

CP CAL1

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 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.

Contents

	About this manual	4
	Safety symbols used	4
1	Safety instructions	5
1.1	Operator qualifications	5
1.2	Safety standards and rules	5
1.2.1	Safety standards	5
1.2.2	Safety rules	5
1.2.3	Safety accessories	6
1.3	Operating the calibration setup	6
1.4	Handling cables	7
1.5	Orderly measures	8
1.6	Static charges	8
1.7	Disclaimer	8
1.8	Compliance statement	9
1.9	Recycling	9
2	Introduction	10
2.1	Designated use	10
2.2	Functional components of the <i>CP CAL1</i>	10
2.2.1	<i>CP CAL1</i> reference capacitor	10
2.2.2	<i>CP CAL1</i> high-voltage connector	11
2.2.3	<i>CP CAL1</i> low voltage connectors	11
2.3	Cleaning	12
3	Calibration setup	13
3.1	Connecting the <i>CP TD1</i> to the <i>Control Device</i>	13
3.2	Connecting the <i>CP CAL1</i>	16
3.3	Disconnecting the <i>CP CAL1</i>	17
3.4	Disconnecting the <i>CP TD1</i>	17
4	Calibration procedure	18
4.1	Settings	18
4.1.1	<i>CPC 100</i> and <i>CPC 80</i>	18
4.1.2	<i>TESTRANO 600</i>	18
4.2	Checking calibration / recalibration of the <i>CP TD1</i>	19
4.2.1	Checking calibration	19
4.2.2	Recalibration	19
4.3	Temperature compensation	20
5	Technical data	21
5.1	Mechanical data	21
5.2	Environmental Conditions	21
5.3	Standards	21
	Support	22

About this manual

This User Manual provides information on how to use the *CP CAL1* calibration unit safely, properly and efficiently. The CP CAL1 User Manual contains important safety rules for working with the *CP CAL1* and gets you familiar with operating the *CP CAL1*. 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 CP CAL1 User Manual always has to be available on the site where the *CP CAL1* is used. The users of the *CP CAL1* must read this manual before operating the *CP CAL1* and observe the safety, installation, and operation instructions therein.

Reading the CP CAL1 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

1.1 Operator qualifications

Working on high-voltage assets can be extremely dangerous. Work with the *CP CAL1* must be carried out only by qualified, skilled and authorized personnel. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *CP CAL1* 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 test. The supervising operator must be familiar with the equipment and the regulations on site.

1.2 Safety standards and rules

1.2.1 Safety standards

Working with *CP CAL1* 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 the *CP CAL1* and its accessories, read the safety instructions in this User Manual carefully.

Do not turn on the *CP CAL1* and do not operate the *CP CAL1* 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 *CP CAL1* and its accessories is only permitted by qualified experts at OMICRON Service Centers (see "Support" on page 22).

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.

1.2.3 Safety accessories

OMICRON offers a range of accessories for added safety during the operation of our test systems. For further information and specifications, refer to the corresponding Supplementary Sheet or contact OMICRON Support.

1.3 Operating the calibration setup

The *CP CAL1* is the calibration unit for the *CP TD1*. Do not connect the *CP CAL1* to any other device than the *CP TD1*.

Only personnel qualified in electrical engineering and trained by OMICRON are authorized to operate the *CP CAL1*.

- Before starting the work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *CP CAL1* 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 calibration procedure.

- Use the *CP CAL1* only in a technically sound condition. Make sure its use is in accordance with the regulations on site and the designated use described in this document.
- Do not enter the high-voltage area if the red status light of the *Control Device* of the *CP TD1* is on since all outputs can carry dangerous voltage or current! *CP TD1 Control Devices* are: *CPC 100*, *CPC 80* or *TESTRANO 600*
- Always obey the five safety rules and follow the detailed safety instructions in the respective user manuals.

