

MCC 210/210L

User Manual



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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 Energy Solutions GmbH 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 Energy Solutions GmbH 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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Limitation of liability

This warranty is made in lieu of all other warranties, representations or conditions, whether expressed or implied, including, without limitation, merchantability or fitness for a specific purpose. The remedy set forth herein shall be the sole, exclusive remedy with respect to OMICRON Energy Solutions GmbH products. No person is authorized to make any other warranty or representation concerning the performance of OMICRON Energy Solutions GmbH products or extend or enlarge the warranty contained herein. Under no circumstances will OMICRON Energy Solutions GmbH be liable for any direct, indirect, special incidental or consequential damages, even if OMICRON Energy Solutions GmbH is notified of the possibility of such damages, including, but not limited to, any loss of revenue, loss of profit, or loss of data, whether based upon any alleged breach of warranty, representation or condition, contract, or any other conduct including negligence (intentional or otherwise). OMICRON Energy Solutions GmbH shall not be liable for any claims made by a third party or made by you for a third party.

If this warranty is applied in a jurisdiction that does not allow exclusions or limitations of liabilities as defined above, only those limitations and exclusions that are not allowed under the jurisdiction shall be void, and all other limitations and exclusions shall remain in force. Some jurisdictions may grant the end user purchaser other rights, which this warranty does not limit.

About this manual

This User Manual provides information on how to use the *MCC 210* coupling capacitor safely, properly and efficiently. The *MCC 210* User Manual contains important safety rules for working with the *MCC 210* and gets you familiar with operating the *MCC 210*. Following the instructions in this User Manual will help you to prevent danger, repair costs, and avoid possible down time due to incorrect operation.

The *MCC 210* User Manual always has to be available on the site where the *MCC 210* is used. The users of the *MCC 210* must read this manual before operating the *MCC 210* and observe the safety, installation, and operation instructions therein.

Reading the *MCC 210* User Manual alone does not release you from the duty to comply with all national and international safety regulations relevant to working on high-voltage equipment.

Safety symbols used

In this manual, the following symbols indicate safety instructions for avoiding hazards.



DANGER

Death or severe injury will occur if the appropriate safety instructions are not observed.



WARNING

Death or severe injury can occur if the appropriate safety instructions are not observed.



CAUTION

Minor or moderate injury may occur if the appropriate safety instructions are not observed.

NOTICE

Equipment damage or loss of data possible

1 Safety instructions

Note: There are two versions of the *MCC 210* available: *MCC 210* and *MCC 210L*. In cases where general information is provided that pertains to both versions (like in this safety chapter), "*MCC 210*" is used. "*MCC 210L*" is only used where specific information on said version is provided.

1.1 Operator qualifications

Working on high-voltage assets can be extremely dangerous. Consequently, only personnel qualified, skilled and authorized in electrical engineering and trained by OMICRON are allowed to handle the *MCC 210*. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *MCC 210* must be under constant supervision of an experienced operator while working with the equipment. The operator is responsible for the safety requirements during the whole procedure.

1.2 Safety standards and rules

1.2.1 Safety standards

Handling the *MCC 210* 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 handling the *MCC 210* read the safety instructions in this User Manual carefully.

Do not handle the *MCC 210* without understanding the safety information in this manual. If you do not understand some safety instructions, contact OMICRON before proceeding.

Maintenance and repair of the *MCC 210* and its accessories is only permitted by qualified experts at OMICRON service centers (see "Support" on page 21).

1.2.2 Safety rules

Always observe the five safety rules:

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

1.3 Operating the measurement setup

- ▶ Switch off the high voltage. Always obey the five safety rules and follow the detailed safety instructions.
- ▶ Before switching on the high voltage, leave the high-voltage area.
- ▶ Make sure that the connection to the *MCC 210* is in good condition, clean, and free of oxidation.
- ▶ Do not connect any cable to the test object without a visible grounding of the test object.
- ▶ Do not use inadequately rated supply cords.
- ▶ Do not insert objects (for example, screwdrivers) into any input/output socket.
- ▶ Do not operate the *MCC 210* in the presence of explosives, gas, vapors or dust.
- ▶ Observe the dangerous areas.
- ▶ Always obey the internal safety instructions for working in areas with high voltage to avoid injury.
- ▶ Ensure the rating of the *MCC 210* fits the requirements of the applied HV.

