

**TESTING
OF ANALOG AND DIGITAL
TRANSFORMERS**

Quick Guide

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1 GENERAL

1.1 Synchronization

The screenshot shows a software interface with several tabs: ADC, Streams, Synchronization, Measurement interval, Connection, and Service. The Synchronization tab is selected. The interface includes a Source dropdown menu set to "Internal (quartz generator)", an Apply button, and two output configuration sections. Output 1 is set to "off" with Frequency, Hz at 1, Pulse duration, s at 0,001, and Pulse delay, s at 0. Output 2 is also set to "off" with Frequency, Hz at 0, Pulse duration, s at 0, and Pulse delay, s at 0.

In the present program version, there are 2 modes of synchronization: internal (with an internal quartz generator) and external PPS (with an external PPS signal). To test **digital CTs or VTs**, you can use either external or internal synchronization. However it is critically important that both devices (the transformer under test and EM61850) are synchronized.

To use an external source of PPS (pulses per second), select **Input 1 (PPS in)** from the **Source** menu. To enable the internal source of synchronization, select **Internal (quartz generator)**.

There are three synchronization options:

Option 1: EM61850 is configured as a source of PPS, a digital transformer under test is set to be synchronized from EM61850.

Option 2: A digital transformer under test is configured as a source of sync pulses 1PPS, EM61850 is set to be synchronized from the transformer under test.

Option 3: A digital transformer and EM61850 are synchronized from another source of sync pulses.

If you choose:

- Option 1, select **Internal (quartz generator)** sync mode for EM61850 and enable **Output 1**
- Option 2 or 3, set EM61850 to the mode of external synchronization by selecting **Input 1 (PPS in)**.

Click **Apply** to send these settings to the instrument.

2 TESTING TRANSFORMERS

2.1 Diagrams and cable connections

2.1.1 Verification of analogue voltage transformers

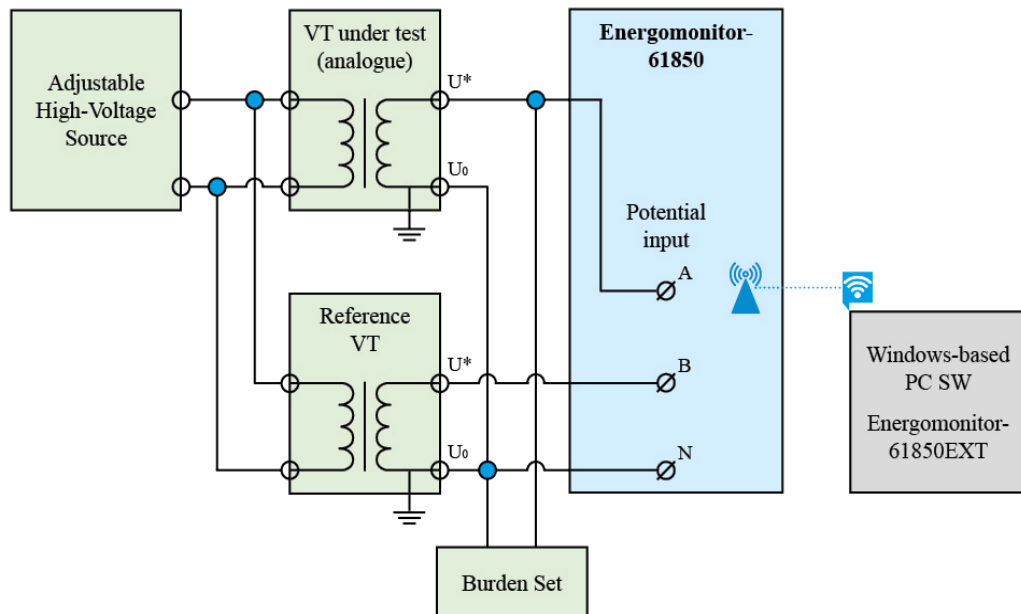
Cables in use:

