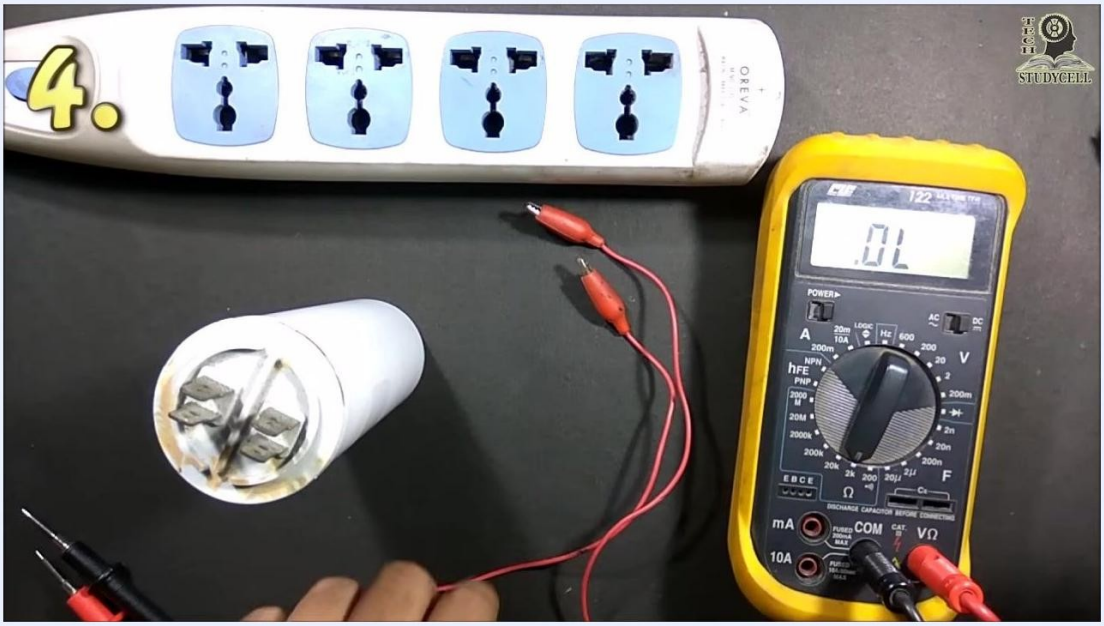
Step 3: Connect the leads to the capacitor

Attach the alligator clips from the multimeter leads to the two terminals of the capacitor, ensuring a secure connection. Observe the display as it begins to register a value.

A hand pointing to the capacitor label with a screwdriver, with the multimeter display showing "0.01"

Step 4: Check the multimeter's capacitance range

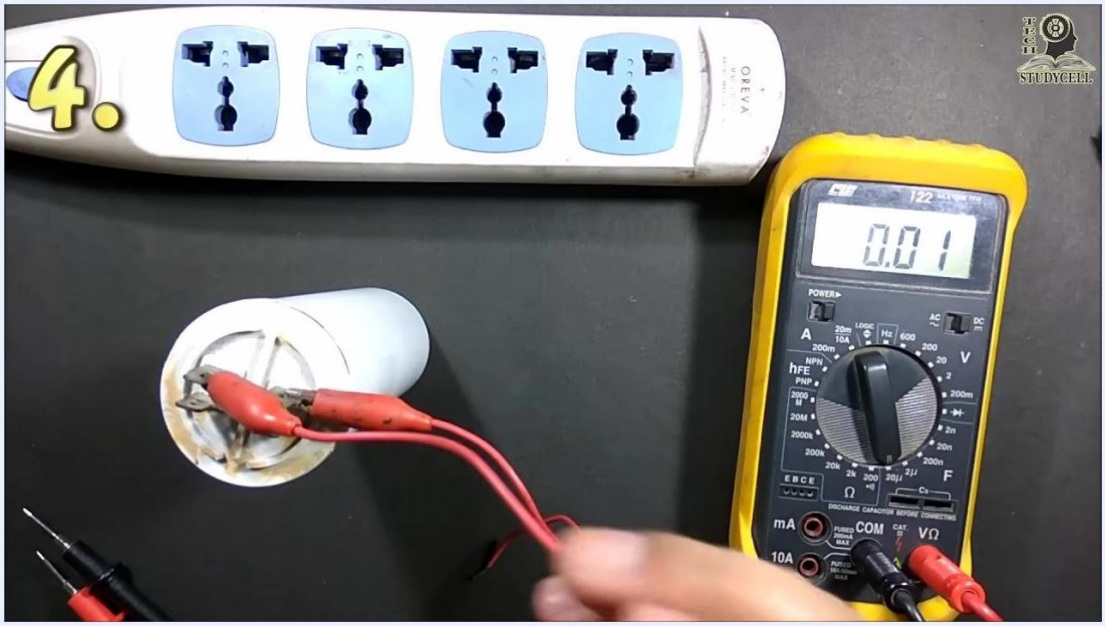
This multimeter can measure up to 20 microfarads (µF). The capacitor under test is labeled "30.00 MFD ± 5%," which exceeds the meter's maximum range. If the capacitance is above the meter's range, the display shows "OL." If the value remains "OL" after adjusting the leads or settings, the capacitor is too large for this meter.