1.4 *MCC 210*-specific safety information

- ▶ For transportation, storage, installation, when the *MCC 210* is not in use and especially before disconnecting the *MCC 210* from the device under test, ensure that the high voltage and ground connectors of the *MCC 210* are short-circuited to avoid any charge from the *MCC 210*'s capacitor.
- ▶ Do not use the *MCC 210* as a mechanical support. It must not be stressed by other mechanical forces than its own weight.
- ▶ Ensure the *MCC 210* is solidly grounded (via the ground flange or the explicit grounding screw).
- ▶ Ensure that the devices connected to the *MCC 210* can handle the output signal during operation at any time.

1.5 Orderly measures

The *MCC 210* User Manual or alternatively the e-book has always to be available on the site where the *MCC 210* is operated.

The users of the *MCC 210* must read this manual before installing the *MCC 210* and observe the safety, installation, and operation instructions therein.

The *MCC 210* may be used only as described in this User Manual. Any other use is not in accordance with the regulations. The manufacturer and the distributor are not liable for damage resulting from improper usage. The user alone assumes all responsibility and risk.

Following the instructions provided in this User Manual is also considered part of being in accordance with the regulations.

Opening the *MCC 210* invalidates all warranty claims.

1.6 Disclaimer

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.7 Compliance statement

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 RoHS directive.

1.8 Recycling



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

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

OMICRON test sets 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 test set 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 test set only in accordance with your local legal requirements.

2 Device description

Note: There are two versions of the *MCC 210* available: *MCC 210* and *MCC 210L*. In cases where information is provided that pertains to both versions, "*MCC 210*" is used. "*MCC 210L*" is only used where specific information on said version is provided.

2.1 Designated use

The main characteristics of the *MCC 210*:

- Decoupling of PD signals and test voltage during HV tests with a corresponding test voltage source.
- Compact 1 nF coupling capacitor on a mobile base for laboratory applications.

The *MCC 210* is a compact coupling capacitor which is connected to the high-voltage potential of a test object and decouples both, the AC and high frequency signals (PD impulses). The typical application is PD measurements according to IEC 60270 or other standards.

The *MCC 210* combines a coupling capacitor with a quadripole (*CPL 542*) on a mobile base where also a *MPD* measurement system and *MPP 600* or *RPB1* battery can be installed. The BNC output of the integrated *CPL 542* can be connected to the *MPD*.

The *MCC 210L* is a *MCC 210* without the quadripole. This version of the *MCC 210* provides two 4 mm output sockets which have to be connected to an external quadripole (for example the *CPL 542*). These outputs are directly connected to the coupling capacitor.

The *MCC 210* is designed and tested for HV tests for up to an U_{pr8} of 100 kV_{AC} (phase-ground). The coupling capacitor is intended for indoor use. For further specifications see 4 "Technical data" on page 17. The *MCC 210* has to be placed inside a controlled area according to national or international safety standards and under consideration of the five safety rules (see 1.2.2 "Safety rules" on page 6). The mobile base of the *MCC 210* has to be solidly grounded (low impedance).

Any other use of the *MCC 210* but the one mentioned above is considered improper use, and will not only invalidate all customer warranty claims but also exempt the manufacturer from its liability to recourse.