- BNC
- Voltage cables

Cable connections



Connection diagram

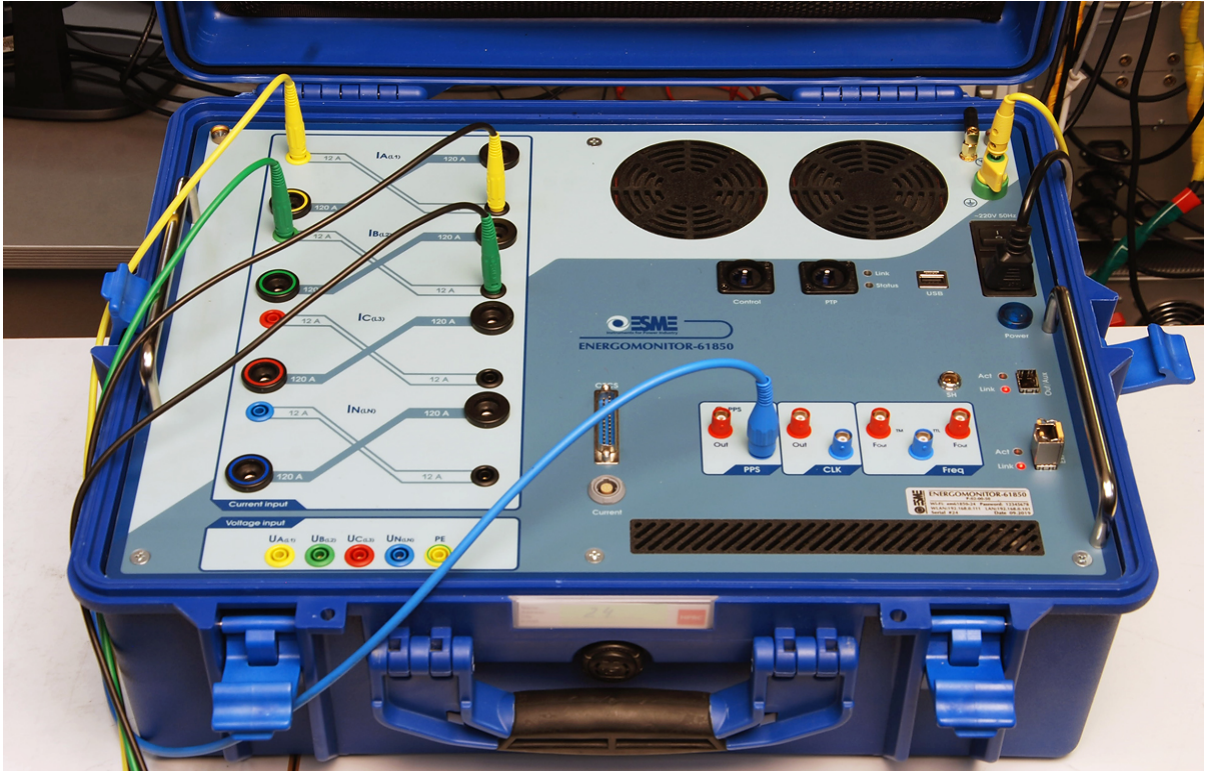


2.1.2 Verification of analogue current transformers

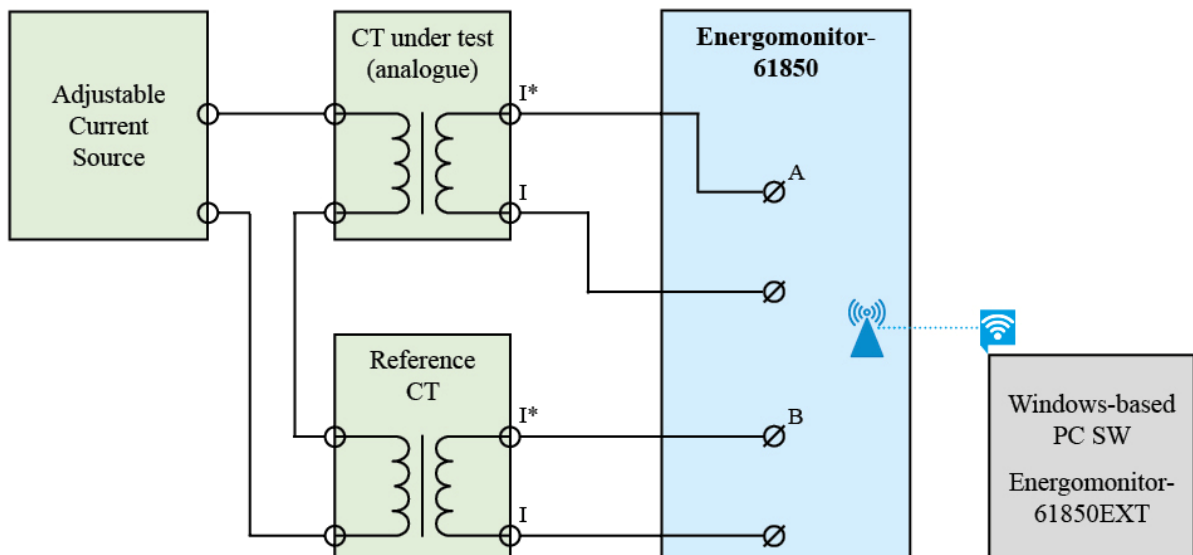
Cables in use:

- BNC
- Current cables 10A

Cable connections



Connection diagram

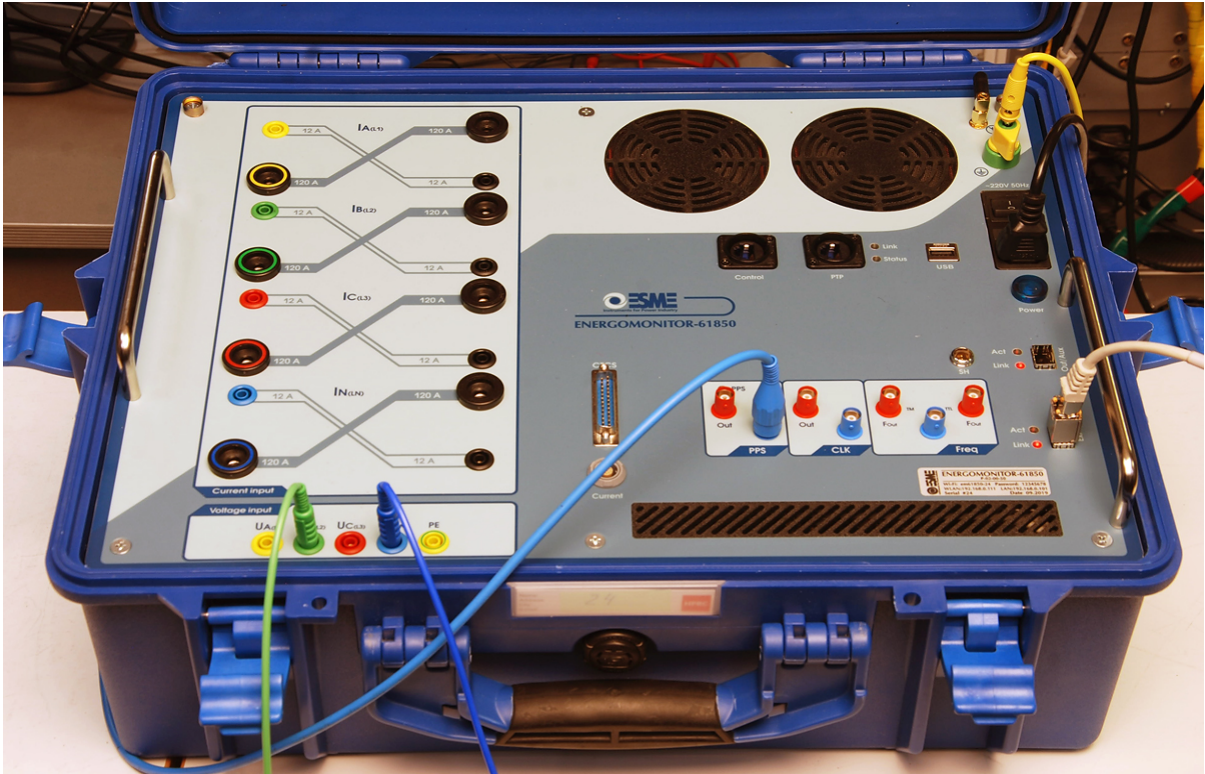


