

CT Analyzer & CT SB2

Getting Started



Manual Version: ENU 1132 03 05

This manual refers to version 5.30 of the *CT Analyzer* firmware and the *CT Analyzer Suite* software.

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The product information, specifications, and technical data embodied in this manual represent the technical status at the time of writing and are subject to change without prior notice.

We have done our best to ensure that the information given in this manual is useful, accurate and entirely reliable. However, OMICRON does not assume responsibility for any inaccuracies which may be present.

The user is responsible for every application that makes use of an OMICRON product.

OMICRON translates this manual from the source language English into a number of other languages. Any translation of this manual is done for local requirements, and in the event of a dispute between the English and a non-English version, the English version of this manual shall govern.

1 Safety instructions

1.1 Operator qualifications

Working on high-voltage power equipment can be extremely dangerous. Only authorized personnel who are qualified, skilled and regularly trained in electrical engineering are allowed to operate *CT Analyzer* and *CT SB2*. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on testing with *CT Analyzer/CT SB2* must be under constant supervision of an experienced operator while working with the equipment. The supervising operator must be familiar with the equipment and the regulations on site. The operator is responsible for the safety requirements during the whole test.

Maintenance and repair of *CT Analyzer* and *CT SB2* is only permitted by qualified experts at OMICRON (see "Support" on page 22).

1.2 Safety standards and rules

1.2.1 Safety standards

Testing with *CT Analyzer* and *CT SB2* must comply with the internal safety instructions and additional safety-relevant documents.

In addition, observe the following safety standards, if applicable:

- EN 50191 (VDE 0104) "Erection and Operation of Electrical Test Equipment"
- EN 50110-1 (VDE 0105 Part 100) "Operation of Electrical Installations"
- IEEE 510 "IEEE Recommended Practices for Safety in High-Voltage and High-Power Testing"

Moreover, observe all applicable regulations for accident prevention in the country and at the site of operation.

Before operating *CT Analyzer* and *CT SB2*, read the safety instructions in this manual carefully.

Do not turn on *CT Analyzer* and *CT SB2*, and do not operate the devices without understanding the safety information in this manual. If you do not understand some safety instructions, contact OMICRON before proceeding.

1.2.2 Safety rules

Always observe the five safety rules:

- ▶ Disconnect completely
- ▶ Secure from reconnection
- ▶ Verify that the installation is dead
- ▶ Carry out grounding and short-circuiting
- ▶ Provide protection against adjacent live parts

1.3 Safe operation

1.3.1 General

When operating *CT Analyzer/CT SB2*, observe the following safety instructions.

- ▶ The safety instructions given here always apply when operating *CT Analyzer/CT SB2*. They are supplemented by further notes and warnings applicable for specific actions only. Such specific notes and warnings are given where necessary in this manual and the *CT Analyzer/CT SB2 User Manual*.
- ▶ In addition to the safety instructions given in this manual, always observe the applicable company-internal safety instructions and safety documents.
- ▶ In case of any problems or questions, or if you do not understand some safety instructions, contact the OMICRON Technical Support (refer to chapter "Support" on page 22).
- ▶ Full compliance with the regulations also includes following the instructions provided in this manual and the *CT Analyzer/CT SB2 User Manual*.
- ▶ Always obey the five safety rules and follow the safety instructions when disconnecting the test object.

1.3.2 Test equipment integrity

- ▶ Use *CT Analyzer/CT SB2* and the accessories only in a technically sound condition. Make sure their use is in accordance with the regulations on site and the designated use described in this document.
- ▶ If *CT Analyzer/CT SB2* or any accessory seems to be functioning improperly, please contact the OMICRON Technical Support (refer to chapter "Support" on page 22).
- ▶ Only use original cables and accessories available from OMICRON.
- ▶ Do not operate *CT Analyzer/CT SB2* under ambient conditions that exceed the temperature and humidity limits listed in the Technical Data chapter of the *CT Analyzer/CT SB2 User Manual*.
- ▶ Do not open *CT Analyzer/CT SB2*. Opening a device invalidates all warranty claims. Do not repair, modify, extend, or adapt *CT Analyzer/CT SB2* or any accessories.

1.3.3 *CT Analyzer/CT SB2*

- ▶ Position *CT Analyzer/CT SB2* so that you can easily disconnect it from mains.
- ▶ Before putting *CT Analyzer/CT SB2* into operation, check the equipment for visible damages.
- ▶ When taking *CT Analyzer/CT SB2* into operation, make sure that the air slots, the power switch and the power supply plug of the devices are not obstructed and that the device can be easily disconnected from mains.
- ▶ Do not operate *CT Analyzer/CT SB2* when explosive gas or vapors are present.
- ▶ Do not insert objects (e.g. screwdrivers, etc.) into ventilation slots or any input/output sockets.