2.2 Functional elements

2.2.1 HV side of the *MCC 210*

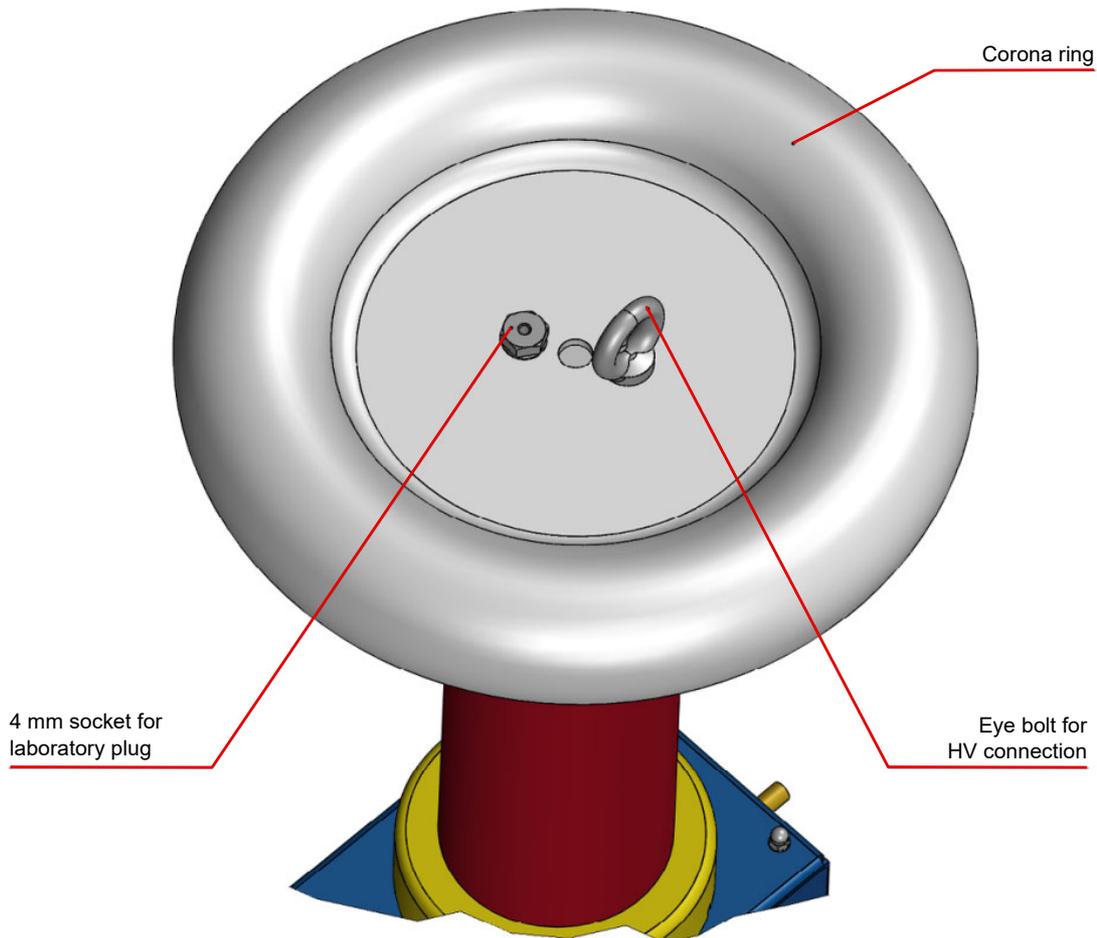


Figure 2-1: Functional elements of the HV side of the *MCC 210*

- ▶ Ensure that the HV side of the *MCC 210* has a good and PD-free (corona-free) connection to the device under test (HV source).

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ For transportation, storage, installation, when the *MCC 210* is not in use and especially before disconnecting the *MCC 210* from the device under test, ensure that the high voltage and ground connectors of the *MCC 210* are short-circuited to avoid any charge from the *MCC 210*'s capacitor.

