

TESTING OF ANALOG AND DIGITAL TRANSFORMERS

Quick Guide

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1 GENERAL

1.1 Synchronization

The screenshot shows the 'Synchronization' tab of a software interface. It includes settings for 'Sync type' (Autonomous, PTP, PPS, CLK 10 MHz), 'PPS Out' (Off, On, Inversion, Frequency, Impulse duration, Impulse delay), and 'CLK Out' (Off, On, Inversion, Frequency, Impulse duration, Impulse delay). There are also visual representations of the PPS and CLK ports with 'Out' and 'In' labels. At the bottom right, there is a 'Terminators' section with checkboxes for 'PPS In' and 'CLK In', and an 'Apply' button.

Two types of synchronization are available: 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 accordingly.

When you work with the Energomonitor-61850EXT program, to enable an external source of PPS pulses in the EM61850, click on the on-screen button **“PPS”**. To enable the internal source of synchronization, select the button **“Autonomous”**.

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 **“Autonomous”** sync type for EM61850 and turn on the button **“PPS out”**.
- Option 2 or 3, set EM61850 to the mode of external synchronization by selecting the **“PPS”** sync type and apply external PPS pulses to the input **“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

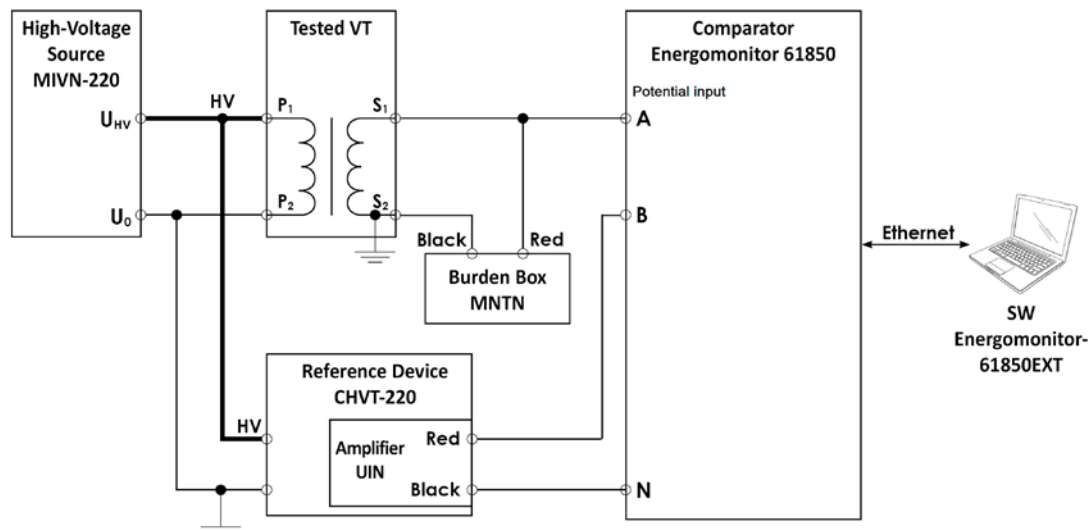
Cables in use:

- BNC
- Voltage cables

Cable connections



Connection diagram for testing analogue VTs

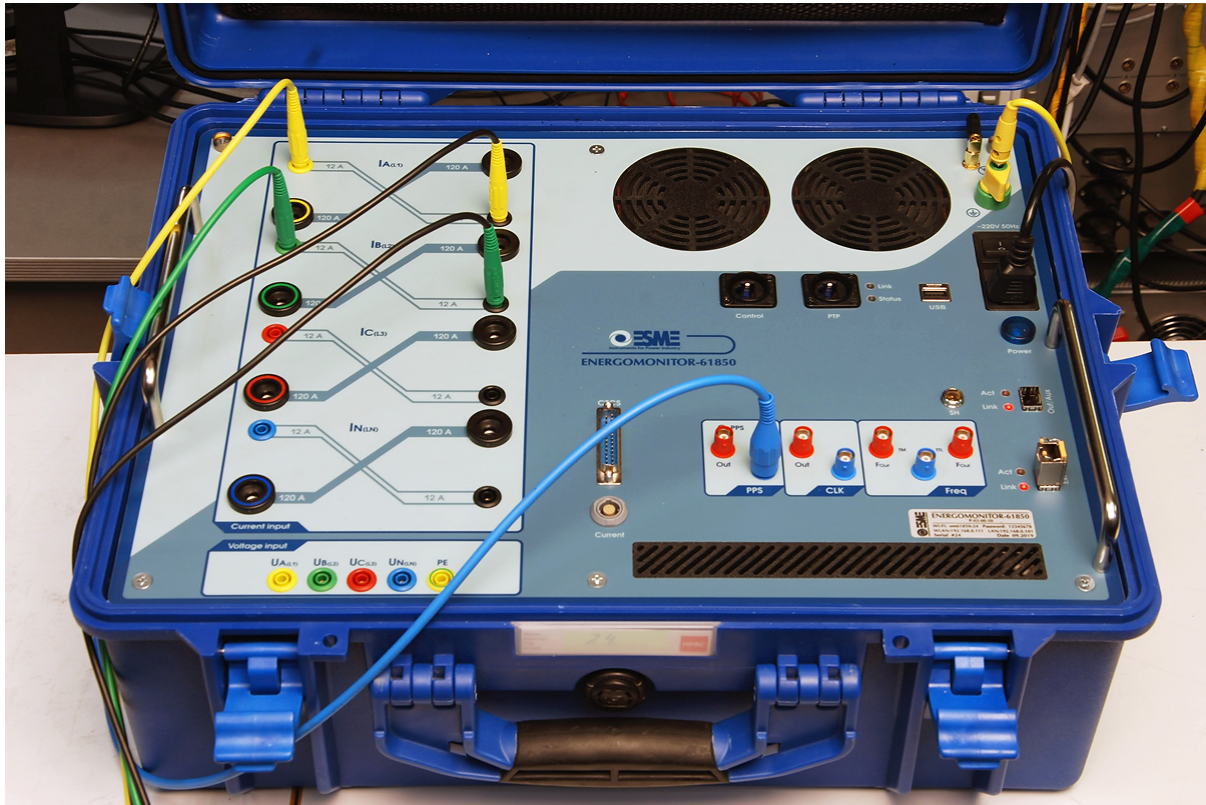


2.1.2 Verification of analogue current transformers

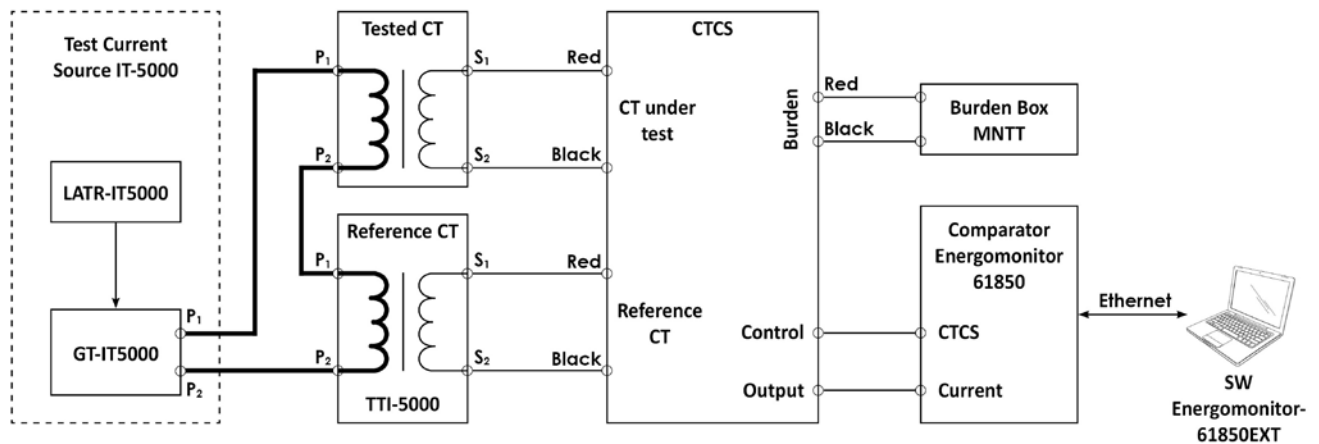
Cables in use:

- BNC
- Current cables 10A

Cable connections



Connection diagram for testing analogue CTs

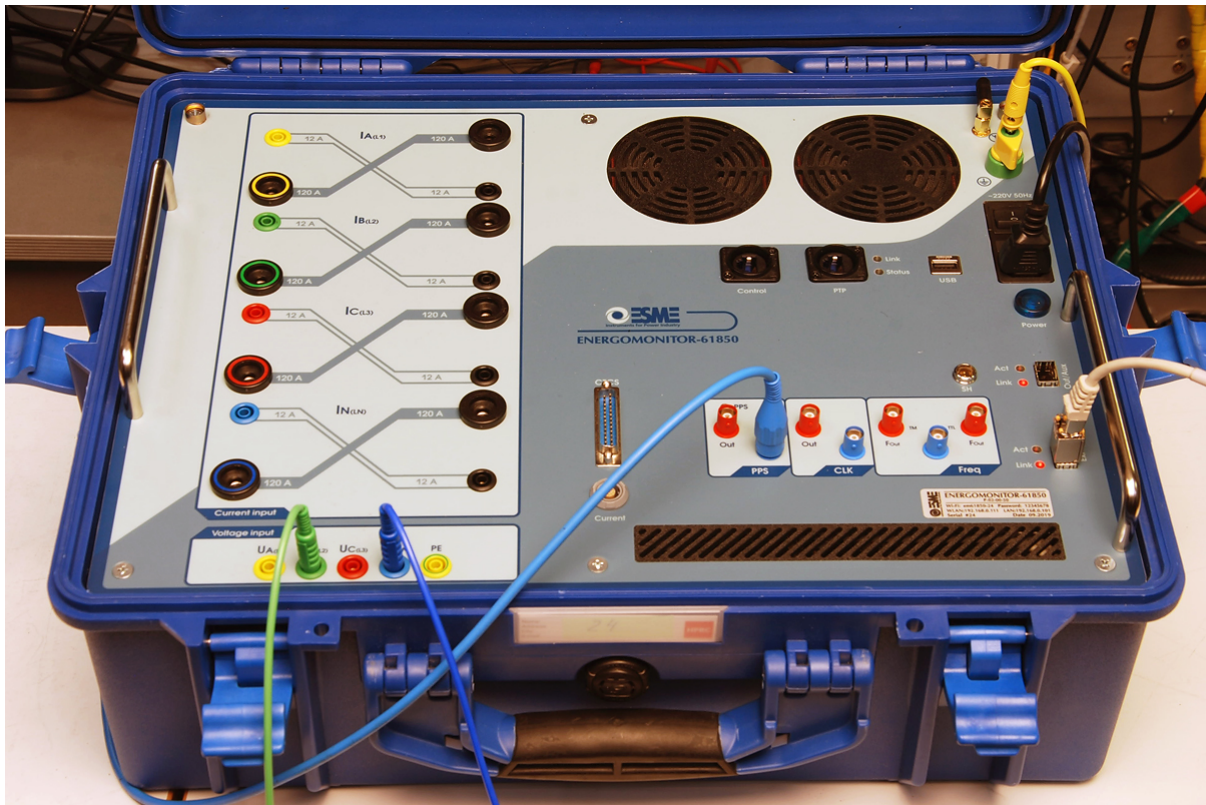


2.1.3 Verification of digital voltage transformers

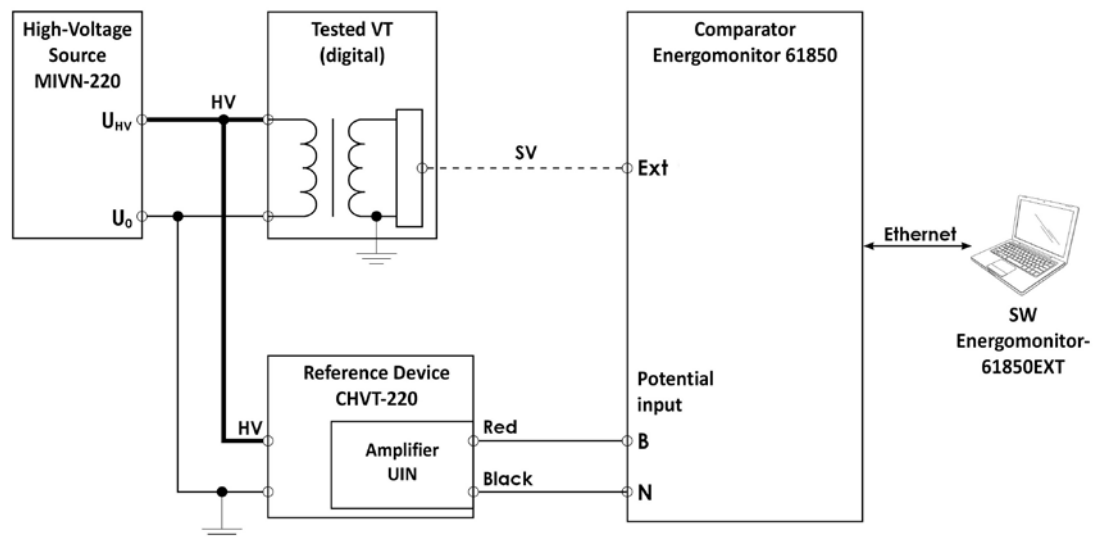
Cables in use:

- BNC
- Voltage cables
- Patch cord

Cable connections



Connection diagram for testing digital VTs

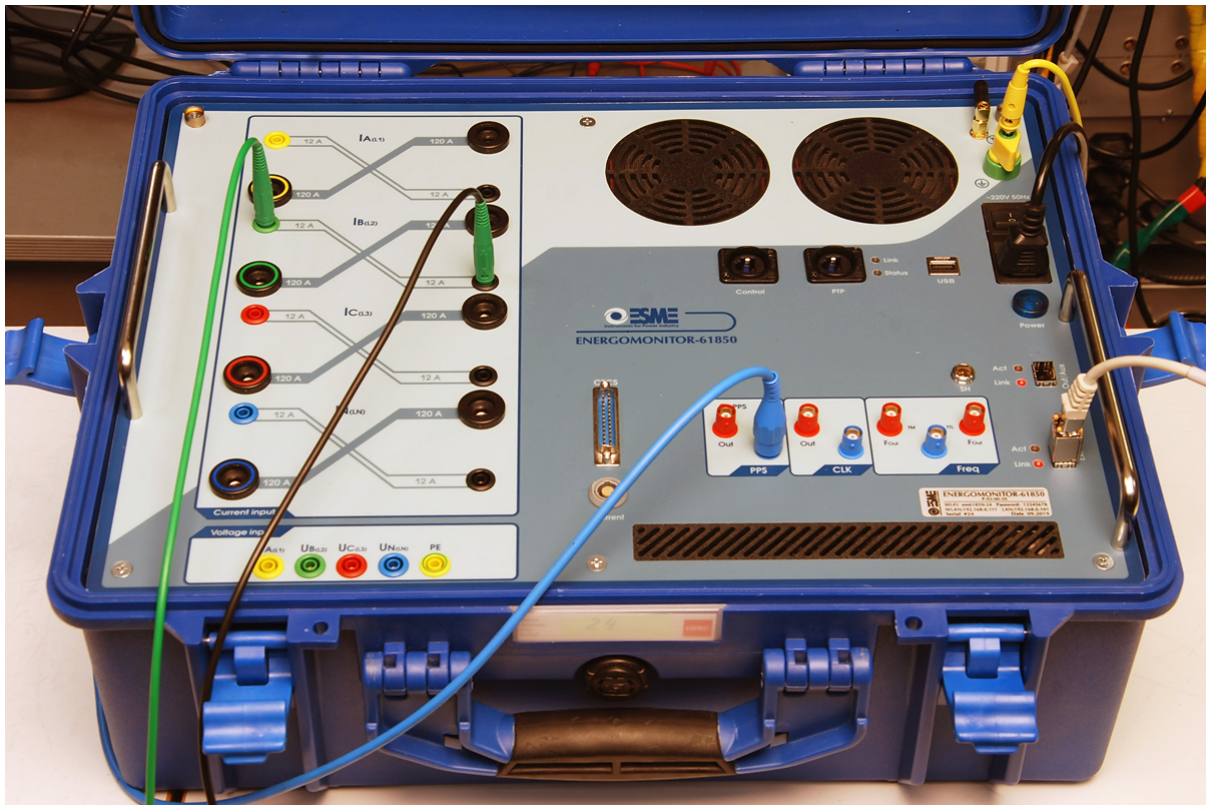


2.1.4 Verification of digital current transformers

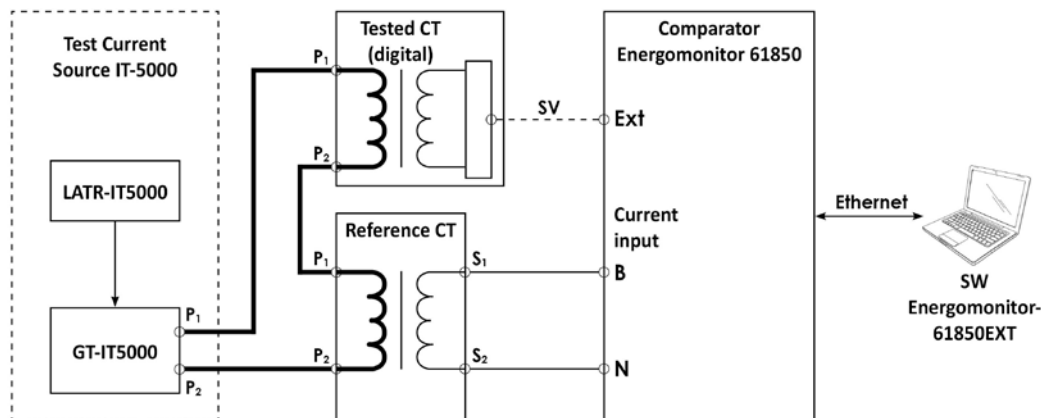
Cables in use:

- BNC
- Current cables 10A
- Patch cord

Cable connections



Connection diagram for testing digital CTs

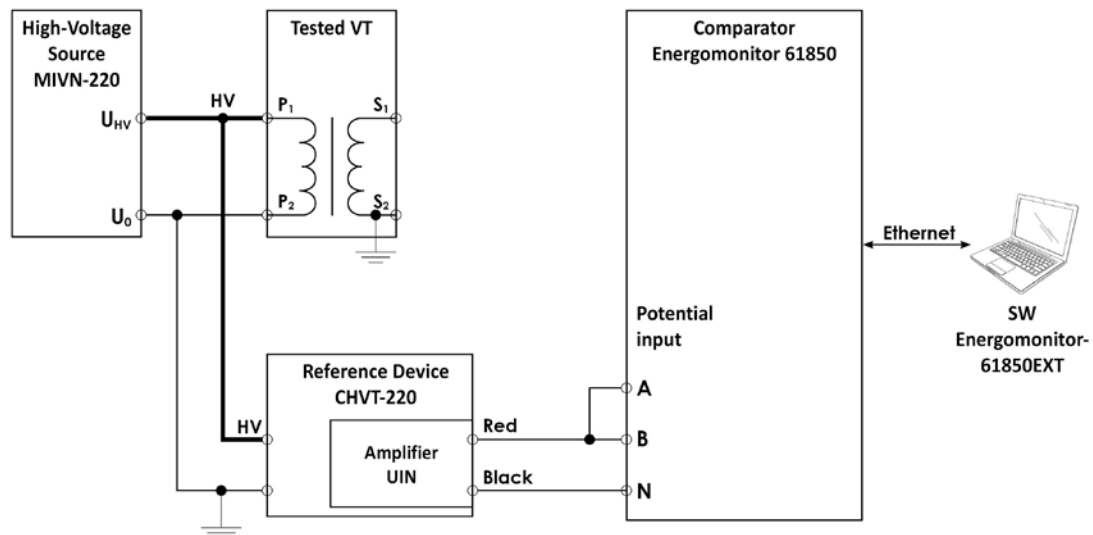


2.1.5 Zero correction for testing analogue transformers

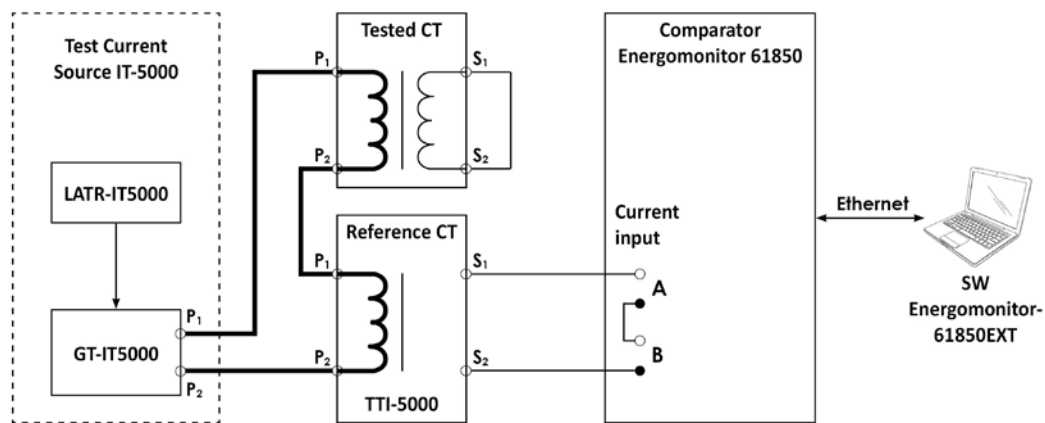
Zero correction means compensation of the differences in characteristics of voltage or current measurement channels which results in providing considerably better measurement accuracy.