1.3.4 Test setup and work area

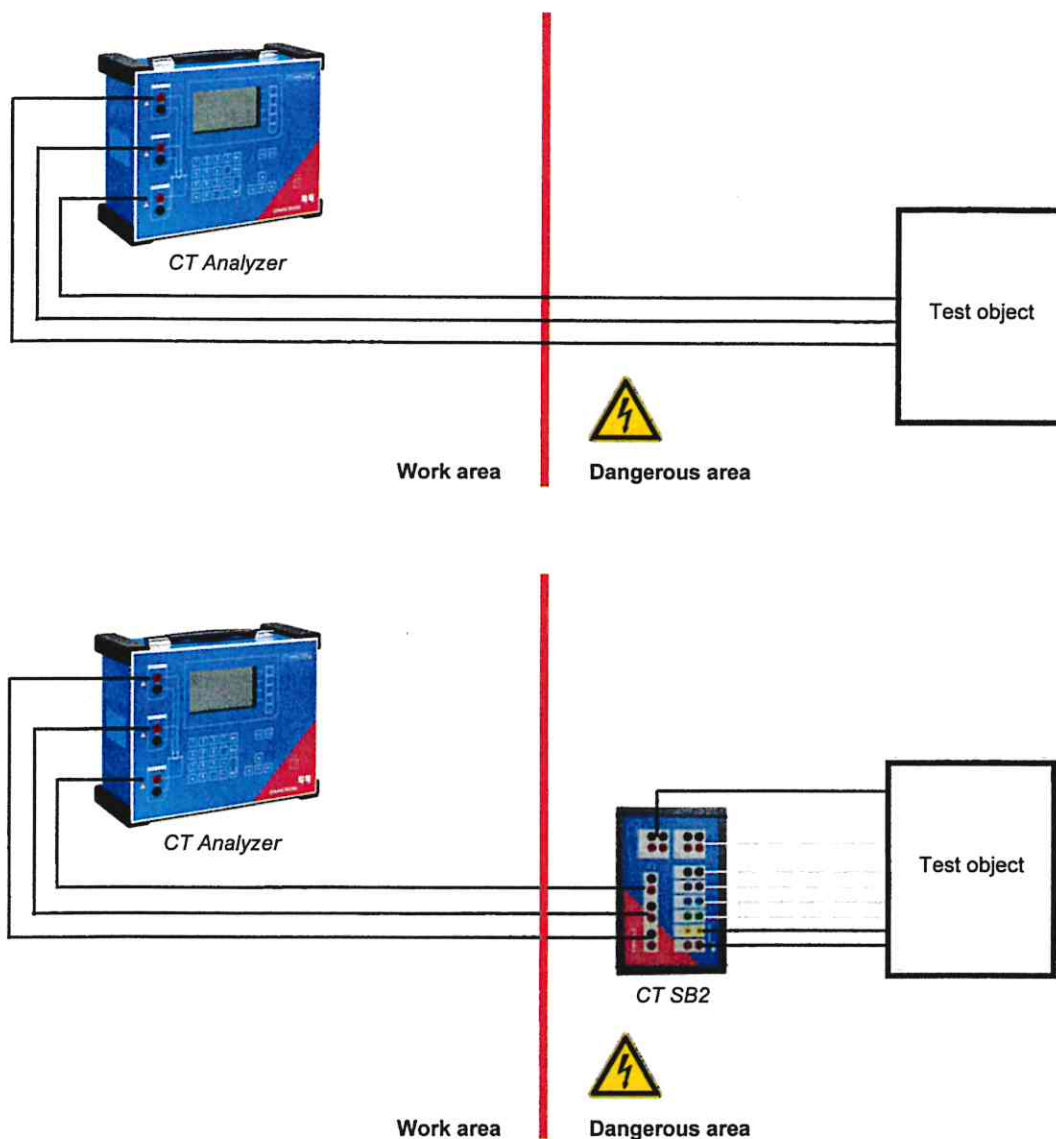


Figure 1-1: Schematic representation of the test setup showing the separation between work area and dangerous area

- ▶ Define a dangerous area around the test object and secure this area against unauthorized access by using a barrier chain and warning sign.
- ▶ Always stay in the work area during the test. Do not enter the dangerous area during the test if not explicitly requested by *CT Analyzer* or *CT Analyzer Suite*.
- ▶ Prevent the presence of other persons in the dangerous area around the test object.
- ▶ Always position the *CT Analyzer* test set and the *CT SB2* switch box on dry, solid ground.
- ▶ Make sure that grounding is applied to the *CT Analyzer* test set and the *CT SB2* switch box as described in section 3.2 "Setting up CT Analyzer/CT SB2" on page 17.

- ▶ Connect the test leads or communication cables first to the grounded device before unreeling.
- ▶ Keep unreeled cables close to ground.
- ▶ Do not stand right next to or directly underneath a connection point because the clamps may fall off and touch you.

1.3.5 Performing tests

Observe the following when running tests:

- ▶ Always be aware of the danger of the high voltages and currents associated with this equipment. Pay attention to the information provided in this manual and the CT Analyzer/CT SB2 User Manual.
- ▶ Stay in the work area during the test.
- ▶ Never remove any cables from *CT Analyzer/CT SB2* or the test object during a running test.
- ▶ When disconnecting cables, always start at the device feeding the power.
- ▶ Start the test only if all safety precautions were taken and if you are absolutely sure that no other person is present in the potentially dangerous area around the test object.

1.4 Grounding

Operating the devices without PE and ground connection is life-threatening and not permitted.

- ▶ Only operate *CT Analyzer/CT SB2* with a mains power supply connected to protective earth (PE).
- ▶ Make sure that both the PE connection of the power supply and the ground connector of *CT Analyzer* and *CT SB2* have a solid and low-impedance connection to the grounding system on site.
- ▶ Make sure that the grounding clamp has a good electrical contact to the grounding system on site and avoid connecting it to corroded or painted surfaces.
- ▶ Make sure that the grounding terminal connections of all grounded devices in use remain intact during the whole measurement procedure, and are not accidentally disconnected.
- ▶ Only use ground and supply cables provided by OMICRON.

1.5 Power supply

Operating *CT Analyzer/CT SB2* without PE and ground connection is life-threatening and not permitted.

- ▶ Only operate *CT Analyzer/CT SB2* with a mains power supply connected to protective earth (PE).

Power supply from grounded grids (TN/TT)

Before a measurement is started, *CT Analyzer* automatically verifies the PE connection in grounded grids (TN/TT).

- ▶ If this check fails, check the power cord and power supply.

If the error message persists, there is no intact connection to protective earth (PE). This is life-threatening. In this case measurements are not permitted and cannot be performed.

Power supply from isolated grids (IT)

An IT grid is a grid structure where none of the active conductors are galvanically connected to ground. In an IT grid, only the PE is connected to ground.

In IT grids, the check fails – even if there is a PE connection. This can be the case when *CT Analyzer/CT SB2* are powered by a generator. Since every operation mandates a PE connection for the operation of *CT Analyzer/CT SB2*, you need to manually verify this.

If *CT Analyzer/CT SB2* are supplied by a generator, the equipotential ground or PE of the generator has to be grounded properly.

► If this is not possible, measurements are not permitted and cannot be performed.

Additional information

Instead of supplying *CT Analyzer/CT SB2* from phase-neutral (L1-N, A-N), the devices may also be supplied from phase-phase (for example, L1-L2; A-B). However, the voltage must not exceed 240 V AC.

