What to Check When an SFRA Comparison Shows a Difference

A Practical Checklist for Clearer SFRA Comparison

When an SFRA comparison shows a difference, the deviation may indicate mechanical change inside the transformer. It may also reflect uncertainty in the comparison itself.

Before the result is used to support escalation, further investigation or a decision about the next stage of work, the comparison needs to be checked carefully. The comparison basis, setup, grounding, transformer configuration, core condition, test settings and repeatability of the measurement can all affect how confidently the difference can be interpreted.

This checklist follows a structured sequence to help teams:

- establish whether the comparison basis is valid
- confirm that the test conditions are comparable
- isolate grounding as a possible influence on the measurement
- account for the transformer's magnetic state
- identify the influence of inactive leads, auxiliary cables or additional site connections
- establish whether the difference is repeatable
- separate comparison uncertainty from possible transformer evidence
- document the evidence and rationale supporting the next decision

Use it when time-based, type-based or phase-based SFRA results do not align and the cause is not immediately clear.

Megger

1 Confirm the Comparison Basis is Appropriate

Before analysing the deviation, confirm that the selected trace provides a suitable basis for comparison.

Check:

- ☐ whether the comparison is time-based, type-based or phase-based
- ☐ the same transformer, a comparable sister unit or symmetrical phases are being compared, as appropriate
- ☐ the correct winding, phase, tap position and winding configuration are being compared
- ☐ the most relevant reference available has been selected
- ☐ measurement direction, test voltage and test settings are comparable
- ☐ the SFRA instrument has been verified using the reference box

Why it matters:

The comparison basis affects how the deviation should be interpreted. Confirming that the reference and measurement conditions are appropriate provides a stronger basis for further investigation.

2 Match the Test Conditions Across the Measurements

A difference in test conditions can affect the result before the transformer condition is even considered.

Check:

- ☐ cable routing follows a comparable approach across the measurements
- ☐ connections follow the same measurement configuration and connection practice
- ☐ grounding points are consistent across the measurements
- ☐ the same test method and sequence have been followed
- ☐ setup notes, diagrams or photographs have been reviewed where available

Why it matters:

SFRA comparison depends on repeatability. If the test conditions differ between measurements, the trace may change for reasons linked to the measurement process rather than the transformer.

3 Check the Grounding Arrangement

Grounding differences can weaken confidence in the comparison and introduce avoidable uncertainty.

Check:

- ☐ the instrument earth or ground connection is secure
- ☐ the transformer tank is properly grounded
- ☐ grounding connections are secure
- ☐ grounding braids or shields follow a comparable approach across the measurements
- ☐ grounding points match as closely as possible across the measurements being compared
- ☐ ground-loop verification has been completed where available
- ☐ there are no obvious setup issues affecting loop continuity

Why it matters:

If grounding is inconsistent, the comparison becomes harder to defend. The result may still show a deviation, but the team needs to understand whether the grounding arrangement has influenced the measurement.

4 Consider the Magnetic State of the Core

The transformer may not be in the same magnetic state as it was during the reference measurement.

Check:

- ☐ whether the transformer may have been left in an unknown magnetic state
- ☐ whether previous electrical tests could have affected the core condition
- ☐ whether the transformer has been demagnetised before the measurement
- ☐ whether the low-frequency region of the trace appears affected
- ☐ the test voltage is the same

Why it matters:

Residual magnetism can influence the low-frequency response in the open-circuit mode test. If the magnetic state is not considered, the comparison may appear less repeatable or show a difference related partly to the test conditions.

Mechanical change?
Verified fingerprint

State-of-the-art technology in
Sweep Frequency Response Analysis

Megger

5 Review Lead and Auxiliary-Connection Influence

Even when the test setup and grounding arrangement have been checked, other connected leads and auxiliary cables may influence the measurement.

Check:

- ☐ whether connected but inactive leads or auxiliary cables could be influencing the measurement
- ☐ whether additional site connections differ from the reference conditions
- ☐ whether these conditions are consistent across the phases being compared
- ☐ whether any connection differences have been documented before interpretation (i.e. shorting leads)

Why it matters:

Lead and auxiliary-connection influence can affect the trace even when the primary measurement setup is correct. Understanding these variables helps distinguish an external connection effect from evidence of change within the transformer.

6 Confirm Whether the Difference Is Repeatable

Before drawing a conclusion, confirm whether the deviation appears consistently.

Check:

- ☐ whether the measurement can be repeated under controlled, comparable conditions
- ☐ whether the deviation appears in the same frequency region across repeat tests
- ☐ whether the comparison remains stable after setup checks have been completed
- ☐ whether any change between repeat measurement points back to the setup, process or measurement conditions

Why it matters:

A repeatable deviation gives the team a stronger basis for investigation. A one-off variation may point to the setup, the process, or another source of comparison uncertainty.

7 Separate Comparison Uncertainty from Transformer Evidence

Once the main variables have been checked, review what evidence remains.

Ask:

- ☐ does the deviation remain after the main comparison and measurement variables have been reviewed?
- ☐ does the comparison still indicate possible mechanical movement, deformation, or displacement?
- ☐ are the measurements controlled well enough to support escalation?
- ☐ does the result justify further investigation, additional testing, or continued monitoring?
- ☐ what remains uncertain and needs to be documented?

Why it matters:

The purpose of the checklist is to separate avoidable comparison uncertainty from evidence that may indicate a genuine transformer issue. That distinction helps the team decide what the result can support.

8 Document the Basis for the Next Step

Once the comparison has been reviewed, document the evidence used to determine the next step.

Record:

- ☐ the comparison basis and traces used
- ☐ which setup, grounding, core-condition and connection variables were checked
- ☐ whether the deviation remained repeatable
- ☐ what comparison uncertainty remains
- ☐ the recommended next step and why the evidence supports it

Why it matters:

Clear documentation shows how comparison uncertainty was addressed and why the result supports the recommended action. It makes the decision easier to explain, defend and act on during commissioning, service work or post-transport verification.

Clearer Comparison Starts with Reducing Uncertainty

When an SFRA comparison shows a difference, the next step depends on how confidently that difference can be interpreted.

By checking the comparison basis, setup, grounding, core condition, lead influence and repeatability, teams can reduce avoidable uncertainty before the result is used to support escalation, further testing or customer communication.

This creates a stronger basis for deciding whether the deviation indicates possible mechanical change inside the transformer or whether the measurement conditions need closer review first.

Supporting offline tests can then provide additional evidence alongside the SFRA results:

- if a deviation is observed and confirmed in the open-circuit mode, an excitation current test is suggested
- if a deviation is observed in the short-circuit mode, a leakage reactance or short-circuit impedance test is suggested

Reduce Uncertainty Before the Next Site Decision

FRAX200 helps teams build more dependable SFRA comparisons by identifying and reducing common sources of measurement uncertainty before the results are used to support a decision.

With built-in demagnetisation, automatic ground-loop detection, high measurement repeatability and a testing approach designed for clearer site verification, FRAX200 helps engineers compare results with greater confidence.

Explore FRAX200 >