2.2.2 Base of the *MCC 210*

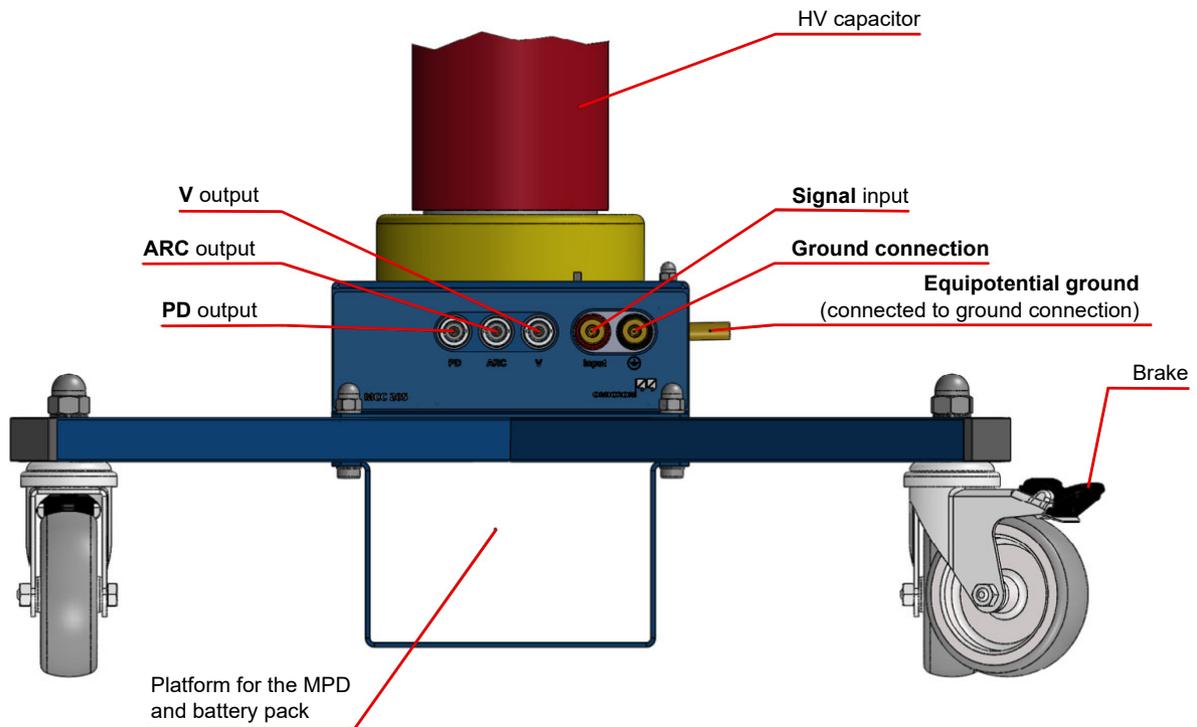


Figure 2-2: Functional elements of the *MCC 210*'s base

- The **Signal input** is the low-voltage side's connector of the HV capacitor.
- **Ground connection** is directly connected to **equipotential ground** (grounding screw) and the *MCC 210*'s base.
- The **ARC output** delivers a 5 V impulse signal that indicates a flash-over in the test setup.

Note: The **ARC output** is not needed for the *MPD* or for PD measurements. It can be used to trigger an automatic shutdown of the HV source in case of a flash-over.

- ▶ Connect the *MPD* to the **V** and **PD** outputs.

Important when using the *MPD 800*: Use the V-to-AC adapter to connect the *MCC 210*'s **V** output to the *MPD 800*'s **AC** input.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Ensure a good connection between the *MCC 210*'s **equipotential ground** (grounding screw) and ground.

2.2.3 Base of the *MCC 210L*

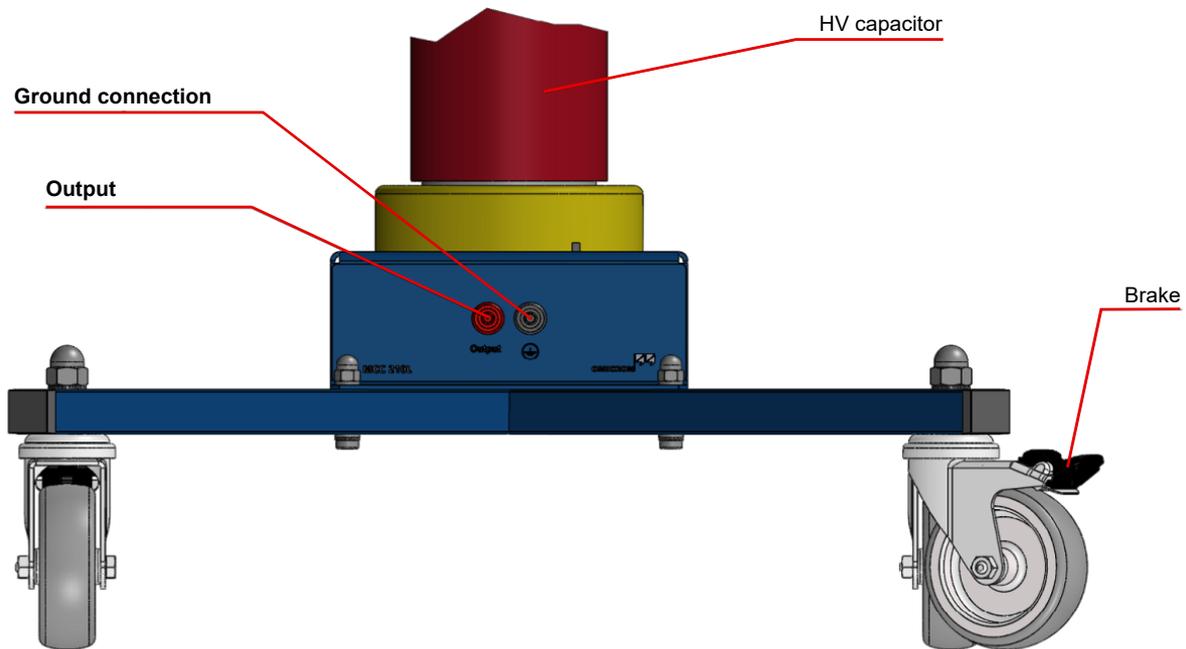


Figure 2-3: Functional elements of the *MCC 210L*'s base

- **Ground connection** is directly connected to the *MCC 210L*'s base.
- **Output** is the low-voltage side's connector of the HV capacitor.
- ▶ Connect **Output** (red) to the external quadripole.