1.6 Orderly measures

The *CT Analyzer* User Manual and, if applicable, the *CT SB2* User Manual or alternatively the e-book has always to be available on the site where *CT Analyzer/CT SB2* is being used.

The users of *CT Analyzer/CT SB2* must read the appropriate user manual before operating the device and observe the safety instructions and all relevant instructions for connection and operation.

CT Analyzer/CT SB2 and the accessories may only be used in accordance with the user documentation (including but not limited to user manuals, reference manuals, getting started manuals and manufacturer manuals). The manufacturer and the distributor are not liable for damage resulting from improper usage.

Opening the *CT Analyzer/CT SB2* device or its accessories without authorization invalidates all warranty claims. Any kind of maintenance, calibration or repair on the device itself may only be carried out by persons authorized by OMICRON.

1.7 Disclaimer

If the equipment is used in a manner not described in the user documentation, the protection provided by the equipment may be impaired. The manufacturer and the distributor are not liable if the safety instructions given in this manual, the *CT Analyzer/CT SB2* User Manual, or any of the relevant international, national, company-internal or local safety standards and rules are not observed.

1.8 Compliance statements

Declaration of conformity (EU)

The equipment adheres to the guidelines of the council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) directive, the low voltage directive (LVD) and the RoHS directive.

FCC compliance (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the

instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Declaration of compliance (Canada)

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

1.9 Recycling



This equipment (including all accessories) is not intended for household use. At the end of its service life, do not dispose of the device with household waste!

For customers in EU countries (incl. European Economic Area)

OMICRON devices are subject to the EU Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE directive). As part of our legal obligations under this legislation, OMICRON offers to take back the device and ensure that it is disposed of by authorized recycling agents.

For customers outside the European Economic Area

Please contact the authorities in charge for the relevant environmental regulations in your country and dispose the OMICRON device only in accordance with your local legal requirements.

2 Introduction

2.1 Designated use of *CT Analyzer*

CT Analyzer is intended to perform automatic testing and calibration of low leakage flux current transformers (i.e., CTs with non-gapped cores) in laboratories as well as on-site in utilities. Testing of CTs with gapped cores is also possible with restricted accuracy. The following tests can be performed using *CT Analyzer*:

- Burden measurement
- Residual magnetism measurement of CTs
- CT winding resistance measurement
- CT excitation characteristic measurement according to IEC 61869-2, IEC 60044-1, IEC 60044-6 (TPS, TPX, TPY, TPZ) and IEEE C57.13.
- CT ratio measurement with consideration of a connected burden
- CT phase and polarity measurement
- Determination of accuracy limiting factor, instrument security factor, secondary time constant, symmetrical short-circuit current factor, transient dimensioning factor, remanence factor, knee point voltage/current, class, saturated inductance and non-saturated inductance.
- Guessing of unknown CT parameters and automatic assessment based on these values (see section 2.2 below).

Using the *Quick Test* feature it is also possible to use *CT Analyzer* as a versatile multimeter with included power source, e.g. for:

- Quick and easy resistance measurement, e.g. for wiring checks on the secondary side of CTs.
- Quick voltage ratio checks for VTs.
- Measurement of burden values, e.g., to determine the new burden value after changes of the relay equipment. This allows the re-calculation of the CT test results for the new burden value by *CT Analyzer* and thus makes it unnecessary to run an additional CT test in order to determine the behavior of the CT with the new burden.
- Quick wiring checks using the *CPOL2* polarity checker from OMICRON. Using *CPOL2* in combination with the specific test signal provided by *CT Analyzer's Quick Test* feature you can check a series of test points (e.g., the burden wiring) for correct polarity.

CT Analyzer is intended exclusively for the applications described above. Any other use is deemed not to be according to the regulations. The manufacturer and the distributor are not liable for damage resulting from improper usage. The user alone assumes all responsibility and risk.

Ratio error and phase displacement measurements with direct (primary current injection) and indirect test equipment (secondary voltage injection)

Alternative testing methods with indirect testing technology as applied by *CT Analyzer* provide similar results to direct testing with high currents for CT designs having low leakage flux. Comparability is given and both testing methods can be used without additional procedures. For CTs having a considerable leakage flux (e.g., with large air gaps, low ratio or non-uniformly wound secondary windings), the ratio error and/or phase displacement results may differ between the direct and the indirect testing method due to the different testing methodologies requiring further procedures.

If the CT design type is unknown, OMICRON recommends to reconfirm the CT characteristics beforehand and/or to perform an initial calibration between direct and indirect method for the certain CT type.

As an example, the so-called factor of construction mentioned in IEC 61869-2 indicates if the CT is of low or high leakage flux. Below the specified limit, both test methods (direct and indirect) provide similar results.

In all other cases, there might be differences between the direct and the indirect test method and an initial calibration, documentation of results, and later consideration of the differences is recommended. Following this procedure, the high reproducibility of *CT Analyzer* even allows to apply *CT Analyzer* for traceable CT calibration.

2.2 "Guessing" of parameters

CT Analyzer provides a so-called guesser function which is intended as an aid for the user to find out single unknown nameplate data, for example if parts of the CT's name plate are unreadable. If sufficient other name plate data of the CT are available and specified by the user, this function is often able to reliably determine single missing CT data, for example I_{prim} , I_{sec} , class or ratio.

Parameters that are guessed by *CT Analyzer* are marked by a question mark in the user interface of the **CT-Object** card prior to the test. To have a parameter guessed by *CT Analyzer*, select the ? soft key instead of specifying a value for this parameter. During the test, *CT Analyzer* replaces the question mark by the value guessed.

When using this function, please be aware that assessments performed with one or more guessed parameters may possibly differ from an assessment based on exact name plate data. Absolutely reliable assessment is only guaranteed if all necessary CT data are specified prior to the test.

For detailed information about the guesser function, please refer to the *CT Analyzer* User Manual.

2.3 Designated use of CT SB2

The *CT SB2* switch box is an optional accessory for *CT Analyzer* and therefore exclusively designated for use with *CT Analyzer*.

