OMICRON

# TEST UNIVERSE

World Leader in Innovative Power System Testing Solutions

# PRIMARY TESTING

CP-LINE CATALOG



# Company Profile

## CUSTOMER AND COMPANY PROFILE

### About our customers



Typical customers of our CP product line, which represents our products for primary testing, are engineers and technicians working mainly in commissioning, maintenance testing, and test fields of

- Power transformers,
- Current transformers,
- Voltage transformers,
- Power cables,
- Circuit breakers,
- Rotating machines,

and other electrical power system equipment in utilities and industry.

Our test equipment is also used for automated measuring of resistances (contact resistances, winding resistances, grounding resistances, cable impedances), power factor, dissipation factor, and capacitance, but also for single-phase testing of primary and secondary protective relays (I>, V>, V< or frequency relays.)

### About OMICRON electronics



OMICRON electronics is an international company providing innovative solutions for primary and secondary testing.

Combining innovation, leading edge technology, and creative software solutions, OMICRON's sales have earned world leader status for OMICRON within this niche market. With sales in more than 100 countries, offices in Europe, the United States, and Asia, and a worldwide network of distributors and representatives, OMICRON has truly established its reputation as a supplier of the highest quality.

The automated testing and documentation capabilities of OMICRON testing solutions are important benefits in light of the changing market conditions resulting in restructured organizations required to "do more with less".

Today, OMICRON's products revolve around a testing concept which provides the solutions to many challenges created by these competitive trends in the marketplace. This integration of lightweight and reliable hardware with flexible and user-friendly software is referred to as the OMICRON Test Universe.

Services in the area of consulting, commissioning, relay testing and training make OMICRON´s product range complete.

Specialization in power system testing along with visionary leadership allows OMICRON to continue with innovative developments for its testing solutions to meet the customer needs of the 21st century.

### Subjects covered in other catalogs

SECONDARY TESTING - CM line catalog
OMICRON's product range in the area of secondary testing.

For a detailed list on literature currently available, please refer to **www.omicron.at**/support/literature or **www.omicronusa.com**/support/literature.

# Table of Contents

## TABLE OF CONTENTS


| | | |
|---|---|---|
| Multifunctional Primary Test System CPC 100 | 4 | Overview |
| | 5 | Interface Elements |
| | 7 | Technical Data |
| | 8 | Applications |
| | 9 | Current Transformer (CT) |
| | 12 | Voltage Transformer (VT) |
| | 13 | Power Transformer |
| | 14 | Resistance |
| | 15 | Automatic Test Procedures |
| | 16 | Power Factor, Impedance Measuring |
| | 17 | Reports, Offline Test Preparation |
| CPC 100 Accessories | | |
| TD1 - Tangent Delta / Power Factor Testing | 18 | CP TD1, Technical Data (CPC 100 with CP TD1) |
| CU1 - Line & Ground Impedance Testing | 19 | CP CU1, Technical Data (CP CU1 and CP GB1) |
| Other Accessories | 20 | Oil Test Cell, Compensating Reactor |
| | 21 | Polarity Checker, Current Booster |
| | 23 | Package Options |
| Test & Maintenance Management Database | 24 | TestBase: Test and Maintenance Management |
| Current Transformer Testing / Analysis | 26 | CT Analyzer, Technical Data |
| Sweep Frequency Response Analyzer | 27 | FRAnalyzer, Technical Data |
| Dielectric Response Analyzer | 28 | DIRANA, Technical Data |
| Partial Discharge Analysis System | 29 | MPD 600, Technical Data |
| Universal Current Measuring System | 30 | MI 600, Technical Data |
| | 31 | Contact Addresses |


*ISO 9001 certified*

# CPC 100

## OVERVIEW

### Multifunctional Primary Test System for Substation Commissioning and Maintenance

This world-wide unique system allows for automated testing of power transformers, CTs, VTs, resistance testing, and more.

Providing up to 800 A (or 2000 A with current booster) and 2000 V with a frequency range of 15-400 Hz, it also comes complete with an integrated PC. Its software routines test a wide range of substation equipment, and automatically create customizable reports. The compact design (29 kg / 64 lbs) and the innovative software save testing time and minimize transportation costs.

