HVX10

Getting Started



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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, up-to-date, and 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.

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1 Introduction

1.1 About this document

This document provides information on how to use this product safely, properly and efficiently.

It contains important safety rules for working with this product and gets you familiar with operating this product. Following the instructions in this document will help you to prevent danger, repair costs, and avoid possible down time due to incorrect operation.

Refer to the related User Manual for detailed information about this product and/or instructions on how to use this product properly and efficiently.

This document is to be supplemented by existing national safety standards for accident prevention and environmental protection.

1.2 Symbols and conventions

The following symbols indicate safety instructions for avoiding hazards:

The following symbols and formatting styles are used:

Symbol/format	Description
✔	Conditions to be met before starting a task
▶	Instructions that can be carried out in any order
1. 2.	Instructions that have to be carried out in the given order 1. Step 2. Step 2.1 Substep 2.2 Substep
➔ / ➔	Expected outcome of a step/task
Text in bold	Text shown on a device, its display or in a software
Text in italics	OMICRON product name
/ **Note:**	Additional information, explanations or tips

1.3 Fulfilled directives

In the following statement, the device is designated as "product", "equipment", or "apparatus".

The OMICRON contact address can be found on the last page (back page) of this document.

European Union

The equipment adheres to the guidelines of the council of the European Community for meeting the requirements of the member states regarding the following directives:

- Electromagnetic compatibility (EMC) directive
- Low voltage directive (LVD)

- RoHS directive

United Kingdom

The equipment adheres to the regulations of the UK government for meeting the requirements regarding the following regulations:

- Electromagnetic Compatibility (EMC) Regulation
- Electrical Equipment Regulation (Safety)
- Regulation for Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

USA (FCC)

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. If this equipment does cause harmful interference to radio or television reception, contact OMICRON Support (→ Support (page 26)).

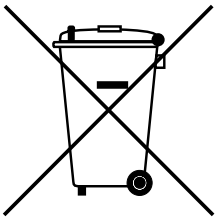
Canada

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.

The use of shielded LAN cables is required when connecting this equipment to any optional peripheral or host devices. Failure to do so may violate FCC and ICES rules, and the EMC directive.

1.4 Recycling



This device (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.

EU countries (incl. European Economic Area)

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

Outside the European Economic Area

For information on the environmental regulations relevant to your country, contact the responsible authorities. Dispose of the OMICRON device only in accordance with your local legal requirements.

2 Safety

2.1 Basic safety information

- ▶ Only install and operate the device and any accessories according to the instructions in the corresponding user documentation.
- ▶ Make sure that this document is available on the site where the device is operated, either digitally or in print.
- ▶ Contact OMICRON Support (→ Support (page 26)) if you do not understand any of the instructions in this document.

Using the device must comply with all applicable local and national safety standards, regulations and safety-relevant documents.

Improper use may result in damage to persons or property and could invalidate warranty claims.

2.2 Designated use

The *CPX 200*, in conjunction with its accessories or as a stand-alone unit, is a multi-purpose primary test set for commissioning and maintaining substation equipment. It can be used to perform tests on current transformers (CT), voltage transformers (VT), power transformers (TR) and switchgear (SG) as described in Available tests.

The various, partly automated tests are defined and parameterized via a color multi-touch display on the front panel of the *CPX 200* or a PC connected to the *CPX 200* using *CPXpert*.

The optional accessory *HVX10* is a high-precision system component for on-site insulation tests of high-voltage assets such as power transformers and bushings as well as the tests described in Available tests. It works as an add-on device to the *CPX 200*, which is used to control the measurement. The *HVX10* can also be used as high-voltage source.

- ▶ Do not use the *CPX 200* to test batteries. This could result in damage to the *CPX 200*, battery explosions, fires or chemical leakage.

2.3 Operator qualifications

Only authorized and qualified personnel who are regularly trained in electrical engineering and their specific tasks are permitted to install and operate the device and any accessories.

All personnel installing or operating the equipment must be familiar with the equipment and observe all applicable standards, local regulations, and safety-relevant documents, for example, the following standards or their equivalents:

- 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"

Personnel receiving training, instructions, directions, or education on the device must be under constant supervision of an experienced operator while working with the equipment.

- ▶ Before starting to work, clearly establish the responsibilities:
  - Designated person in control of the electrical installation
  - Designated person in control of the work activities
- ▶ Make sure that the designated person in control of the work activities coordinates the communication with all persons involved in work activities.