CT SB2 is intended for the following applications:

- Multi-ratio CT testing
The *CT SB2* switch box enables automatic testing of multi-ratio CTs with up to 6 tap connections. With this accessory, *CT Analyzer* is able to measure every tap combination of multi-ratio CTs without any need for wiring changes during the test.
- Burden and primary winding resistance measurement
Using *CT SB2* it is also possible to include burden and primary winding resistance measurement to the automatic CT test procedure without rewiring.
- Single-ratio CT testing
Due to the possibility to include burden and primary winding resistance measurement, *CT SB2* is not only useful for testing multi-ratio CTs but also for testing single-ratio CTs.

CT SB2 is intended exclusively for the applications described above. Any other use is deemed not to be according to the regulations. The manufacturer and the distributor are not liable for damage resulting from improper usage. The user alone assumes all responsibility and risk.

Note:

The *Quick Test* function included in *CT Analyzer* and *CT Analyzer Suite* cannot be used with the *CT SB2* switch box.

2.4 Functional components of *CT Analyzer*

2.4.1 Overview

Figure 2-1 provides an overview of the operating and display elements and the connectors on *CT Analyzer*.

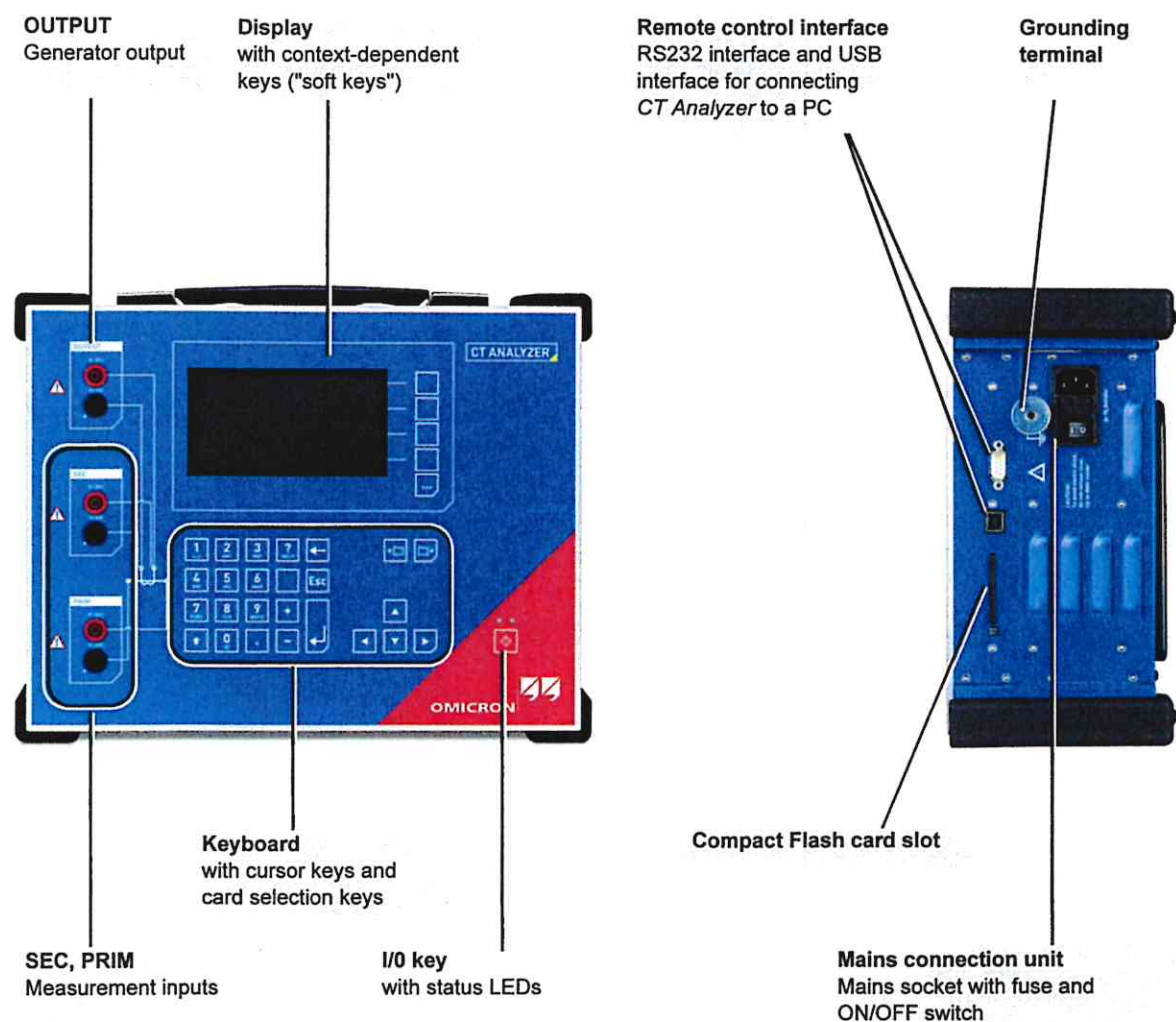


Figure 2-1: *CT Analyzer* overview

2.4.2 Inputs and outputs

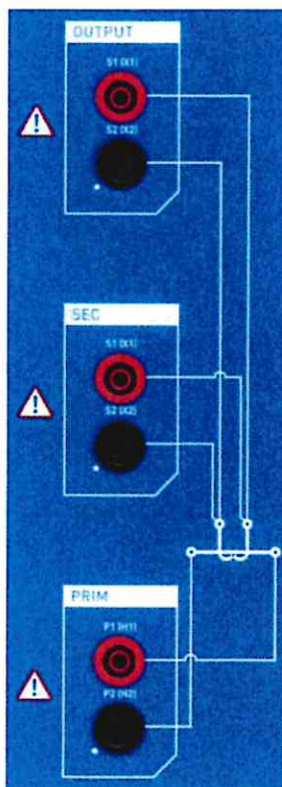
WARNING



Death or severe injury caused by high voltage possible

As long as the red LED of the  key is flashing, the output is active and lethal voltages can occur due to the high energy stored in external inductors.