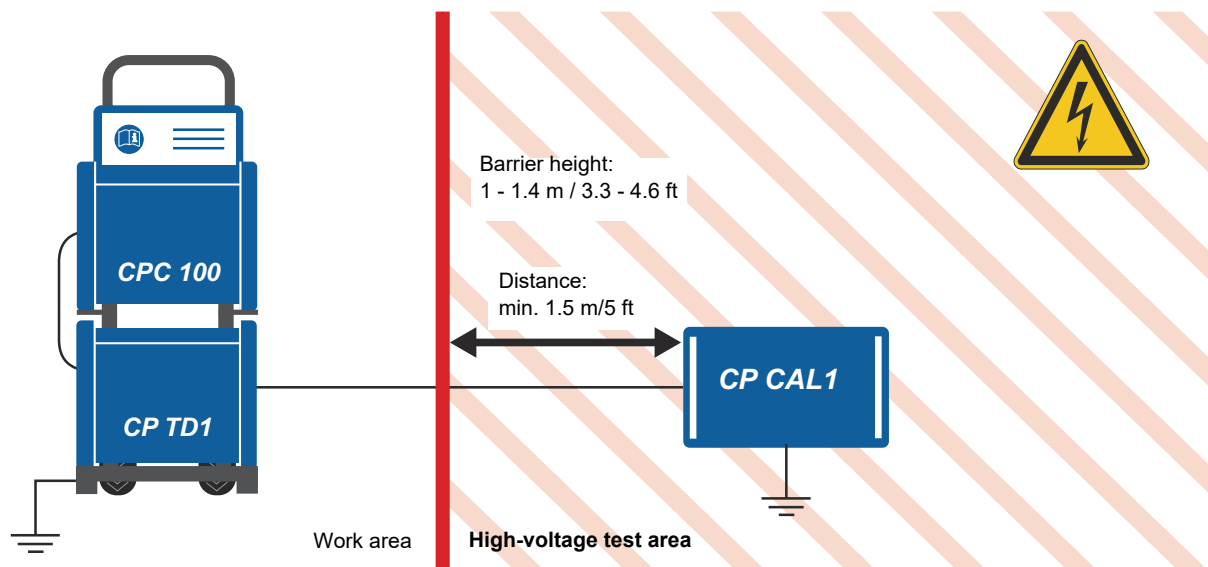


Figure 1-1: Example of the separation of safe and high-voltage area

Before performing calibrations using high voltage, observe the following instructions:

- ▶ Do not use the equipment without a good connection to substation ground.
- ▶ Do not insert objects (for example screwdrivers, etc.) into any input/output socket.
- ▶ Do not operate the *CP CAL1* under ambient conditions that exceed the permissible temperature and humidity limits.
- ▶ Make sure to position the equipment on dry, solid ground.
- ▶ Do not operate the *CP CAL1* in the presence of explosives, gas or vapors.
- ▶ Do not use an extension cable on a cable reel to prevent an overheating of the cord; run out the extension cord.
- ▶ If the *CP CAL1* does not seem to function properly, do not use it anymore. Please call the OMICRON technical support.

1.4 Handling cables

- ▶ Always turn off the *CP CAL1* completely before you connect or disconnect any cable (disconnect the *Control Device* from mains or turn it off via its power switch).
- ▶ The high-voltage cable must always be well attached and tightly connected to both the *CP CAL1* and the *CP TD1*. A loose or even falling off connector carrying high-voltage is life-hazardous. Make sure the connectors are clean and dry before connecting.
Press the high-voltage cable's plug to the connectors tightly and turn the screw cap until you feel a mechanical stop. If you notice a rough-running of the screw-cap, clean the screw thread and use a lubricant (Vaseline recommended).
Note: Tighten the plugs manually. Do not use any tools for that because that can damage the plugs or connectors.
Insert the yellow banana plug (the high-voltage cable's grounding) into the respective plug socket.
- ▶ Do not connect any cable to the test object without a visible grounding of the test object.
- ▶ The high-voltage cable is double-shielded and therefore safe. However, the last 50cm (20 inch) of this cable have no shield. Therefore, during a test consider this cable a life wire and due to the high-voltage life-hazardous!
- ▶ When the *Control Device* is switched on, consider this part of the cable has to be in the high-voltage area due to a hazard of electric shock!
- ▶ Never remove **any** cables from the *CP CAL1* or the *CP TD1* during calibration.
- ▶ Keep clear from zones in which high voltages may occur. Set up a barrier or establish similar adequate means.
- ▶ Do not use any other cables than the ones supplied by OMICRON.