2.4 Safety instructions

- ▶ Stay focused on your tasks to ensure safety.
- ▶ Visually check the device for damage. If the device or any accessory is damaged, not in technically sound condition, or does not seem to function properly, do not use it. If in doubt, contact OMICRON Support (→ Support (page 26)).
- ▶ In case of unforeseen or erroneous behavior of the device during use, immediately stop using the device. When removing any wiring, adhere to the five safety rules.
- ▶ Only use original cables provided by OMICRON.
- ▶ Only use original accessories provided by OMICRON.

Using cables and accessories not provided by OMICRON is at your own risk. Make sure they meet all technical requirements and comply with the relevant safety and certification standards. If in doubt, contact OMICRON Support (→ Support (page 26)).

2.4.1 Work environment

- ▶ Do not operate the device in a condensing environment.
- ▶ Do not operate the device in the presence of explosive or flammable gas, vapors, or dusts.
- ▶ Do not operate the device under environmental conditions that exceed the temperature and humidity limits listed in the "Technical data" section.
- ▶ Before using any additional equipment, make sure that the environmental conditions are suitable for that equipment.

2.4.2 Personal safety

- ▶ Protect others from accessing the danger zone and accidentally touching live parts by setting up a suitable safety barrier and, if applicable, signal lamps.
- ▶ Warn other people prior to any operation to make them aware of any possible disturbances.

2.4.3 Mechanical safety

- ▶ Do not open the device without authorization.
- ▶ Contact OMICRON Support (→ Support (page 26)) for maintenance and repair.

2.4.4 Operating the measurement setup

- ▶ Before handling the *CPX 200* or *HVX10* in any way, connect its equipotential ground terminal with a solid connection of at least 6 mm^2 cross-section to the ground terminal of the test object.
- ▶ Never connect or disconnect a test object while the outputs are active.

- Do not remove any cables from the *CPX 200* or *HVX10* during a test.
- When connecting cables to a control cabinet, be aware of uninsulated live components. Adhere to the safety instructions provided by the manufacturer.
- Make sure that a test object's terminals that are to be connected to the *CPX 200* or *HVX10* do not carry any voltage potential. During a test, the only power source for a test object may be the *CPX 200*.
- Make sure the use of the *CPX 200* or *HVX10* is in accordance with the regulations on site and the designated use described in this document (→ Designated use (page 6)).
- Comply with the workflow described in this document. Avoid interruptions or distractions that could affect safety.
- Do not enter the danger zone if the red **ACTIVE** (red) signal light or the **Discharge** indicator light of the *CPX 200* are continuously lit or flashing since all outputs can carry dangerous voltage or current!
- Before entering the danger zone, remove the **INTERLOCK** key from the *CPX 200* and wait until the external loads are discharged and the outputs are locked. This state is reached when the green **SAFE** (green) signal light is lit continuously.
- Always obey the five safety rules and follow the detailed safety instructions in the respective user manuals.
- Do not connect the measurement setup to assets, if there is a possibility of a thunderstorm or lightning. Cancel the measurements at the slightest indication of lightning.

2.5 Grounding

- Only operate the *CPX 200* with a power supply connected to protective earth (PE).
- Make sure that both the PE connection of the power supply and the ground connector of the *CPX 200* have a solid and low-impedance connection to the grounding system on site. This also applies to all other test sets and accessories in the test setup.
- 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 grounding and supply cables provided by OMICRON.

2.6 Power supply

Operating the *CPX 200* without PE and ground connection is dangerous and not permitted.

- Only operate the *CPX 200* with a power supply connected to protective earth (PE).
- If the power cord is unexpectedly disconnected from the power supply socket during normal operation of the *CPX 200*, the *CPX 200*'s power supply socket must not be touched for a minimum of 5 seconds. This is to mitigate risk of electrical shock from components of the *CPX 200* that may still be charged.

Power supply from grounded grids (TN/TT)

Before a measurement is started, the *CPX 200* 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 dangerous. In this case, measurements are not permitted and cannot be performed.

Power supply from isolated grids (IT) - generator use

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 the *CPX 200* is powered by a generator. Since every operation mandates a PE connection for the operation of the *CPX 200*, you need to manually verify this.

If the *CPX 200* is 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 the *CPX 200* from phase-neutral (L1-N, A-N), it may also be supplied from phase-phase (for example, L1-L2; A-B).

▶ Make sure that the voltage does not exceed 240 V_{AC}.

▶ Make sure that the power supply is fuse-protected (16 A automatic circuit breaker).

▶ Do not use an extension cable on a cable reel to prevent an overheating of the cord; run out the extension cord.

▶ Keep extension cables as short as possible to prevent power loss.

If the power supply is < 190 V_{AC}, the *CPX 200* cannot provide the full output power.

▶ Therefore, in order to gain the full output power, provide a sufficient power supply (190 V … 240 V_{AC}).