Note: For the *MPD 500/600* the *CPL 542* 0.5 A quadripole is recommended. If you are using the *MPD 800*, it is recommended to use the *CPL1* quadripole that was specifically developed for the *MPD 800*.

Important when using the *MPD 800* with the *CPL 542*: Use the V-to-AC adapter to connect the *CPL 542*'s **V** output to the *MPD 800*'s **AC** input.

- ▶ Connect **Ground connection** (black) to the external quadripole and ground.
- ▶ Connect the measurement device (*MPD*) to the external quadripole.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Ensure a good connection between the *MCC 210L*'s **Ground connection** and ground.

2.3 Delivery

Table 2-1: *MCC 210* delivery

Item	Part/document number
<i>MCC 210</i> coupling capacitor with quadripole	
Coax RG58 Cable (black – 0.5m, 2x)	E0449300
<i>MCC 210</i> User Manual	ENU 1056 05 xx

Table 2-2: *MCC 210L* delivery

Item	Part/document number
<i>MCC 210L</i> coupling capacitor without quadripole	
<i>MCC 210</i> User Manual	ENU 1056 05 xx

3 Application

3.1 Before connecting the *MCC 210*

Note: There are two versions of the *MCC 210* available: *MCC 210* and *MCC 210L*. In cases where information is provided that pertains to both versions "*MCC 210*" is used. "*MCC 210L*" is only used where specific information on said version is provided

Before connecting the *MCC 210* adhere to the following:

- ▶ Always obey the five safety rules and safety instructions (see 1 "Safety instructions" on page 6).
- ▶ Ensure that the measurement setup is done by qualified personnel.
- ▶ Position the *MCC 210* inside the HV area according to the structural conditions on site. Ensure that the *MCC 210* is placed on even and solid ground.
- ▶ When the *MCC 210* is not permanently mounted, engage the brakes at the wheels of the base to keep the *MCC 210* from moving.
- ▶ Place the *MCC 210* as close to the device under test as possible to ensure the highest possible sensitivity and decrease noise.



DANGER

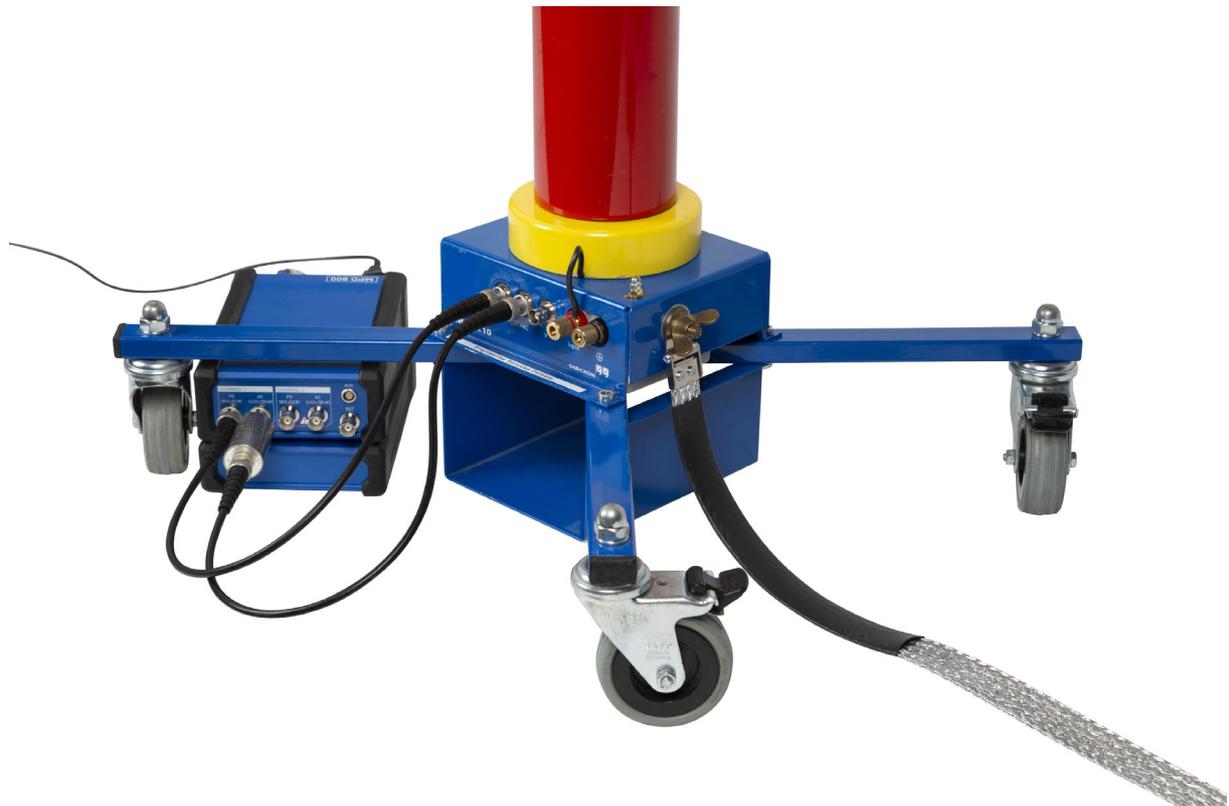
Death or severe injury caused by high voltage or current