1.5 Orderly measures

The CP CAL1 User Manual or alternatively the e-book in PDF format has always to be available on site where the *CP CAL1* is being used. It must be read and observed by all users of the *CP CAL1*.

The *CP CAL1* 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). This also includes the user documentation of the *CP TD1* and the *Control Device* used (*CPC 100*, *CPC 80* or *TESTRANO 600*).

The manufacturer and/or distributor is not liable for damage resulting from improper usage.

Opening the *CP CAL1* 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.

1.6 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 to the equipment, 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.

► Use safety grounds before handling.

Always observe the five safety rules!

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.

1.8 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 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 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 Introduction

2.1 Designated use

The *CP CAL1* is a calibration unit designated for calibrating the *CP TD1*. The calibration is based on measurements of the known capacitance and dissipation factor values of a high-precision reference capacitor. The calibration procedure is controlled by the *CPC 100* or *CPC 80* test system.

Any other use of the *CP CAL1* 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 components of the *CP CAL1*

2.2.1 *CP CAL1* reference capacitor

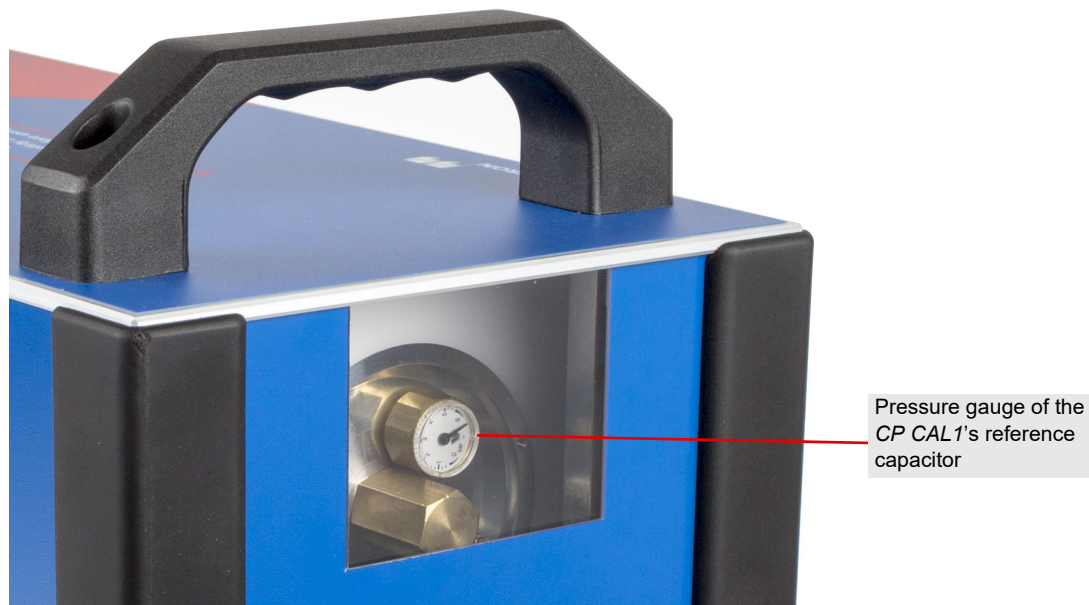


Figure 2-1: Pressure gauge window of the *CP CAL1*'s reference capacitor

An integral part of the *CP CAL1* calibration unit is a high-precision reference capacitor. It is a cylinder capacitor filled by a very dry nitrogen N_2 gas under pressure (of approx. 0.6 MPa). A guard electrode prevents surface leakage current flow from the insulator to the connector on the low-voltage side by bypassing it to earth. Consequently, the relevant insulator between the high-voltage and low-voltage sides consists only of the very dry N_2 gas.