A large white capacitor, a yellow digital multimeter displaying "OL," red test leads with alligator clips, and a power strip arranged on a black work surface, with the dial set to the capacitance (F) range

Step 5: Read and interpret the measurement

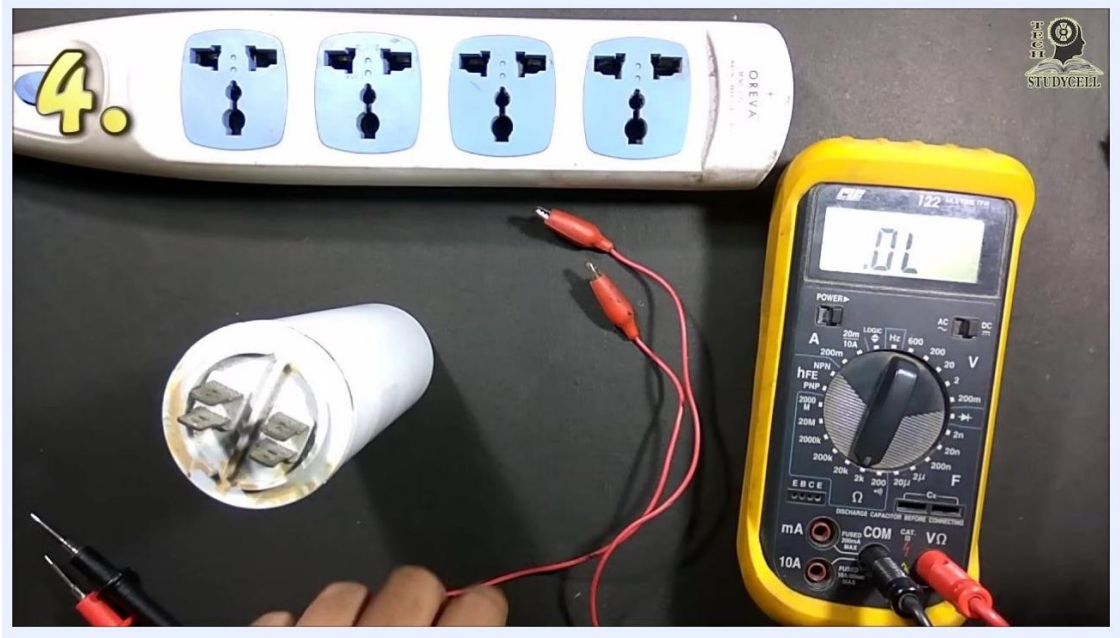
If the capacitor value is within the meter's range, the display shows a numeric value, such as "9.30" for 9.3 µF. If the value is too high, the display shows "OL." Compare the measured value to the capacitor's rated value to determine if it is within specification.



Alligator clips attached to the capacitor terminals, with the multimeter displaying "0.01" and a hand adjusting the setup

Step 6: Verify against the rated specification

Use a screwdriver or pointer to indicate the capacitor's label and confirm its rated capacitance, such as "30.00 MFD ± 5%." If the measured value is significantly lower than the rated value, the capacitor may be faulty.



A hand adjusting the multimeter dial and test leads, with the display reading "OL" and the capacitor label "30.00 MFD ± 5%" visible