- ▶ Do not touch the test object or the measurement leads while the red LED is flashing.
- ▶ Wait until the red LED is off and the green LED is on before touching the measurement setup.
- ▶ Do not touch the test setup until the energy stored in the external inductors has dissipated over time, if the measurement interrupted unexpectedly, for example, due to a loss of supply voltage or erroneous behavior of *CT Analyzer*.



OUTPUT

Generator output.
AC: 40 V_{rms}, 5 A_{rms}
DC: 120 V, 5 A (15 A_{peak})

SEC

Measurement input for secondary side of CT, 300 V_{AC} max.

PRIM

Measurement input for primary side of CT, 30 V_{AC} max.

Figure 2-2: Inputs and outputs of *CT Analyzer*

2.4.3 I/O key with status LEDs



Red LED on the left, green LED on the right.

I/O key to start the test.

During the boot process after switching *CT Analyzer* on, both LEDs are on. The red LED goes off when the boot process is finished and *CT Analyzer* is ready for operation.

The **green LED lights continuously** to indicate that the equipment is operational and no voltage is applied to the test setup.

The **red LED flashes** to indicate that a test is in progress and voltage is applied to the test setup. Do not touch any part of the test setup while the red LED flashes.

Any other behavior of the status LEDs than described above indicates an error. In this case, switch off *CT Analyzer*. Do not touch any part of the test setup until the red LED is off and contact the OMICRON Technical Support (refer to chapter "Support" on page 22).