WARNING



Death or severe injury caused by high voltage or current possible

- Don't use the *CP CAL1* if the pressure drops below 0.3 MPa, as the insulation of the reference capacitor may be impaired.

NOTICE**Inaccurate measurement results (resulting in faulty calibration)**

Should the actual pressure deviate from the reference value (given in the Calibration Report) by 0.1 MPa or more, the *CP CAL1* needs to be recalibrated.

2.2.2 *CP CAL1* high-voltage connector

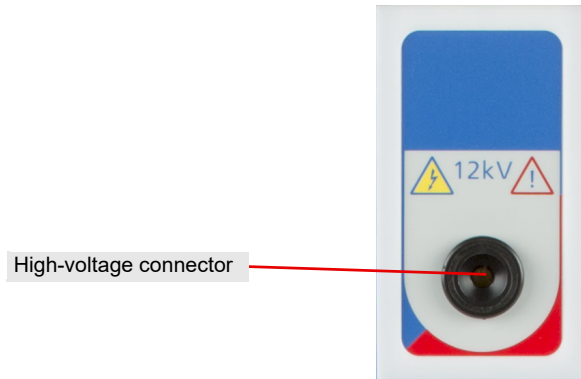


Figure 2-2: High-voltage connector of the *CP CAL1*

The *CP CAL1* provides a high-voltage socket for connecting with the *CP TD1*'s high-voltage output.

2.2.3 *CP CAL1* low voltage connectors



Figure 2-3: Low-voltage connectors C1, C2 and C3 as well as the EG ground connector and equipotential ground terminal

The *CP CAL1* provides three low-voltage connectors C1, C2 and C3 for connecting with the *CP TD1*. The connectors have the same capacitance but different dissipation factor values. On connector C1 a high-precision capacitor with very low dissipation factor is available. For the most accurate results it is recommended to use connector C1.

The EG ground connector is connected with the *CP CAL1*'s equipotential ground terminal (functional earth, protection earth).

2.3 Cleaning



WARNING

Death or severe injury caused by high voltage or current possible

► Prior to cleaning disconnect the device.

To clean one of the devices described in this document, use a cloth dampened with isopropanol alcohol or water.