2.7 Handling long cables

▶ The entire working environment, including the power supply of the test system, must not extend beyond the perimeter of the substation, except where this is not feasible due to the situation on site.

▶ Make sure the *CPX 200*, its cables, and the test object are properly grounded as described in this manual.

▶ Before unreeling any power extension cords to supply the *CPX 200*, make sure the respective cable is connected to a power supply with protective earth (PE).

▶ Before unreeling any measurement, communication or interface cables of the *CPX 200*, make sure no cables are connected to an ungrounded 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).

▶ Any measurement, communication or interface cables of the *CPX 200* shall be placed in an environment where unauthorized or unintentional human entry is avoided during usage of the *CPX 200* by any means necessary.

▶ Unwind extension cables from their reel. Otherwise they will overheat.

2.8 Static charges

Static charges on bushings or other apparatus such as transformer windings may be induced by test potentials. While the voltage may not be significant enough to do any damage, it can be a source for serious accidents due to falls caused by reflex action.

High static charges may also be encountered at the bushing capacitance taps if the covers are removed.

▶ Ground all test objects before handling.

3 HVX10

The *HVX10* is operated in conjunction with the *CPX 200*, providing test voltages of up to 10 kV AC/DC. The *HVX10* hardware and its accessories are required for performing a variety of measurements, including Capacitance & Dissipation/Power factor as well as Insulation Resistance measurements.

NOTICE

Altered measurement results due to mechanical force affecting the *HVX10*'s reference capacitor

The *HVX10* contains a reference capacitor that could be negatively impacted during a fall of the *HVX10* from a height of around 10 cm or more. This could even be the case if no damage to the device is visible externally.

▶ In case of such a fall, we recommend sending the *HVX10* to OMICRON for an accuracy check and calibration.

Utilize the *HVX10* in supported tests. The corresponding test licenses for the *CPX 200* must be kept in place.

3.1 HVX10 right side panel



Figure 3-1: *HVX10* right side panel with **EtherCAT®** connector and Booster input

Functional elements on the *HVX10*'s right side panel

No.	Element	No.	Element
1	**EtherCAT®** port **EtherCAT®** port for connecting the *HVX10* to the *CPX 200*	2	**BOOSTER IN** providing the *HVX10* with power from the *CPX 200*

3.2 HVX10 left side panel



Figure 3-2: *HVX10* left side panel with grounding terminal, measurement inputs and high-voltage output

Functional elements on the *HVX10*'s left side panel

No.	Element	No.	Element
1	**M GND** (measurement ground) socket with interlock function. (→ HVX10 left side panel (page 13))	4	**V IN** measurement input
2	Red **ACTIVE** and green **SAFE** signal lights	5	**I IN** measurement inputs 4× 225 mA AC / 4× 7.5 mA DC current inputs
3	**HV OUT** high-voltage output		

For more details on the interlock function, refer to Safety and interlock functions (page 14).

3.2.1 HVX10 safety functions and components

3.2.1.1 Safety and interlock functions

The *HVX10* has several internal and external safety functions to prevent dangerous situations. The *HVX10* will not work if a safety function detects a problem, such as:

- Defect of the protective ground connection to the control device
- Missing measurement ground connection (cable not connected to device)
- Bad measurement ground connection (measurement ground has no contact to protective ground)
- Disconnection between the high-voltage cable and the *HVX10*