- ▶ Observe the high-voltage safety distances between the phases and phase to ground. Always adhere to international standards and local safety regulations.
- ▶ For transportation, storage, installation, when the *MCC 210* is not in use and especially before disconnecting the *MCC 210* from the device under test, ensure that the high voltage and ground connectors of the *MCC 210* are short-circuited to avoid any charge from the *MCC 210*'s capacitor.

3.2 Connecting the *MCC 210*

To connect the *MCC 210* proceed as follows:

1. Ground the *MCC 210* via **equipotential ground** (grounding screw) or **Ground connection**. Ensure a solid connection to ground with for example a wire or copper braid with a cross-section of more than 6 mm².



2. Connect the *MCC 210*'s **V** and **PD** outputs to the *MPD 500/600*'s **V** and **PD** inputs.
Important when using the *MPD 800*: Use the V-to-AC adapter to connect the *MCC 210*'s **V** output to the *MPD 800*'s **AC** input.

Note: The coaxial signal cables connecting the *MCC 210* with the *MPD* should be as short as possible. Place the *MPD* and its battery directly on the platform of the *MCC 210* underneath the *CPL 542*,

3. Connect the fiber-optic cable for the *MCU* fiber-optical control unit to the *MPD*'s *fiber-optic connector(s)*.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Avoid a galvanic connection between the HV-area and work-area. Use the fibre-optic connection of the *MPD* to cross the border of the HV-area. Therefore place the *MPD* inside of the HV-area close to the *MCC 210* to avoid problems with grounding loops and to increase safety.

4. Connect the other end of the fiber-optic cable to the *MCU*.

5. Connect the *MCC 210* to the test object via the *MCC 210*'s eye-bolt in the center of the corona ring.
6. Ensure that the HV side of the *MCC 210* has a good and PD-free (corona-free) connection to the device under test (HV source).

3.3 Connecting the *MCC 210L*

To connect the *MCC 210L* proceed as follows:

1. Ground the *MCC 210L* via **Ground connection**. Ensure a solid connection to ground with for example a wire or copper braid with a cross-section of more than 6 mm².
2. Connect an external quadripole to the *MCC 210L*'s **Output**.

Note: For the *MPD 500/600* the *CPL 542* 0.5 A quadripole is recommended. If you are using the *MPD 800*, it is recommended to use the *CPL1* quadripole that was specifically developed for the *MPD 800*.

3. Ground the external quadripole. Ensure a solid connection to ground.
4. Connect the external quadripole to the *MPD*.

Note: The coaxial signal cables connecting the external quadripole with the *MPD* should be as short as possible.

- a) **CPL 542:** Connect the *CPL 542*'s **V** and **PD** outputs to the *MPD 500/600*'s **V** and **PD** inputs respectively.

Note: If you are using the *MPD 800*, it is recommended to use the *CPL1* quadripole that was specifically developed for the *MPD 800*.

Important when using the *MPD 800* with the *CPL 542*: Use the V-to-AC adapter to connect the *CPL 542*'s **V** output to the *MPD 800*'s **AC** input.

- b) **CPL1:** Connect the *CPL1*'s **AC** and **PD** outputs to the *MPD 800*'s **AC** and **PD** inputs respectively.
5. Connect the fiber-optic cable for the *MCU* fiber-optical control unit to the *MPD*'s *fiber-optic connector(s)*.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Avoid a galvanic connection between the HV-area and work-area. Use the fibre-optic connection of the *MPD* to cross the border of the HV-area. Therefore place the *MPD* inside of the HV-area close to the external quadripole and *MCC 210L* to avoid problems with grounding loops and to increase safety.