3 Calibration setup

3.1 Connecting the *CP TD1* to the *Control Device*



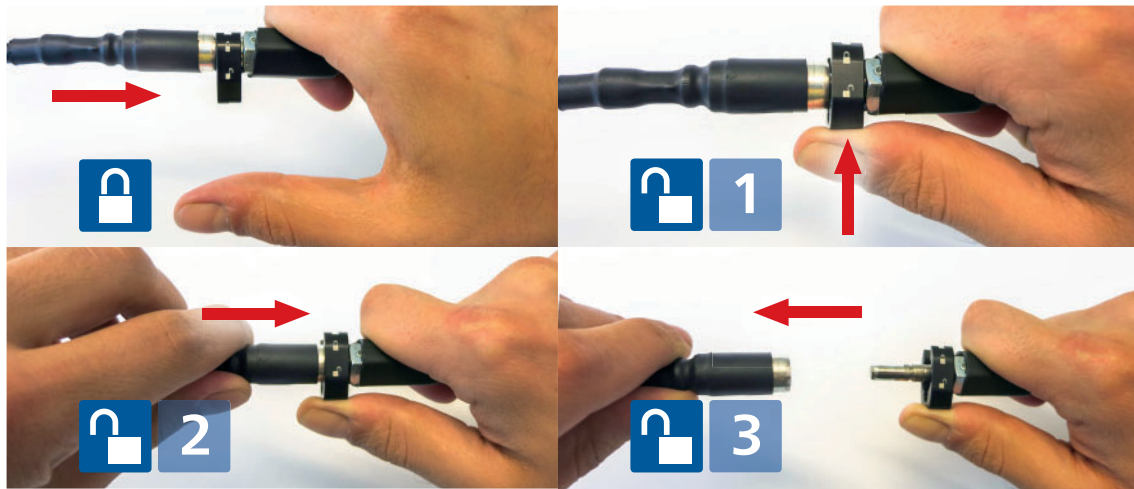
DANGER

Death or severe injury caused by high voltage or current

- ▶ Never use the *CP TD1* without a solid connection to ground with at least 6 mm².
- ▶ Use a ground point as close as possible to the test object.
- ▶ Make sure to position the test object or *CP CAL* in the high-voltage area.

1. Ensure that the *Control Device* is switched off at the mains power switch.
2. Without trolley:
 - ▶ Properly connect the *Control Device* and *CP TD1* grounding terminals to substation ground.
 With trolley (optional):
 - ▶ Connect the trolley's ground bar to earth.
 - ▶ Properly connect the *CPC 100* or *TESTRANO 600* and *CP TD1* grounding terminals to the trolley's ground bar.
3. Make sure that all cable connectors are clean and dry before being tightly connected.
4. Connect the *CP TD1*'s **BOOSTER IN** to the *Control Device*'s **EXT. BOOSTER** with the booster cable.
5. Connect the *CP TD1*'s **SERIAL** to the *Control Device*'s **SERIAL** with the data cable. This cable also provides the power supply for the *CP TD1*.
6. Pull out the measuring cables from the cable drum and connect the test object to the *CP TD1*'s measuring inputs **IN A** and **IN B**.
7. Connect the high-voltage cable from the test object to the *CP TD1*'s **High-voltage** output.
 - ▶ At the *CP TD1*, press the high-voltage cable's plug to the connector tightly and turn the screw cap manually without using any tools until you feel a mechanical stop. If you notice a rough-running of the screw-cap, clean the screw thread and use a lubricant (Vaseline recommended).
 - ▶ Insert the yellow banana plug (the high-voltage cable's grounding) into the respective plug socket.
 - ▶ At the test object, insert the high-voltage cable's plug carefully until you feel a "click" position. Now they are locked. Confirm this by trying to pull them out. This should not be possible now.

The images below show how to unlock the cable connection again. This is also shown on a label fixed to the high-voltage cable.



- After the HV cable connection is established, use the strain relieve delivered with the HV cable to fasten it to the test object.



DANGER

Death or severe injury caused by high voltage or current

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

- During a test, consider this cable a life wire and, due to the high-voltage, life-hazardous.

8. Connect the *Control Device* to the mains power supply using the provided cable.



WARNING

Death or severe injury caused by high voltage or current possible

- Establish a barrier to the high-voltage area.

9. Turn on the *Control Device* at its mains power switch.
10. The green status light lights up, showing that the *Control Device*'s output does not carry a dangerous voltage or current yet (on *TESTRANO 600* the blue ring of the Start/Stop button is additionally lit).



WARNING

Death or severe injury caused by high voltage or current possible

- If none or both status lights are on, the unit is defective and must not be used anymore.

11. An error message appears either if the PE connection is defective or if the power supply has no galvanic connection to ground. The latter is the case on very special power supplies like with generators or when insulation transformers are used.

WARNING



Death or severe injury caused by high voltage or current possible

This is a safety-relevant message. If the reason for this message is that neither PE nor grounding terminal is connected, it can cause injury or possibly death of the operating staff. The operator is fully responsible for any hazard that might occur due to improper grounding.

- ▶ For safe operation always make sure that both PE and grounding terminal are connected.

If the CPC 100 or CPC 80 is the Control Device:

12. If the PE connection and the galvanic ground connection of the power supply are both intact and the error message still appears, you can deactivate the Ground check and continue testing.

WARNING



Death or severe injury caused by high voltage or current possible

If the Ground check is disabled, the operator is fully responsible for any hazard that might occur due to improper grounding.