3.2.1.2 SAFE and ACTIVE signal lights

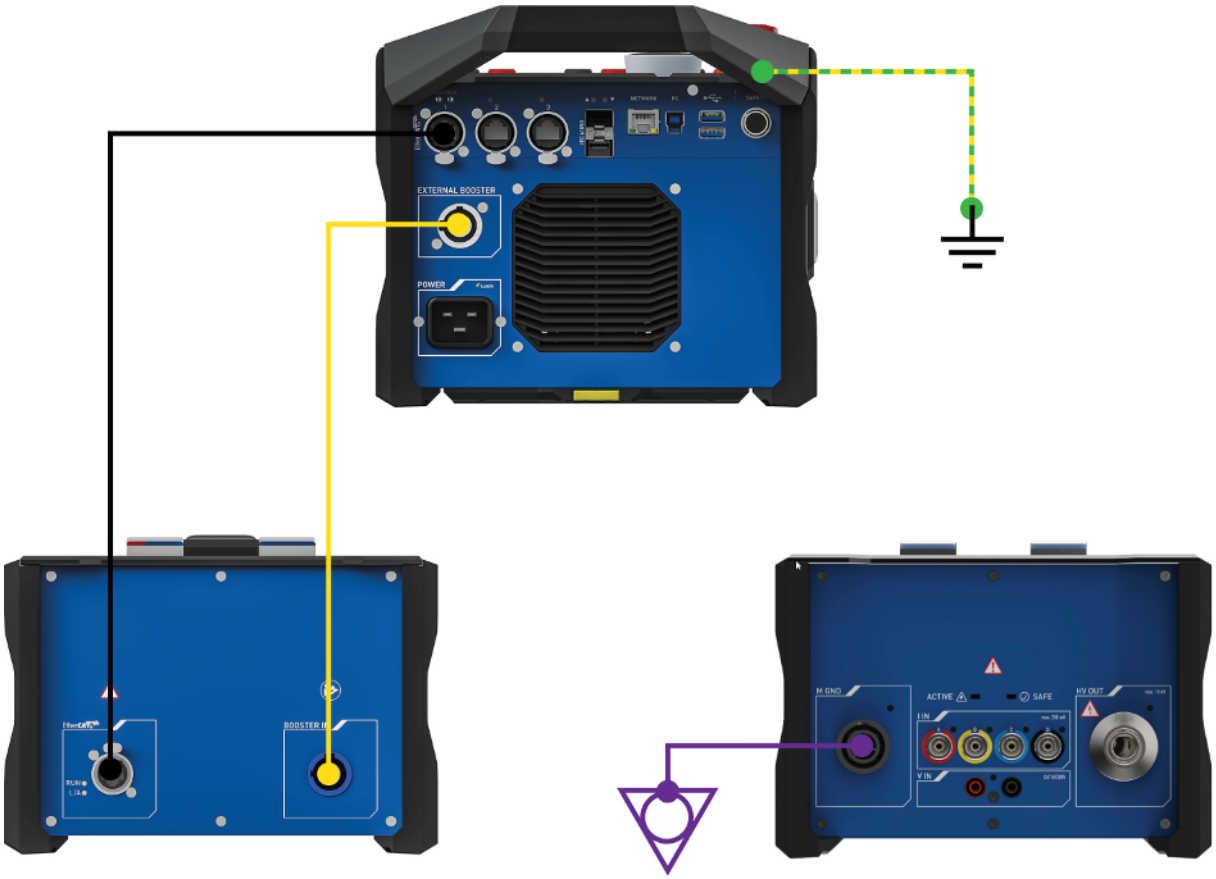
The **SAFE** and **ACTIVE** signal lights indicate the safety-relevant operational status of the *HVX10*.

- The green signal light shows the **SAFE** mode, which indicates that the *HVX10* is safe for wiring. In the **SAFE** mode, all energies stored in the *HVX10* are discharged and the outputs are safe to touch.
- The red signal light shows the **ACTIVE** mode, which indicates a possible danger before or during testing.
- If the **HV OUT** output is active, the **ACTIVE** signal light will start to flash red.

Table 3-1: Statuses of the **ACTIVE** and **SAFE** signal lights

Indicator	Signal light status	Action
	**SAFE** signal light is continuously illuminated in green	The operational mode is inactive or set to SAFE state.
	**ACTIVE** signal light is continuously illuminated in red	The operational mode is set to the ACTIVE state, but no measurement is currently in progress.
	**ACTIVE** signal light is continuously flashing red	The operational mode is set to the ACTIVE state, and a measurement is currently ongoing
	**ACTIVE** and **SAFE** signal lights are off, while the *HVX10* is running.	**Dangerous operating condition** Always consider this a dangerous erroneous state of the device and do not use the *HVX10* under any circumstances.

3.3 Connecting the HVX10 to the CPX 200



For more information related to the safety functions and wiring operations, refer to the following sections:

- Safety (page 6)
- CPX 200 safety functions and components
- HVX10 safety functions and components (page 14)
- Wiring and operation (page 21)

To connect the *HVX10* to the *CPX 200*:

1. Make sure that the green **SAFE** signal light is on and the red **ACTIVE** signal light is off at the *CPX 200*.



2. Remove the **INTERLOCK** key from the *CPX 200* to prevent unauthorized or unintentional activation.
3. Properly connect the *CPX 200* grounding socket to substation ground.
4. Properly connect the *HVX10* measurement ground (**M GND**) to the ground terminal of the test object.

5. Connect the **EXTERNAL BOOSTER** of the *CPX 200* to the **BOOSTER IN** of the *HVX10* by using the provided yellow or orange booster cable.
6. Connect **EtherCAT®** port **1** of the *CPX 200* to the **EtherCAT®** port of the *HVX10*.

EtherCAT® port **2** or **3** of the *CPX 200* can also be used to establish a connection with the *HVX10*.

7. If required by the test setup, connect the *HVX10* test leads to the test object using **I IN A**, **I IN B**, **I IN C**, or **I IN D** as well as **V IN**.

For more detailed information, refer to the wiring diagrams specific to the test.