Step 7: Confirm your findings

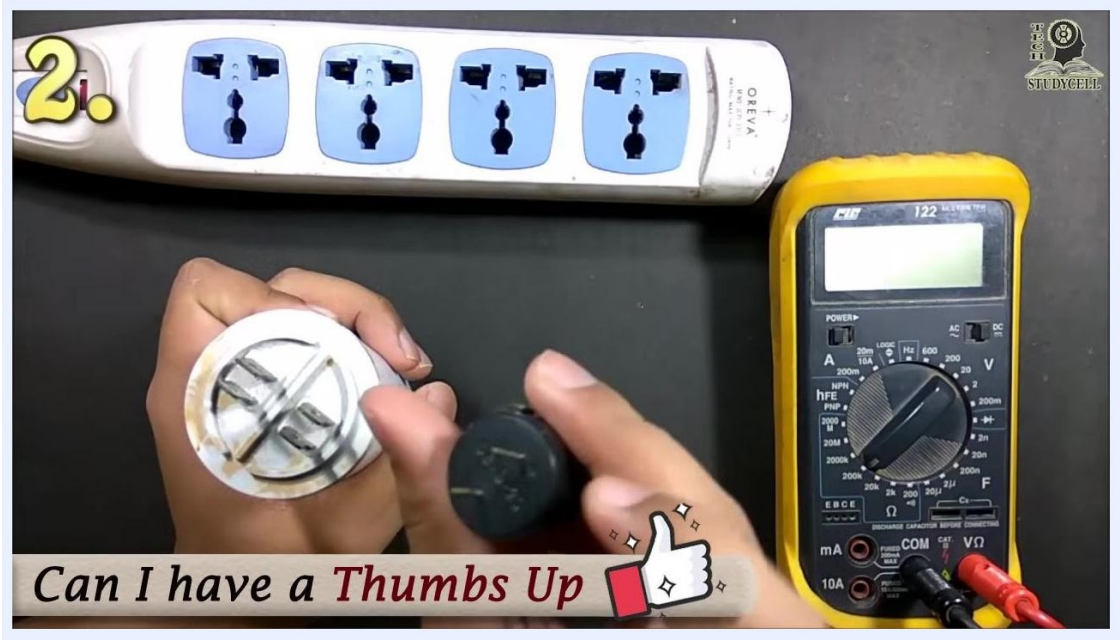
If your multimeter cannot measure the full value of the capacitor, use a meter with a higher capacitance range or verify the result with another testing method.

Verification and summary

You can confirm a start capacitor's condition using any of the four methods below:

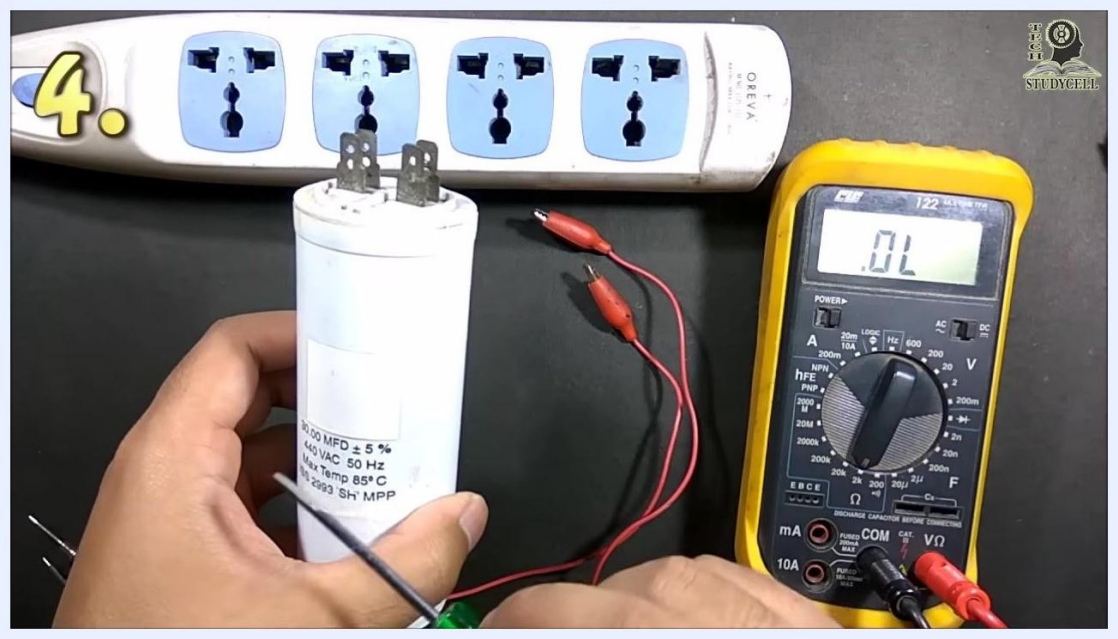
- Charging and discharging without a multimeter (visual/audible spark check)
- Charging and discharging using a DC source and DC load (buzzer sound check)
- Charging/discharging behavior observed on a multimeter's resistance scale

- Direct capacitance measurement compared against the rated specification



The user holding the capacitor and buzzer, preparing to connect the buzzer across the capacitor terminals

Measuring capacitance directly with a multimeter is the most accurate and recommended method for testing a compressor capacitor. Always ensure the capacitor is fully discharged before handling or testing it, to avoid electric shock or damage to your multimeter.



A hand holding a large white capacitor while another hand touches a screwdriver to the terminals to discharge it, with the multimeter set to "OL" and red test leads with alligator clips visible

What's next

If your multimeter cannot measure the full rated value of your capacitor, use a meter with a higher capacitance range or cross-check the result using one of the other three methods described above. If a capacitor fails any of these tests — through lack of spark, lack of buzzer sound, or a significantly lower capacitance reading than its rated value — replace it before reinstalling it in the motor.

A hand pointing to the capacitor label with a screwdriver, with the multimeter display showing "0.01"