2.1.3 Verification of digital voltage transformers

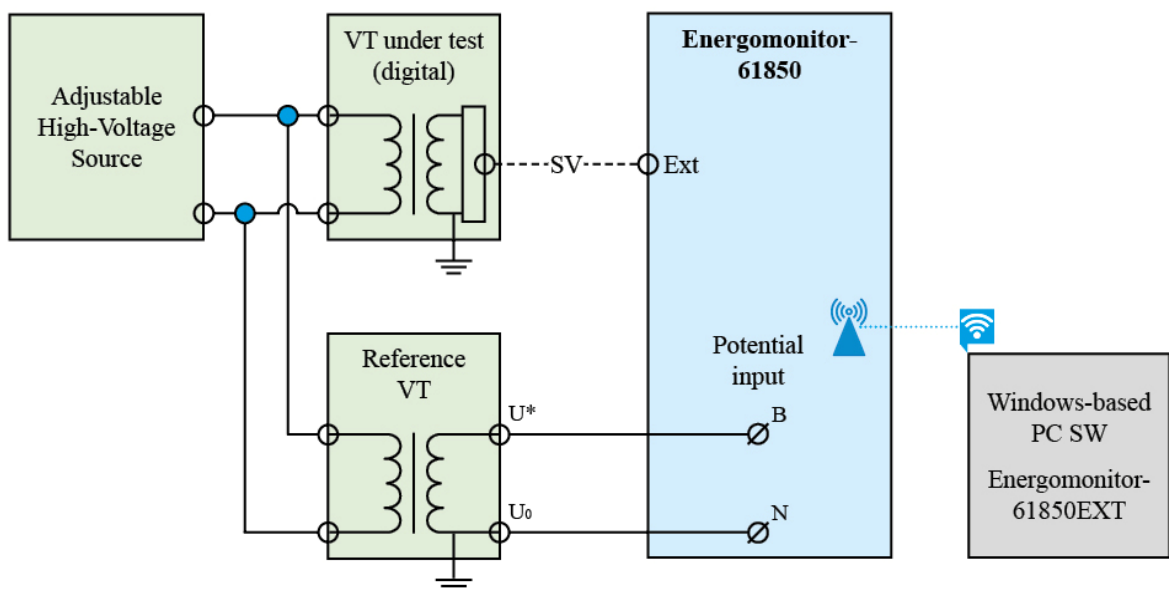
Cables in use:

- BNC
- Voltage cables
- Patch cord

Cable connections



Connection diagram

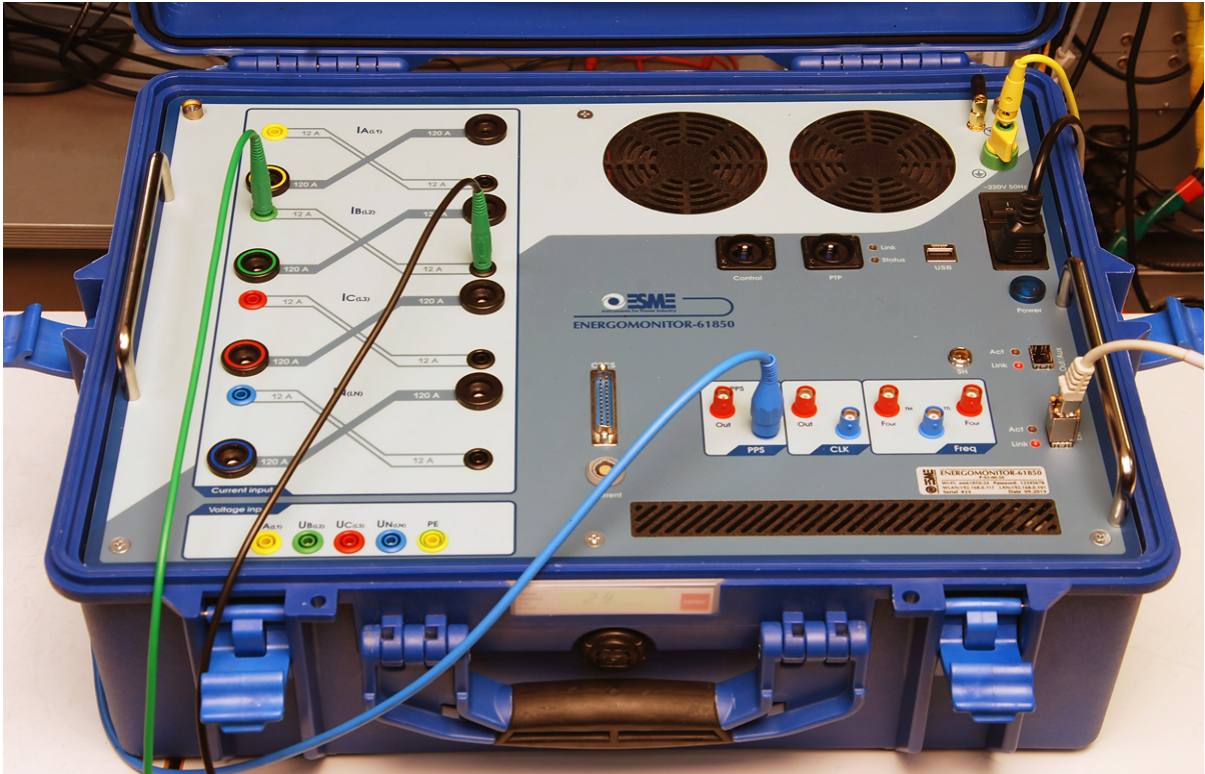


2.1.4 Verification of digital current transformers

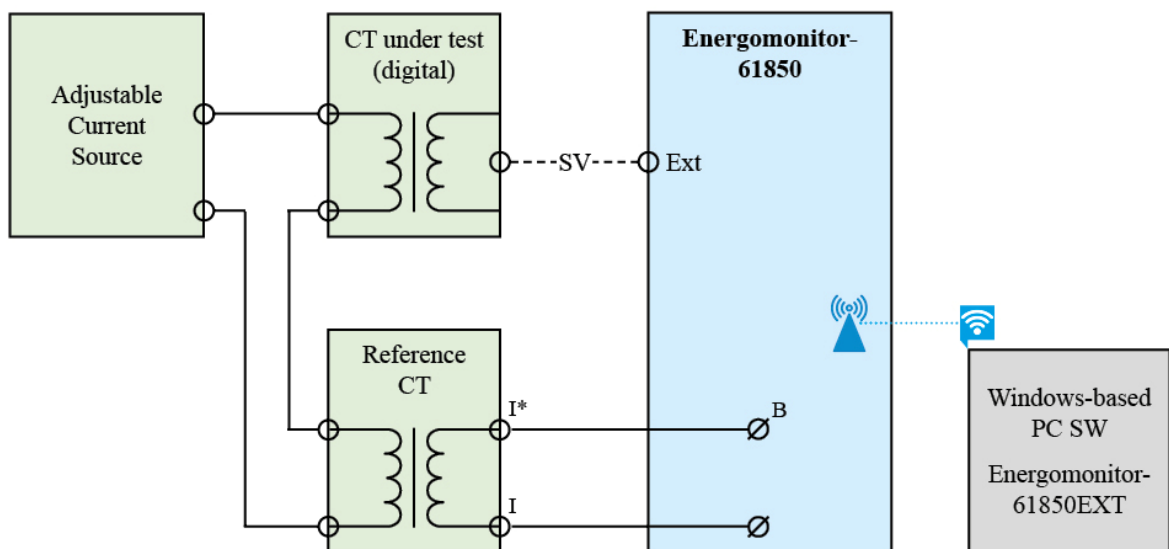
Cables in use:

- BNC
- Current cables 10A
- Patch cord

Cable connections



Connection diagram

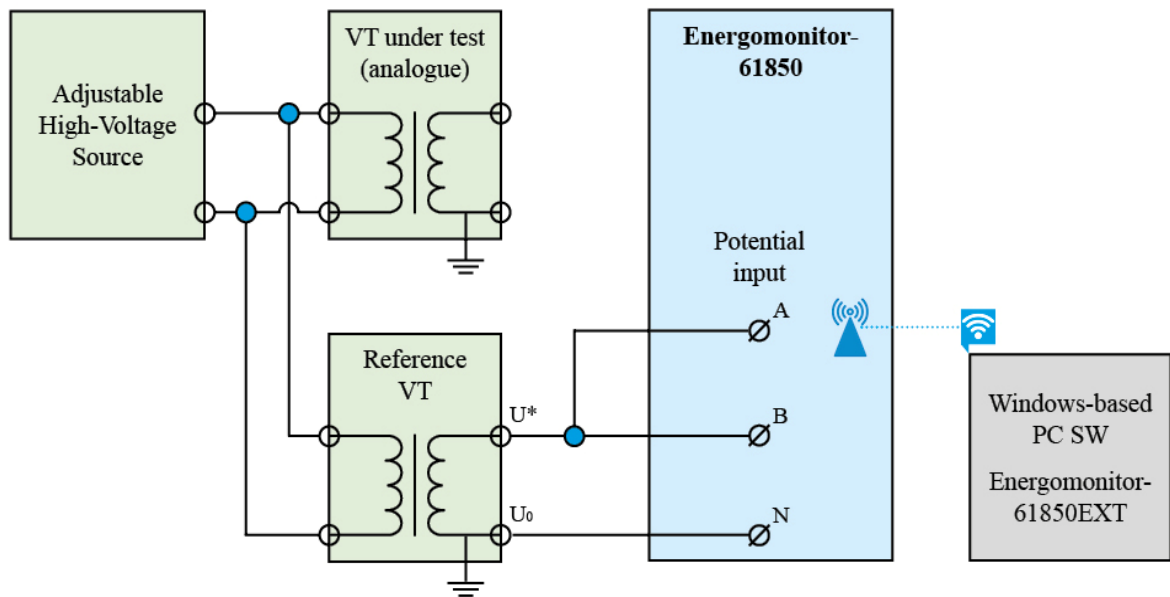


2.1.5 Zero correction for testing analogue transformers

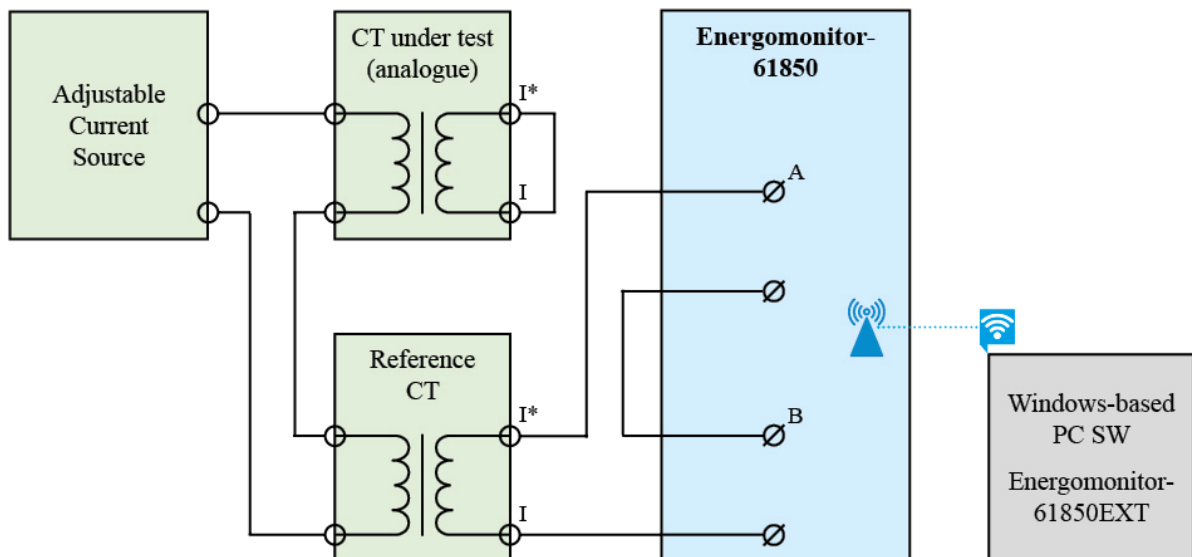
Zero correction means compensation of the differences in characteristics of voltage or current measurement channels which results in providing considerably better measurement accuracy.

Zero correction may be performed before testing (verification) of **analogue** voltage or current transformers.

Connection scheme for zero correction of analogue voltage transformers:

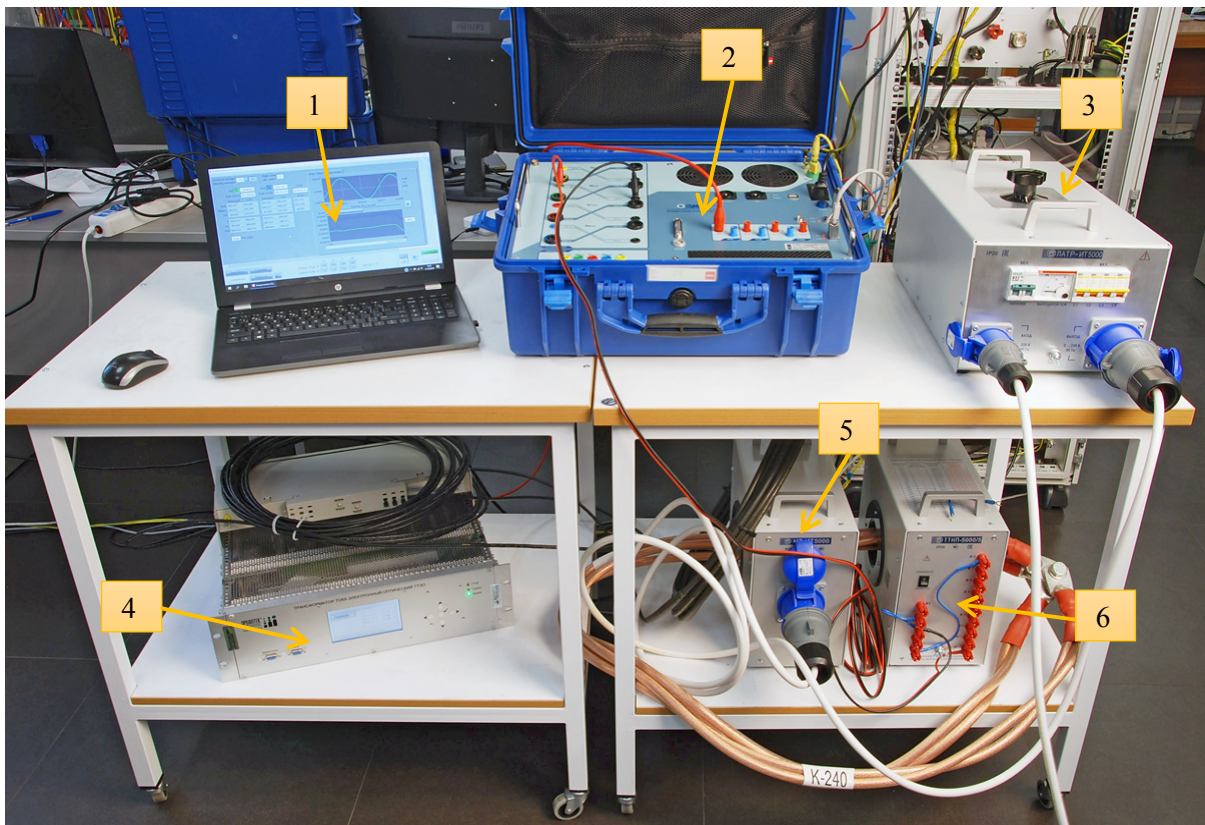


Connection scheme for zero correction of analogue current transformers:



2.1.6 Practical example

Verification of a digital CT with an analogue CT test set:



Positions in the figure above:

- 1 Control Terminal
- 2 EM61850 - Comparator
- 3 Regulating Current Transformer LATR-IT5000
- 4 Digital current transformer under test
- 5 Generating Transformer GT-IT5000
- 6 Reference transformer TTIP-5000

3. TROUBLESHOOTING

3.1 Readings are not updated on the display

Reason 1: EM61850 is set to external synchronization however the synchronizing signal does not come to the **PPS in** connector.

Solution: check the connector '**PPS in**' and check the source of external synchronization for the presence of sync pulses.

Reason 2: EM61850 is set either to the comparison of two external streams or to the comparison of the internal (analogue) stream with an external stream. The reference stream and the stream from the DUT are not properly synchronized.

Solution: check the configuration settings related to the synchronization of stream sources. See section 1.1 of this document.

3.2 EM Online indicator alternatively blinks red and green

Reason: a current routing bug of EM61850. The problem may take place for the reason that all data streams from transformers are routed via a switch including the computer connected via the same switch.

Solution: To avoid this bug, connect all of the devices within the test scheme via patch cords (without switches).

3.3 The readings of an external stream are markedly unstable and are updated less frequently than once per second

Reason: there are too many incoming streams in the channel so that an actual stream cannot be properly detected and processed within the dedicated time interval.

Solution: Do not connect several instruments that produce digital streams in one subnetwork. Configure the digital transformer to produce no more than 2 streams.