8. Connect the high-voltage cable to the **HV OUT** output of the *HVX10*.

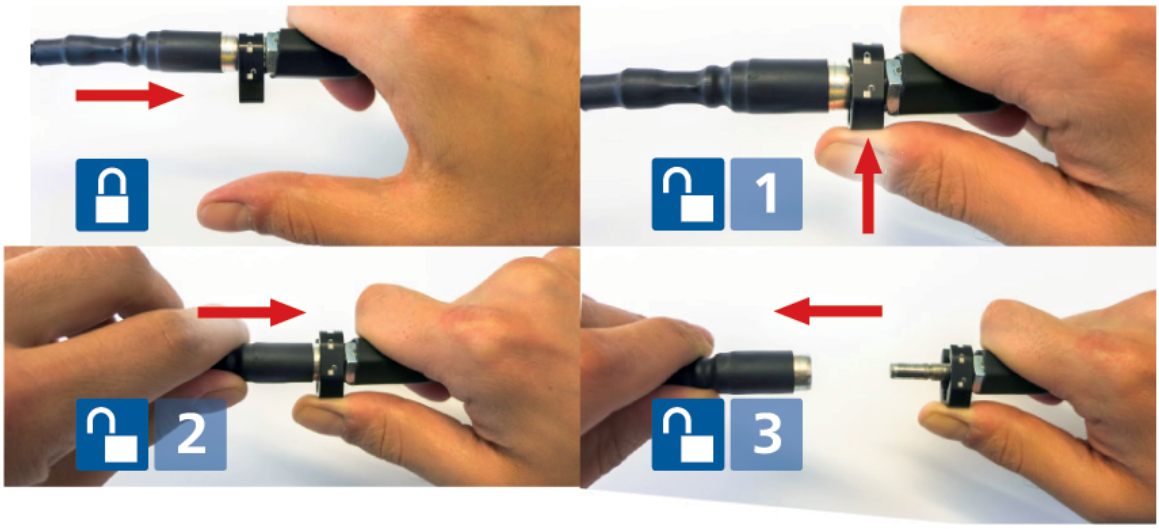
For more detailed information, refer to the wiring diagrams specific to the test.

▶ Connect the high-voltage cable to the *HVX10* **HV OUT** and make sure the plug is securely fastened. Confirm this by trying to gently pull it out.

9. At the test object, carefully insert the 6 mm high-voltage cable plug into the high-voltage clamp until the plug clicks into place.

▶ The high-voltage cable and clamp are now locked. Verify this by attempting to gently pull them out. It should not be possible.

▶ The following images illustrate how to lock and unlock the connection. This information is also provided on a label attached to the high-voltage cable.



10. Connect the high-voltage clamp to the test object.
11. Once the high-voltage connection from the *HVX10* to the test object is established, use the strain relief provided with the high-voltage cable to secure it to the test object.

⚠ DANGER

Death or severe injury caused by high voltage or current

The high-voltage cable is shielded and therefore safe. However, the 50 cm (20 in) of this cable highlighted in yellow have no shield.

- ▶ Avoid any direct contact of this part of the cable to ground potential and any objects.
- ▶ During a test, consider this part of the cable a live wire and life threatening.

12. Vacate the danger zone and ensure that it is clear of individuals and ready for operation.

⚠ WARNING

Death or severe injury caused by high voltage or current possible

- ▶ Establish a safety barrier to isolate the danger zone.

13. Insert the **INTERLOCK** key into the *CPX 200*.
14. Proceed with the steps specific to the test and software as outlined in the respective test sections.

3.4 Transportation of the CPX 200 and the HVX10

⚠ CAUTION

Injury due to heavy lifting and strain possible

- ▶ To minimize physical strain, carry the *CPX 200* and the *HVX10* separately.
- ▶ To prevent injuries, adhere to ergonomic guidelines for manual material handling.

NOTICE

Equipment damage possible

Failure to comply with the following instructions may result in damage to the devices during transport and could potentially void warranty coverage.

- ▶ When transporting the *CPX 200* and the *HVX10* individually, only use the transport case with correctly installed original foam inlays.
- ▶ If the transport case or foam inlays are damaged or defective, do not transport the *CPX 200* or the *HVX10*.

3.4.1 Separating the CPX 200 and the HVX10

Transporting the *CPX 200* and the *HVX10* devices requires careful consideration due to their weight. To ensure the safety of both the operators and the devices, carry each device separately. This approach minimizes the weight each operator must carry, reducing the risk of strain or injury.

The *CPX 200* units are equipped with a snap lock system that facilitates the mechanical connection to accessory devices like the HVX10.