- ▶ Only deactivate the Ground check if you are completely sure that the measurement equipment is properly grounded via PE and grounding terminal connections.
- ▶ Make sure that the grounding terminal connections stay intact during the whole measurement procedure. If necessary, block the area to prevent unaware people from stumbling over the grounding cables, possibly disconnecting them inadvertently.

Note: After the CPC 100 or CPC 80 has been rebooted, the "Disable ground check" check box is cleared for safety reasons.

3.2 Connecting the CP CAL1

1. Connect the CP CAL1's connector **C1** with the CP TD1's connector **IN A** (red plugs) using the banana cable.
2. Connect the CP CAL1's connector **EG** with the CP TD1's connector **IN B** (blue plugs) using the banana cable.
3. Connect the **High-voltage** input of the CP CAL1 to the CP TD1's **High-voltage** output using the high-voltage cable.
 - ▶ At the CP TD1, press the high-voltage cable's plug to the connector tightly and turn the screw cap manually without using any tools until you feel a mechanical stop. If you notice a rough-running of the screw-cap, clean the screw thread and use a lubricant (Vaseline recommended).
 - ▶ Insert the yellow banana plug (the high-voltage cable's grounding) into the respective plug socket.
 - ▶ At the CP CAL1, insert the high-voltage cable's plug carefully until you feel a "click" position. Now they are locked. Confirm this by trying to pull them out. This should not be possible now.

DANGER



Death or severe injury caused by high voltage or current

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

- ▶ During calibration, consider this cable a live wire and, due to the high-voltage, life-hazardous.

4. Erect a safety barrier as depicted in Figure 3-1 below.

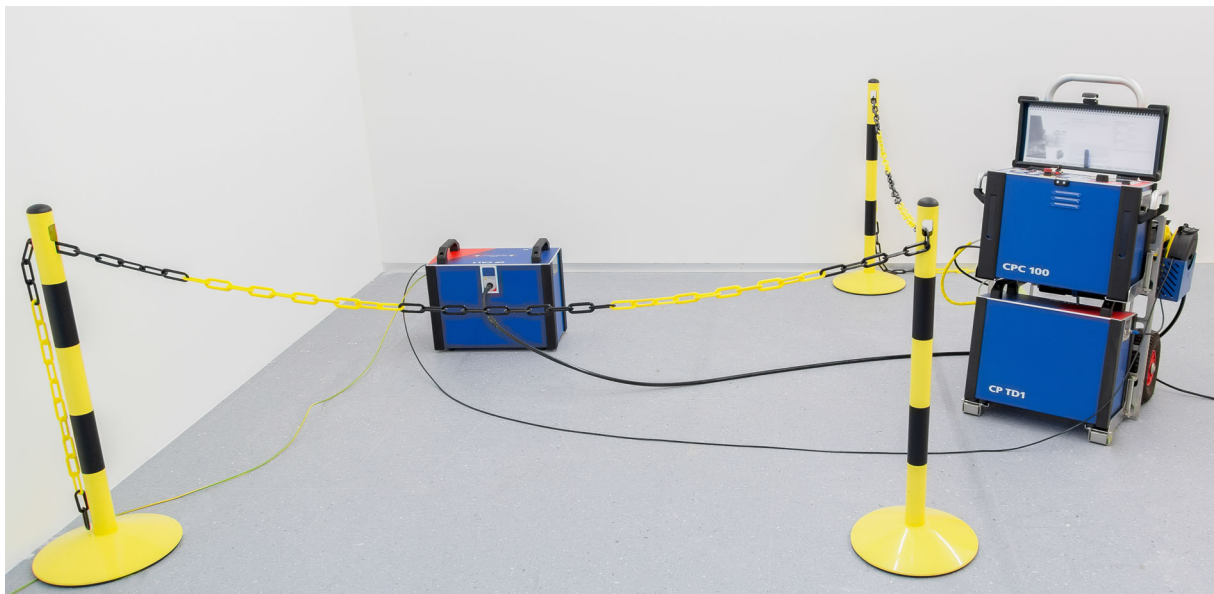


Figure 3-1: CP CAL1 calibration setup with safety barrier

3.3 Disconnecting the *CP CAL1*

1. Switch off the high voltage with the **I/O** (test start/stop) push-button.

**WARNING****Death or severe injury caused by high voltage or current possible**

The green status light indicates that the outputs of the *Control Device* are not activated.