6. Connect the other end of the fiber-optic cable to the *MCU*.
7. Connect the *MCC 210L* to the test object via the *MCC 210L*'s eye-bolt in the center of the corona ring.
8. Ensure that the HV side of the *MCC 210* has a good and PD-free (corona-free) connection to the device under test (HV source).

4 Technical data

4.1 Specifications valid for both versions of the *MCC 210*

These are the specifications of Option D of both the *MCC 210* and *MCC 210L*. Option D is the currently delivered version of the *MCC 210* and *MCC 210L*. All other device options are discontinued.

Note: The specifications are valid for $f=50$ Hz, $U_n=100$ kV and $t=20$ °C if no other values specified.

Table 4-1: *MCC 210/MCC 210L* (Option D) specifications

Characteristic	Rating
Primary rated voltage for 8 h or lab U_{pr8} (phase-ground)	100 kV
Operation frequency range	20...800 Hz
Nominal HV capacity C_{HV}	1 nF (-0 % / +10 %)
C_{HV} alteration over temperature	< +2 % / -2 %
Creeping distance	468 mm
tan Delta	< 0.2 %
Over-voltage test level (phase-ground)	120 kV (72 sec)
PD test voltage level (phase-ground)	100 kV (< 1 pC)

Note: The *MCC 210* is equipped with a *CPL 542* quadripole between the low-voltage side of the HV capacitor and ground. The *MCC 210L* is the light version and isn't equipped with a quadripole or any other over-voltage protection.

Table 4-2: Environmental conditions

Characteristic	Rating
Operating/storage temperature	-10...+50°C / 14...122 °F
Relative humidity	50...95 %, non-condensing
Resistance to environmental influences	Indoor & temporarily outdoor (do not use the device in rainy weather)
Maximum altitude	2000 m

Table 4-3: MCC 210/MCC 210L (Option D) mechanical data

Characteristic	Rating
Overall height (H)	776 mm / 30.16 inch
Height of the capacitor (h)	648 mm/ 25.51 inch
Height of corona ring (a)	100 mm/ 3.94 inch
Diameter of corona ring (b)	400 mm/ 15.75 inch
Width and depth of base (W)	450 x 450 mm / 17.72 x 17.72 inch
Mounting/placement	Vertical