To separate the units, follow these steps:

1. Locate the yellow snap lock buttons on the *CPX 200* device.
2. Press both snap lock buttons simultaneously.
   ➔ A click sound indicates that the snap lock system has been disengaged.
3. Once the snap lock system is disengaged, the *CPX 200* unit can be carefully tilted towards the user.

Avoid tilting the unit away from the user due to the increased physical exertion required to maintain control of the unit.



Figure 3-3: Separating the *CPX 200* and the *HVX10*

3.4.2 Safe transportation

When relocating the *CPX 200* and the *HVX10* units, adherence to proper lifting techniques is mandatory to ensure operator safety.

When transporting the *CPX 200* or the *HVX10* units individually, it is strongly advised to use both hands for secure handling. Ideally, your arms should be bent at a 90° angle. This position allows for optimal control and movement while carrying the unit.

To ensure safety and prevent potential damage from dropping the devices due to the physical strain from lifting, adhere to the following best practices:

- Apply a firm grip on the handle at all times during transport.
- Engage your core and use your legs to lift, maintaining a stable posture.
- Avoid twisting your body while carrying the unit, pivot with your feet instead.
- If the unit feels too heavy or if you experience strain, set it down safely and ask for assistance.



Figure 3-4: Carrying the *CPX 200* and *HVX10*

If available, the transport cases for the *CPX 200* and the *HVX10* are highly recommended. These cases are specifically designed to fit the units and therefore provide a secure enclosure for the units. In addition, the handles and the wheels can significantly facilitate transportation.

NOTICE

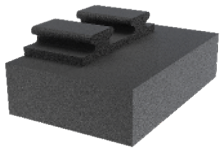
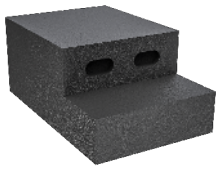
Equipment damage possible

Any movement of the units in the cases during transit could cause potential damage.

▶ Ensure that the units are securely fastened within the transport cases.

3.4.3 Transport case

When transporting the *CPX 200* or the *HVX10* units individually within the transport case, it is imperative to utilize the additional 2 foam inlay pieces. For the *CPX 200* unit, 2 *HVX10* foam inlay pieces are necessary, and conversely, for the *HVX10* unit, 2 *CPX 200* foam inlay pieces are required. These foam inlay pieces are designed to ensure the units are securely stowed within the transport case. Failure to properly place both required foam inlays within the transport case can result in the units moving within the case during transit, potentially leading to transportation damage.

Picture	Usage of the foam inlays
	**Transportation instructions for the *CPX 200*:** When transporting the *CPX 200* device on its own within the combined transport case, it is imperative to install 2 foam inlays designed for the *HVX10*. This ensures the *CPX 200* remains securely cushioned during transit. Follow these steps for correct installation: 1. Insert the foam inlays into the transport case, positioning one on the left side and the other on the right side, ensuring they have a stable position at the bottom. 2. Center the *CPX 200* device atop the foam inlays, making sure it is evenly balanced between them for optimal protection during transit.
	**Transportation instructions for the *HVX10*:** When transporting the *HVX10* device on its own within the combined transport case, it is imperative to install 2 foam inlays designed for the *CPX 200*. This ensures the *HVX10* remains securely cushioned during transit. Follow these steps for correct installation: 1. Insert the foam inlays into the transport case, positioning one on the left side and the other on the right side, ensuring they have a stable position at the bottom. 2. Center the *HVX10* device atop the foam inlays, making sure it is evenly balanced between them for optimal protection during transit.

4 Wiring and operation

4.1 Safety information

- For general safety instructions, see Safety (page 6).
- For information about *CPX 200* safety functions and components, see CPX 200 safety functions and components.
- For information about *HVX10* safety functions and components, see HVX10 safety functions and components (page 14).
- If in doubt, contact OMICRON Support (→ Support (page 26)) for more information.

4.1.1 Connecting/disconnecting test leads

▶ Before connecting/disconnecting test leads to the *CPX 200* or *HVX10*, make sure that you have read and understood the safety section and follow the wiring instructions stated in this document.

▶ Only connect/disconnect test leads to the outputs and inputs of the *CPX 200* or *HVX10* when the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.

Wiring of capacitive loads

⚠ DANGER

Death or severe injury caused by high voltage or current

Some test objects (for example, voltage transformers, cables, and rotating machines) may have high-capacitive parts and can store a dangerous amount of energy.

▶ Before entering the danger zone, always discharge potentially lethal capacitive loads.

Wiring of inductive loads

⚠ DANGER

Death or severe injury caused by high voltage or current

If charged with current, inductive loads may store a dangerous amount of energy.

▶ Only use the **OUT A** or **HC OUT (100 A)** output to carry out DC tests on inductive test objects to ensure proper discharging of the connected load.