- Even if you switched off the *Control Device*, wait until the red status light is fully extinguished. As long as this status light is lit, there is still voltage potential on the output.

2. Even if you switched off the *Control Device*, wait until the red **I/O** status light is fully extinguished. As long as this status light is lit, there is still voltage potential on the output. Check the operational condition, in particular:
 - that only the green light "0" on the *Control Device*'s front panel is lit and
 - that the *CP TD1* does not give an acoustic warning sound.
3. Turn off the *Control Device* via its
4. Lock the *Control Device* using the key lock on the front panel to avoid anybody accidentally turning on the high voltage.
5. Remove the barrier between the high-voltage and safe area.
6. Disconnect all cables from the *CP CAL1*.

3.4 Disconnecting the *CP TD1*

1. Make sure the *Control Device* is still powered off and locked.
2. Plug off the high-voltage cable from the high-voltage output of the *CP TD1*.
3. Disconnect the cables from the *CP TD1*.

4 Calibration procedure

The *CP TD1* can either be recalibrated or the calibration can be checked by measuring the known capacitance and dissipation factor of the *CP CAL1*'s reference capacitor given in the Calibration Report. The calibration procedure is controlled by the *Control Device*.

Note: Recalibration is only possible if the *CPC 100* or *CPC 80* are used as *Control Device*. With *TESTRANO 600* calibration can only be checked.

For best results, the ambient temperature should be kept at 23 °C / 73.4 °F and the *CP CAL1* should be subjected to that temperature for at least 30 min before a measurement is conducted.

4.1 Settings

4.1.1 *CPC 100* and *CPC 80*

After connecting the *CPC 100* or *CPC 80*, *CP TD1* and *CP CAL1* as described in section 3.1 on page 13 and section 3.2 on page 16, switch on the *Control Device* by the main power switch and select the **TanDelta** test card on the *CPC 100* or *CPC 80*.

In the main window of the test card make the following settings:

1. Select the test voltage. The recommended values are 3000 V and 10000 V.
2. Select the test frequency. The recommended value is 55 Hz.
3. Select the mode UST-A for measuring with the *CP CAL1*'s connector C1.
4. Select the measurement bandwidth ± 5 Hz for the best selectivity.
5. Set the averaging factor to 20.
6. Select the measurement mode Cp, DF(tan δ).

In the **Settings** window of the test card:

1. Clear the **Compensation** check box,
2. Clear the **Use ext. CT** check box.

4.1.2 *TESTRANO 600*

After connecting *TESTRANO 600*, *CP TD1* and *CP CAL1* as described in section 3.1 on page 13 and section 3.2 on page 16, switch on *TESTRANO 600* by the main power switch and select the device's **Tan Delta** settings.

In the **Tan delta test – Settings** view make the following settings:

1. Select the test frequency. The recommended value is 55 Hz.
2. Select the measurement mode **DF, Cap, watt losses**.
3. Set the **Averaging** to 20.
4. Select the measurement **Bandwidth** ± 5 Hz for the best selectivity.
5. Switch the **Avoid test frequency** to **Off**.
6. Switch the **Temperature correction** to **Off**.

In the **Tan delta test – Measurement** view make the following settings:

1. Use the UST-A measurement method for measuring with the *CP CAL1*'s connector C1.
2. Set the test voltage (**V test**). The recommended values are 3000 V and 10000 V.

4.2 Checking calibration / recalibration of the CP TD1

4.2.1 Checking calibration

1. Measure the capacitance (Cp) and dissipation factor (DF).
2. Compare the measured values with the reference values of your CP CAL1 compensated for the ambient temperature (see 4.3 "Temperature compensation" on page 20).