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

Connection diagram for zero correction of voltage channels (for testing analogue VTs):

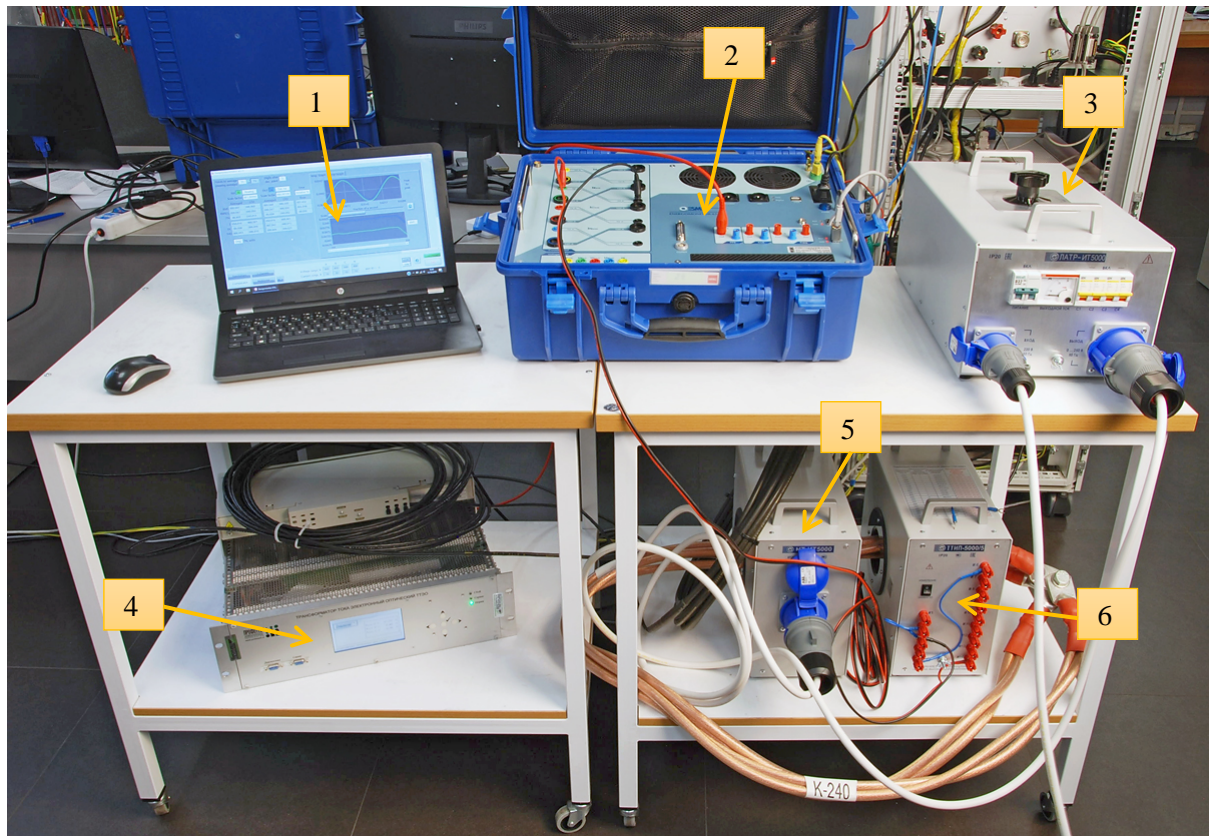


Connection diagram for zero correction of current channels (for testing analogue CTs):



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.