2.4.4 Display with soft keys

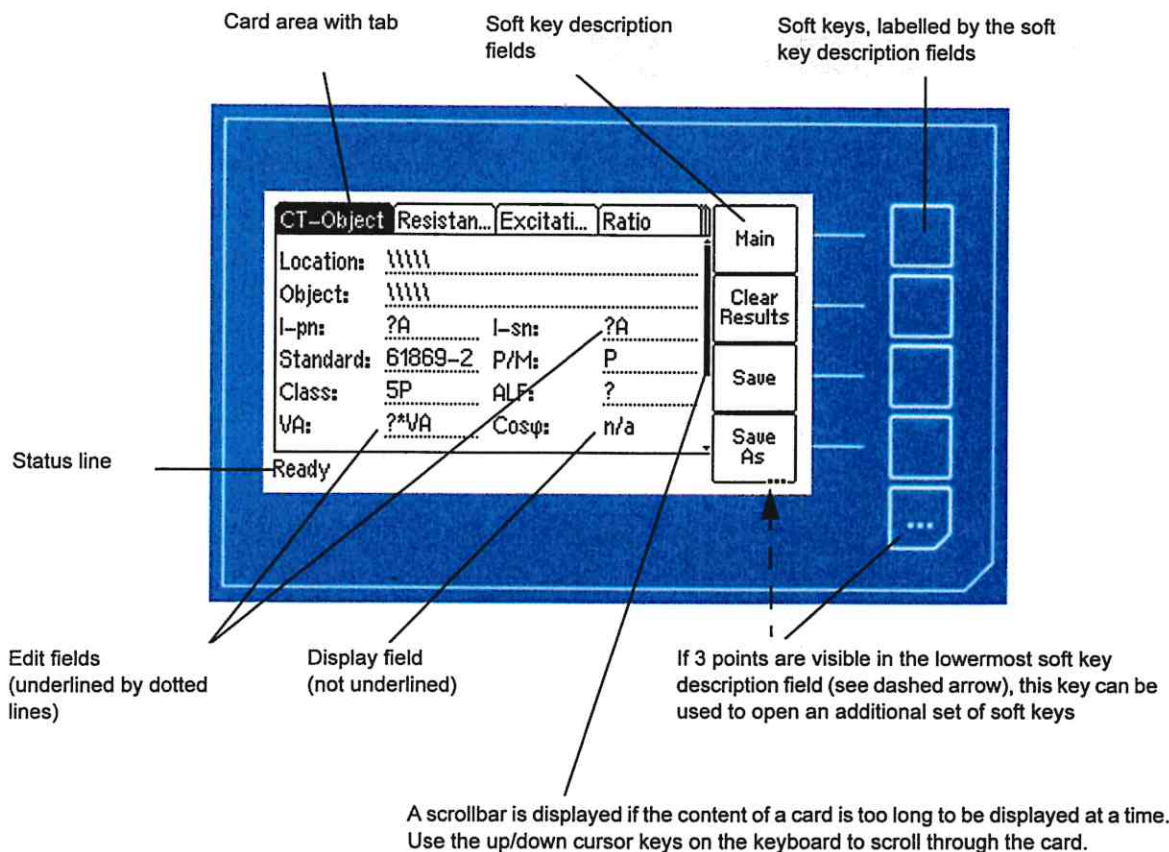


Figure 2-3: Display with context-dependent soft keys

2.5 Functional components of CT SB2

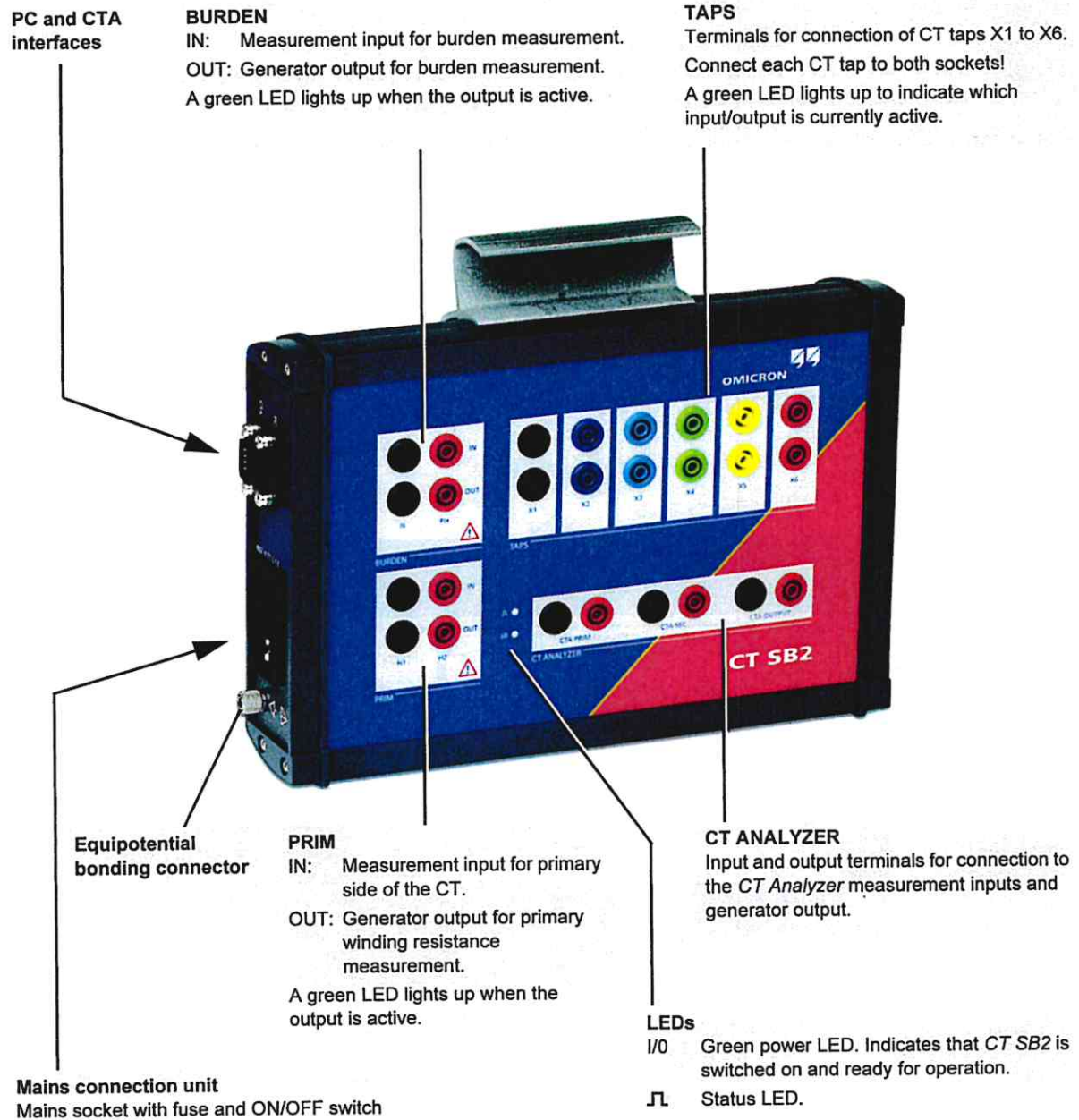


Figure 2-4: CT SB2 overview

3 Setup, connection and disconnection

3.1 Safety rules for connecting and operating *CT Analyzer/CT SB2*

3.1.1 General safety rules

Observe the following general safety rules and the safety instructions given in chapter 1 "Safety instructions" on page 3 when connecting and operating *CT Analyzer/CT SB2*. The safety rules given here are supplemented by further notes and warnings applicable for specific actions only. Such specific notes and warnings are given where necessary in this manual and the *CT Analyzer/CT SB2 User Manual*.

- ▶ Before putting *CT Analyzer/CT SB2* into operation, check the equipment for visible damages.
- ▶ When taking *CT Analyzer/CT SB2* into operation, make sure that the air slots, the power switch and the power supply plug on *CT Analyzer/CT SB2* are not obstructed and that the devices can be easily disconnected from mains.
- ▶ Only use wires with 4 mm safety "banana" connectors and plastic housing for connection to the front panel input/output sockets.
- ▶ During the test always connect one terminal of the transformer's primary side to protective earth.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Make sure that the terminals of the test object to be connected to *CT Analyzer/CT SB2* do not carry any voltage potential.
- ▶ During a test, *CT Analyzer/CT SB2* is the only permitted power source for the test object.

WARNING



Death or severe injury caused by high voltage or current possible

As long as the red LED on the *CT Analyzer* test set is flashing, the output is active and lethal voltages can occur due to the high energy stored in external inductors.

- ▶ Do not touch the equipment under test or the measurement leads while the red LED on *CT Analyzer* is flashing.
- ▶ Never connect or disconnect measurement leads while the red LED on *CT Analyzer* is flashing.
- ▶ Do not touch the test setup until the energy stored in the external inductors has dissipated over time, if the measurement interrupted unexpectedly, for example, due to a loss of supply voltage or erroneous behavior of *CT Analyzer*.

WARNING



Death or severe injury caused by high voltage or current possible

Accidentally mixing up primary and secondary windings can cause life-threatening voltages and/or destroy the connected CT or the *CT Analyzer* test set.

- ▶ Always make sure that the *CT Analyzer* output is connected to the correct side of the current transformer according to the wiring instructions given in the *CT Analyzer/CT SB2 User Manual*.

WARNING



Death or severe injury caused by high voltage or current possible

Feeding test voltage to a CT can cause life-threatening voltages on other taps and/or cores of the CT.

- ▶ Do not touch other taps or windings of the CT during the test.
- ▶ When testing multi-core CTs, make sure that no other windings of the CT are open. Leave the secondary windings of the other (non-measured) cores connected, or short-circuit them if the windings are open.
- ▶ If possible, use the optional *CT SB2* switch box for testing multi-ratio CTs. *CT Analyzer* then automatically reduces the test voltage in a way that the maximum possible voltage within the measurement setup (i.e., the voltage occurring at the tap combination with the highest ratio) is limited to 200 V.

WARNING



Death or severe injury caused by high voltage or current possible

Observe the following when running tests:

- ▶ Prevent the presence of other persons in the potentially dangerous area around the test object.
- ▶ If necessary, perform appropriate additional safety precautions according to the relevant standard, for example, by defining a high-voltage area around the test object and securing this area against unauthorized access by using a barrier chain and warning sign.
- ▶ Start the test only if all safety precautions were taken and if you are absolutely sure that no other person is present in the potentially dangerous area around the test object.