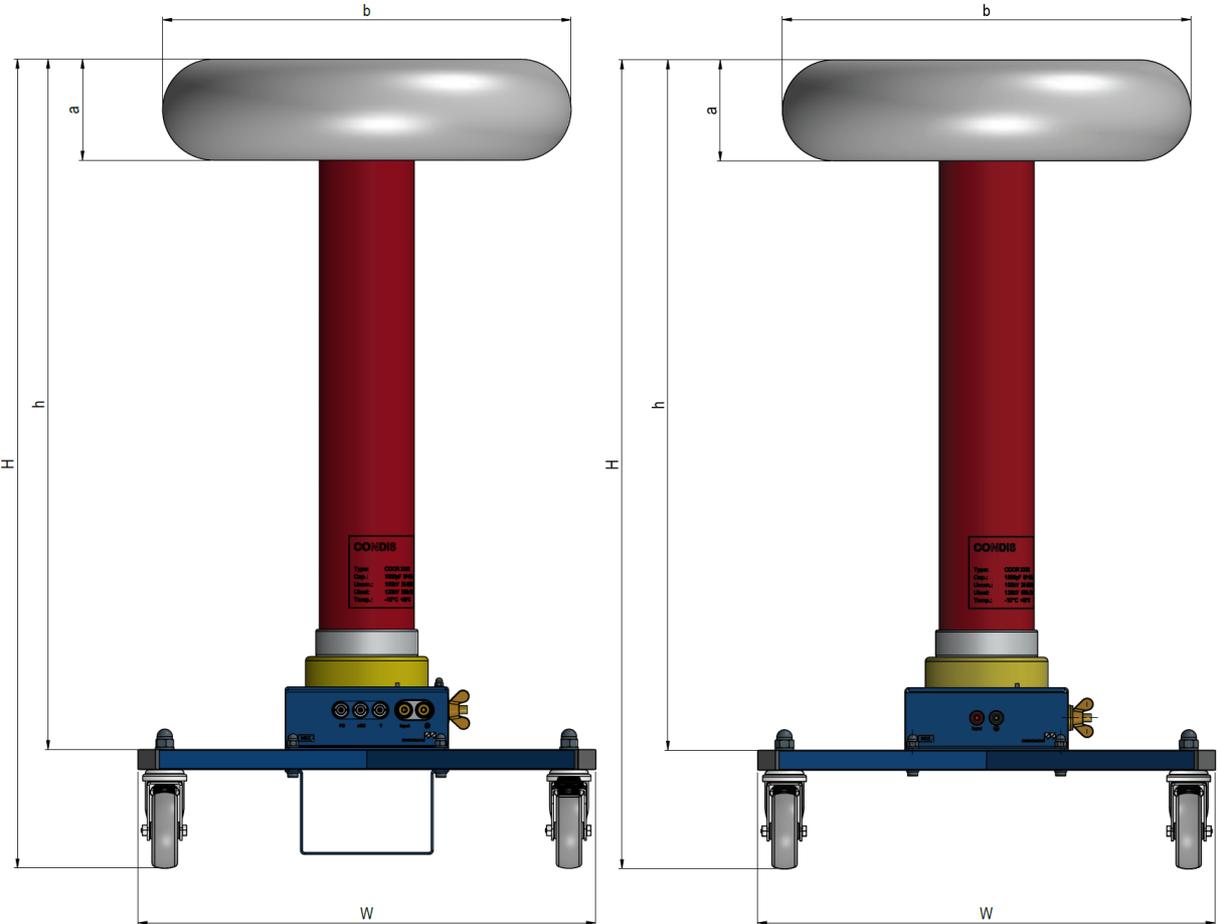


Figure 4-1: Left: MCC 210 with integrated quadripole CPL 542 and platform for the MPD and batteries
 Right: MCC 210L with 4 mm connectors to connect an external quadripole

4.2 Specifications valid for the *MCC 210* only

Table 4-4: *MCC 210* (Option D) specifications

Characteristic	Rating
Connectors	3x BNC (V , ARC , PD) 2x 4 mm (Signal , Ground connection) Grounding screw (equipotential ground)
Weight	10 kg / 22.05 lb
Voltage divider factor (see Note : below)	1:5000
Space for measurement devices	Platform for <i>MPD 500/600</i> + <i>MPP 600</i> or <i>MPD 800</i> + <i>RPB1</i>
Integrated quadripole	<i>CPL 542</i> 0.5 A 4 uF
Measurement frequency (PD output)	20 kHz...5 MHz
Test voltage frequency (V output) f_{test}	20...800 Hz
Output voltage (V output)	< 25 V_{rms}
ARC output	5 V impulse in case of a flash-over in the test circuit
Low-arm capacity	4 uF (typical +/- 10 %)

Note: The voltage divider factor depends on the high-voltage capacitance (here $C_{HV}=1000$ pF (-0 % / +10 %)) and low-arm capacitance. The integrated quadripole (*CPL 542*) has a low-arm capacitance of 4 uF (typical +/- 10 %). When using an *MPD 600*, the total low-arm capacitance is about 5 uF (*MPD 600* (1 uF) + *CPL 542* (4 uF)) which leads to the above mentioned voltage divider factor of 1:5000.

4.3 Specifications valid for the *MCC 210L* only

Table 4-5: *MCC 210L* (Option D) specifications

Connectors	2x 4 mm (Output , Ground connection)
Weight	9 kg / 19.84 lb
Measurement frequency for PD	up to 20 MHz
Output voltage (Output) V_{rms}	Should not exceed 200 V_{rms} . Do not leave it unconnected!
Output current (Output) I_{rms}	$I_{rms} = 2\pi \cdot f_{test} \cdot C_{HV} \cdot U_{rms}$ For example: ~500 mA for 100 kV @ 800 Hz Note: Impulse currents can be much higher.

4.4 Standards

Table 4-6: Standards conformity

Tests	Standards	
RoHS	2011/65/EU	
Partial discharge measurement	IEC 60270	
Protection class	IP20, according to IEC/EN 60529	

Support

When you are working with our products we want to provide you with the greatest possible benefits. If you need any support, we are here to assist you!



24/7 Technical support – get support

www.omicronenergy.com/support

At our technical support hotline, you can reach well-educated technicians for all of your questions. Around the clock – competent and free of charge.

Make use of our 24/7 technical support hotlines:

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