▶ Never use the **HC OUT (1000 A)** output to carry out DC tests on inductive test objects. The **HC OUT (1000 A)** output does not have an active discharge functionality.

4.2 Basic steps to carry out a test with the CPX 200

4.2.1 Test setup

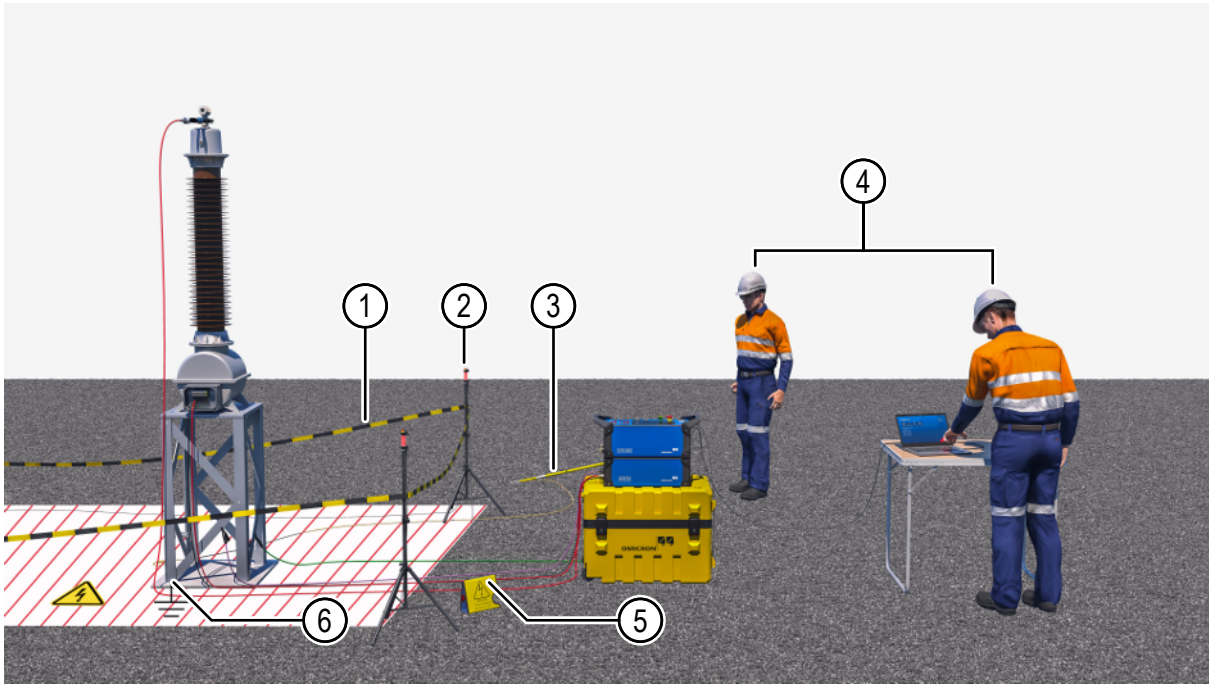


Figure 4-1: Test setup for a VT Ratio test with the *CPX 200* and the *HVX10*

No.	Description	No.	Description
1	Safety barrier	4	Multi-person testing team
2	*OSA1* warning lamps	5	*CPX 200* display cover as a warning shield
3	Grounding rod	6	Proper asset and device grounding

The *CPX 200* is designed to test a variety of assets, including power transformers, current transformers, voltage transformers, and switchgear. For a detailed overview of the supported applications and tests, refer to Available tests.

4.2.2 Connecting and preparing for signal output

1. Define a work area and a danger zone around the test object and secure the danger zone sufficiently against unauthorized access, for example using a safety barrier and signs.
2. Connect the grounding terminal of the *CPX 200* to the substation ground using the grounding cable delivered with the *CPX 200*. When working with the *HVX10*, make sure that the Measurement Ground (**M GND**) is connected to the grounded terminal of the test object.

⚠ DANGER

Death or severe injury caused by high voltage or current

The output signals of the *CPX 200* can carry up to 300 V.

The output signals of the *HVX10* can carry up to 10 000 V.

Capacitive loads: Some test objects may have high-capacitive parts and can store a lethal amount of energy.

Inductive loads: If charged with current, inductive loads may store a dangerous amount of energy.

- ▶ Only connect/disconnect test leads to the outputs and inputs of the *CPX 200* or its accessories when the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.
- ▶ Use safety test leads whenever possible.
- ▶ Capacitive loads: Make sure that capacitive loads are always discharged before connecting/disconnecting the *CPX 200*.
- ▶ Inductive loads: Make sure that inductive loads are always discharged before connecting/disconnecting the *CPX 200* or its accessory device.