3.1.2 Handling of long cables

Observe the following when using long cables/measurement leads. The maximum permitted cable lengths are stated in the Technical data chapter of the *CT Analyzer User Manual*.

- ▶ The entire working environment, including the power supply of the test system, must not extend beyond the perimeter of the substation.
- ▶ Make sure that *CT Analyzer/CT SB2* including the cables and the test object are properly grounded as described in 3.2 "Setting up *CT Analyzer/CT SB2*" on page 17.
- ▶ Before unreeling any power extension cords to supply *CT Analyzer/CT SB2*, make sure the extension cord is connected to a mains supply with protective ground (PE).

- ▶ The power cord is always grounded at the mains socket (PE connection point). Before unreeling any further cables of *CT Analyzer/CT SB2* longer than 10 m, make sure they are connected to the properly grounded test object.
- ▶ Extra care should be taken that cables are placed as close as possible to ground level (this practice minimizes both electric and magnetic coupling).
- ▶ 100 m cables may only be used if the user can keep the overview of the measurement setup and cables.

3.2 Setting up *CT Analyzer/CT SB2*

Proceed as follows to set up *CT Analyzer/CT SB2*:

1. Make sure to position the *CT Analyzer* test set and the *CT SB2* switch box (if applicable) on dry, solid ground.
2. Connect the grounding terminals of *CT Analyzer* and *CT SB2* to protective ground (PE). Use the original cable supplied by OMICRON or alternatively a solid connection of at least 6 mm². Use a ground point as close as possible to the test object.
3. Connect *CT Analyzer* and *CT SB2* to mains using the supplied power cord. Supply the devices only from a power outlet that is equipped with protective ground (PE).

An error message (901) appears if the PE connection is defective or if the power supply has no galvanic connection to ground. This can be the case in very special grid applications or if *CT Analyzer/CT SB2* is supplied by a generator or an isolating transformer. The error message 901 is a safety relevant message!

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Always make sure that protective ground and equipotential ground are connected properly to ensure safe operation.
4. Connect *CT Analyzer* and *CT SB2* (if applicable) to your computer as described in the appropriate user manual.
 5. Connect the equipment under test according to the instructions given in this manual and the appropriate user manual. Refer to the *CT Analyzer* User Manual for detailed descriptions how to connect *CT Analyzer* for a specific measurement and/or application. Refer to the *CT SB2* User Manual for detailed descriptions how to connect *CT SB2*.

3.3 Connection for a CT test

This section shows the basic wiring of *CT Analyzer* for a CT test without using *CT SB2*.

Observe the general safety rules in section 3.1 on page 15 and the safety instructions given in chapter 1 "Safety instructions" on page 3. Observe the hints and instructions for improving the quality of the measurement results given in the *CT Analyzer User Manual*.

WARNING



Death or severe injury caused by high voltage or current possible

Feeding test voltage to a CT can cause life-threatening voltages on other taps and/or cores of the CT.

- ▶ Do not touch other taps or windings of the CT during the test.
- ▶ Make sure that no other windings of the CT are open.

NOTICE

Falsification of measurement results possible

- ▶ Always connect the grounded terminal on the secondary side of the CT to the black sockets of input SEC and the OUTPUT of *CT Analyzer*. Connecting the red sockets of *CT Analyzer* to PE can result in incorrect measurement and/or cause an automatic abortion of the measurement with an error message.
- ▶ If it is necessary to use clamps for the connection of the measurement leads to the secondary side of the test object, always use the 4-wire connection technique as described in the *CT Analyzer User Manual* in order to avoid measurement errors.

Connect *CT Analyzer* as shown in Figure 3-1:

1. Make sure that the primary side of the CT is connected to PE on one side and open on the other side.

NOTICE

Falsification of measurement results possible

It is absolutely important to avoid coupling of interferences into the primary circuit during measurement.

- ▶ Connect the side of the primary circuit that is able to receive more interferences to PE (e.g. the side with the longer line length). The ungrounded side should be the side that receives less interferences (refer to Figure 3-1).
2. Disconnect all secondary windings of the CT core under test in order to remove any load from this core. Every kind of load remaining on the secondary side of a CT core during measurement will lead to incorrect measurement results or error messages.
If the CT under test is a multi-core CT, leave the secondary windings of the other (non-measured) cores connected, or short-circuit them if the windings are open.
 3. Connect the black socket of *CT Analyzer* input PRIM to the grounded side of the CT's primary circuit and the red socket of this input to the open (ungrounded) side.
 4. Connect the black OUTPUT socket and the black socket of input SEC of *CT Analyzer* to that terminal on the secondary side of the CT that is connected to PE.

Setup, connection and disconnection

5. Connect the red OUTPUT socket and the red socket of input SEC of *CT Analyzer* to the other (ungrounded) terminal on the secondary side of the CT.