4.2.2 Recalibration

Note: Recalibration only is possible with the CPC 100 or CPC 80 as *Control Device*.

If the capacitance differs by less than 100 ppm or the dissipation factor differs by less than 0.005% (e.g. at 3 kV/95 Hz) from the reference values, you do not need to recalibrate the CP TD1. Otherwise, proceed as follows.

Note: If you recalibrate your CP TD1 test system, the factory calibration is valid no more. You are responsible for the accuracy of your CP TD1.

1. Compensate for the ambient temperature (see 4.3 "Temperature compensation" on page 20).
2. Measure the Cp and DF values by pressing the I/O button on the *Control Device*'s front panel.
3. Optionally, make multiple measurements and calculate average values as described in 4.2.1 "Checking calibration" above.
4. Calculate the following values:

$$C_x = C_{ref} / C_p$$

$$DF/PF+ = DF_{ref} - DF$$

where Cp and DF are the measured capacitance and dissipation factor respectively and C_{ref} and DF_{ref} are the respective reference values of your CP CAL1 for the ambient temperature.

5. Press the **Settings** button to open the **Settings** window.
6. Press the **Edit Calib.** button to enable the **Cx** and **DF/PF+** text boxes.
7. Enter the calculated C_x and DF/PF+ values in the **Cx** and **DF/PF+** text boxes.
8. Enter your name in the **by:** text box.
9. Press the **Update Calib.** button.

4.3 Temperature compensation

Note: For best results, the ambient temperature should be kept at 23 °C / 73.4 °F and the *CP CAL1* should be subjected to that temperature for at least 30 min before a measurement is conducted.

The capacitance of the reference capacitor is temperature dependent. The data for your *CP CAL1* calibration unit given in the Calibration Report refer to the temperature of 23 °C. To obtain accurate results, use the *CP CAL1* in a room with constant temperature and compensate for the ambient temperature as follows:

1. After approx. four hours of heat exchange measure the ambient temperature.
It is recommended to use the optional *TH 3631* thermo-hygrometer supplied by OMICRON (see Figure 4-1 below).
2. Calculate the reference value C_{ref} of your *CP CAL1* for the ambient temperature as follows:

$$C_{ref} = C_{ref23} \times [1 + T_c \times (T - 23)]$$

where $T_c = 24 \text{ ppm/}^\circ\text{C}$ is the temperature coefficient
and T is the ambient temperature in °C.

C_{ref23} is the reference value given in the Calibration Report for a measurement voltage of 10 kV and a frequency 55 Hz.



Figure 4-1: *TH 3631* thermo-hygrometer

5 Technical data

Table 5-1: Technical data

Characteristic	Raing
Maximum voltage	12000 V AC (RMS)
Capacity	90... 100 pf
Dissipation factor of the reference capacitor	$\tan(\delta) < 50$ ppm

5.1 Mechanical data

Table 5-2: Mechanical data

Characteristic	Raing
Dimensions (w × h × d)	450 x 330 x 220 mm / 17.7 x 13 x 8.7 inches without handles
Weight	9.6 kg / 21.16 lb

5.2 Environmental Conditions

Table 5-3: Climate

Characteristic	Rating
Temperature	Operating −10...+55 °C / +14...+131 °F ¹
	Storage and transportation −20...+70 °C / −4...+158 °F
Max. altitude	2000 m
Relative humidity	5...95 %; no condensation, tested according to IEC 60068-2-78

1. For best results, the ambient temperature should be kept at 23 °C / 73.4 °F and the CP CAL1 should be subjected to that temperature for at least 30 min before a measurement is conducted.

5.3 Standards

Table 5-4: Standards conformity

Safety		
Safety	IEC / EN / UL 61010-1	
Other		
Humidity	IEC / EN 60068-2-78, 5...95 % relative humidity; no condensation	

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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