3. Make sure that the power supply to the *CPX 200* is turned off.
4. Remove the **INTERLOCK** key from the *CPX 200*.
5. Connect the *CPX 200* to the power supply with the provided cable.
6. Switch on the *CPX 200* by pressing the power button.
   → The *CPX 200* is ready for wiring as soon as the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.

NOTICE

Equipment damage due to infeed possible

Infeed of voltages from external sources may damage the outputs and inputs of the *CPX 200* and its accessory device.

- ▶ Always ensure that the *CPX 200* is connected to live parts of the asset last.

7. Optionally, connect the *CPX 200* to the control computer.
8. Connect the *CPX 200* to the test object according to your test setup using the test leads and adapters.
9. Connect the *CPX 200* or *HVX10* to the test object.
10. Insert the **INTERLOCK** key.
11. To change from **SAFE** to **ACTIVE** mode, press the operational mode button.
    → The red **ACTIVE** signal light is on, and the green **SAFE** signal light is off.
12. Start the test sequence using *CPXpert* or *TouchControl*.
    → As soon as the test is started, the red **ACTIVE** signal light flashes slowly (1 Hz).

4.2.3 Changing the wiring

⚠ DANGER

Death or severe injury caused by high voltage or current

The output signals of the *CPX 200* can carry up to 300 V.

The output signals of the *HVX10* can carry up to 10 000 V.

Capacitive loads: Some test objects may have high-capacitive parts and can store a lethal amount of energy.

Inductive loads: If charged with current, inductive loads may store a dangerous amount of energy.

- ▶ Only connect/disconnect test leads to the outputs and inputs of the *CPX 200* or its accessories when the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.
- ▶ Use safety test leads whenever possible.
- ▶ Capacitive loads: Make sure that capacitive loads are always discharged before connecting/ disconnecting the *CPX 200*.
- ▶ Inductive loads: Make sure that inductive loads are always discharged before connecting/ disconnecting the *CPX 200* or its accessory device.

1. To change from **ACTIVE** to **SAFE** mode, press the operational mode button.
   → While the red **ACTIVE** signal light flashes quickly (10 Hz), the *CPX 200* is discharging internal and external energies.
2. Wait until the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.
   → The *CPX 200* is ready for wiring.
3. Remove the **INTERLOCK** key to prevent unauthorized activation while changing the wiring.

NOTICE

Equipment damage due to infeed possible

Infeed of voltages from external sources may damage the outputs and inputs of the *CPX 200* and its accessories.

- ▶ Make sure that the *CPX 200* is not connected to an external voltage source.

4. Change the wiring according to your test setup.
5. Insert the **INTERLOCK** key.
6. To change from **SAFE** to **ACTIVE** mode, press the operational mode button.
   → The red **ACTIVE** signal light is on, and the green **SAFE** signal light is off.
7. Start the test sequence using, for example, *CPXpert* or *TouchControl*.
   → As soon as the test is started, the red **ACTIVE** signal light flashes slowly (1 Hz).

4.2.4 Disconnecting and switching off

⚠ DANGER

Death or severe injury caused by high voltage or current

The output signals of the *CPX 200* can carry up to 300 V.

The output signals of the *HVX10* can carry up to 10 000 V.

Capacitive loads: Some test objects may have high-capacitive parts and can store a lethal amount of energy.

Inductive loads: If charged with current, inductive loads may store a dangerous amount of energy.

- ▶ Only connect/disconnect test leads to the outputs and inputs of the *CPX 200* or its accessory device when the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.
- ▶ Use safety test leads whenever possible.
- ▶ Capacitive loads: Make sure that capacitive loads are always discharged before connecting/ disconnecting the *CPX 200*.
- ▶ Inductive loads: Make sure that inductive loads are always discharged before connecting/ disconnecting the *CPX 200* or its accessories.

1. To change from **ACTIVE** to **SAFE** mode, press the operational mode button.
   → While the red **ACTIVE** signal light flashes quickly (10 Hz), the *CPX 200* or *HVX10* is discharging internal and external energies.
2. Wait until the green **SAFE** signal light is on and the red **ACTIVE** signal light is off.
   → The *CPX 200* or *HVX10* is ready for wiring.
3. Remove all test leads and adapters.
4. Switch off the *CPX 200* by pressing the power button.
   → Both the green **SAFE** and the red **ACTIVE** signal lights are off.
5. Disconnect the *CPX 200* from the power supply.

4.3 Cleaning

Preconditions

✓ The device is switched off/de-energized.
✓ All connection cables and accessories are disconnected from the device.

▶ Clean the device and its accessories with a cloth dampened with isopropanol alcohol.

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