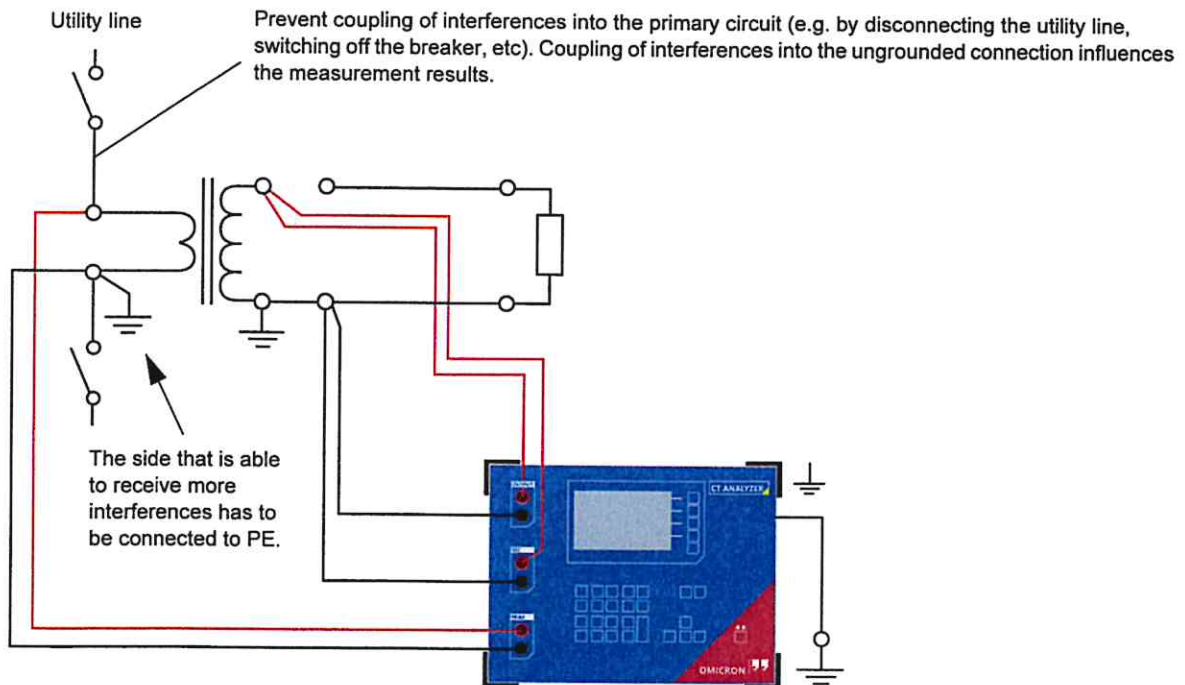
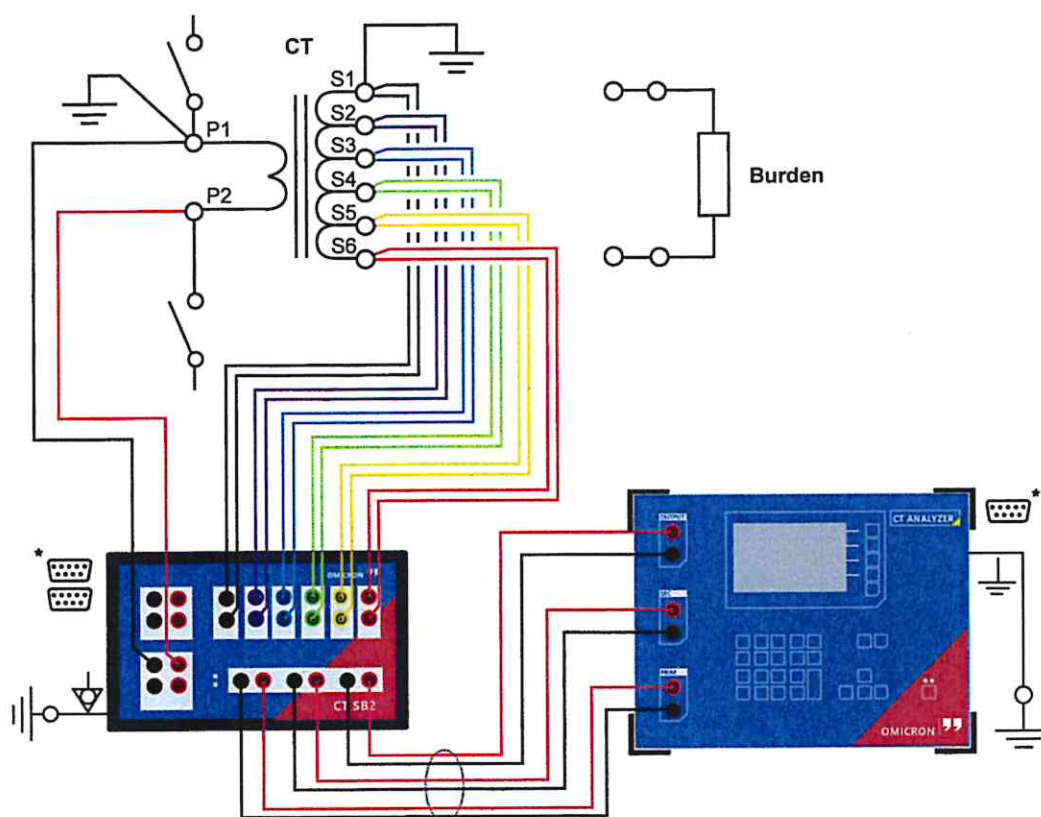


Figure 3-1: Basic wiring for a CT test

Note: The CT may make humming or buzzing noises of varying frequency during the CT test. This is normal behavior and does not indicate a defective CT.

3.4 Basic measurement setup for multi-ratio CT testing using *CT SB2*



* For information on how to connect the communication link between *CT SB2* and *CT Analyzer*, please refer to the *CT SB2* User Manual.

Figure 3-2: Basic measurement setup for multi-ratio CT testing (6-tap CT, no burden measurement, no primary winding resistance measurement)

WARNING



Death or severe injury caused by high voltage or current possible

Feeding test voltage to a CT can cause life-threatening voltages on other taps and/or cores of the CT.

- ▶ Do not touch other taps or windings of the CT during the test.
- ▶ When testing multi-core CTs, make sure that no other windings of the CT are open. Leave the secondary windings of the other (non-measured) cores connected, or short-circuit them if the windings are open.
- ▶ Always connect all secondary taps/windings to the *CT SB2* switch box in order to guarantee safety during testing.

3.5 Disconnection

WARNING



Death or severe injury caused by high voltage or current possible

As long as the red LED on *CT Analyzer* is flashing, the output is active and lethal voltages can occur due to the high energy stored in external inductors.

- ▶ Do not disconnect measurement leads while the red LED on *CT Analyzer* is flashing.
- ▶ Always wait until the red LED is off before disconnecting measurement leads.
- ▶ Do not touch the test setup until the energy stored in the external inductors has dissipated over time, if the measurement interrupted unexpectedly, for example, due to a loss of supply voltage or erroneous behavior of *CT Analyzer*.

Proceed as follows to disconnect *CT Analyzer/CT SB2*:

1. Wait until the red LED on *CT Analyzer* is off.
2. Disconnect the measurement leads starting at *CT Analyzer/CT SB2*.

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