Analog voltages and currents can be measured with very high precision. Its Ω meters offer ranges from μΩ to kΩ to allow for a wide variety of applications. Testing of unconventional equipment, such as Rogowski Coils or current sensors completes the spectrum. Additional applications can be added with the use of flexible accessories to include tangent delta / power factor testing and primary measurements of power system equipment.

#### LIGHTWEIGHT
***29 kg / 64 lbs***
- Less than one fourth the weight of equivalent conventional equipment
- Lower transportation costs saves money
- Easier handling reduces manpower needs
- Low weight reduces injury potential

#### ONE TEST UNIT FOR MULTIPLE USES
- Replaces need for multiple test sets (e.g. high current and voltage sources, μΩ meter)
- Saves time by eliminating need for multiple training
- User-friendly interface reduces training time to one day

#### AUTOMATED TESTING AND REPORTING
- Prepare test plans ahead of time in office (saves time in field testing phase)
- Set up test once, push button to start (saves testing time)
- Results automatically saved (saves time and reduces errors by eliminating manual recording of data)
- Automatic report generation (saves time by eliminating manual report writing; accelerates project completion)
- Print reports via external PC

#### SAFETY FEATURES
- Emergency shut off button
- Safety key lock (block unauthorized use)
- Overvoltage protection on all inputs and outputs

#### PREPARED FOR THE FUTURE
- Able to test unconventional equipment like Rogowski Coils or current sensors
- Unit accessible in a network or with direct PC connection via standard internet protocols
- Maximum flexibility for future enhancements by using DSPs for signal generation and switched mode amplifier technique




#### CURRENT TRANSFORMER (CT)
automatic testing of:
- Ratio, burden and polarity
- Phase and magnitude error
- Excitation curve
- Winding resistance
- Secondary burden
- Dielectric withstand voltage (2kV ac)
- CT circuit continuity

#### VOLTAGE TRANSFORMER (VT)
automatic testing of:
- Ratio and polarity
- Phase and magnitude error
- Secondary burden
- Dielectric withstand voltage (2kV ac)
- VT circuit continuity

#### POWER TRANSFORMER
- Ratio
- Winding resistance
- Tap changer testing
- Excitation current
- Short-circuit impedance measurement
- Leakage reactance

#### RESISTANCE TESTING
- Contact resistance (μΩ)
- Winding resistance (μΩ - kΩ)
- Ground resistance
- Measuring of complex impedances (winding impedances, cable impedances, etc.)

#### PROTECTION RELAYS
- Single phase testing of primary and secondary relays (I>, V>, V<, or frequency relays)

#### ADDITIONAL APPLICATIONS

- **TANGENT DELTA / POWER FACTOR TEST**
  Add the CP TD1 accessory for the most flexible insulation diagnosis system in the industry.

- **LINE & GROUND IMPEDANCES, k-FACTOR, MUTUAL COUPLING**
  Add the CP CU1 accessory for the safest, most accurate system for measuring primary power system parameters.

# CPC 100 Technical Data

## INTERFACE ELEMENTS




**1) 6 A or 130 V AC Output**

**2) Current Output 6 A DC**

**3) Current Measuring Input I AC or DC**

**4) Voltage Measuring Input 300 V AC**

**5) Low Level Voltage Measuring Input 3 V AC**

**6) Voltage Measuring Input V DC / 2-wire resistance measurement**

**7) Binary input for potential-free contacts or voltages up to 300 V DC**

See page 7 for details on outputs and inputs.

**8) Safety key lock**
If locked, the quantities which are currently put out are frozen. The unit does not accept any commands except for an Emergency stop.

**9) Signal Lights**
Green light indicates a safe operation, whereas red light indicates an operation with hazardous voltage and/or current levels at the outputs

**10) Emergency stop button**

**11) Keys for quick selection of your application**

**12) Keys for quick selection of your desired view**

**13) LCD monitor**

**14) Soft-touch keys changing according to the selected application**

**15) Keys for selecting stacked test cards**

**16) Numerical keyboard**

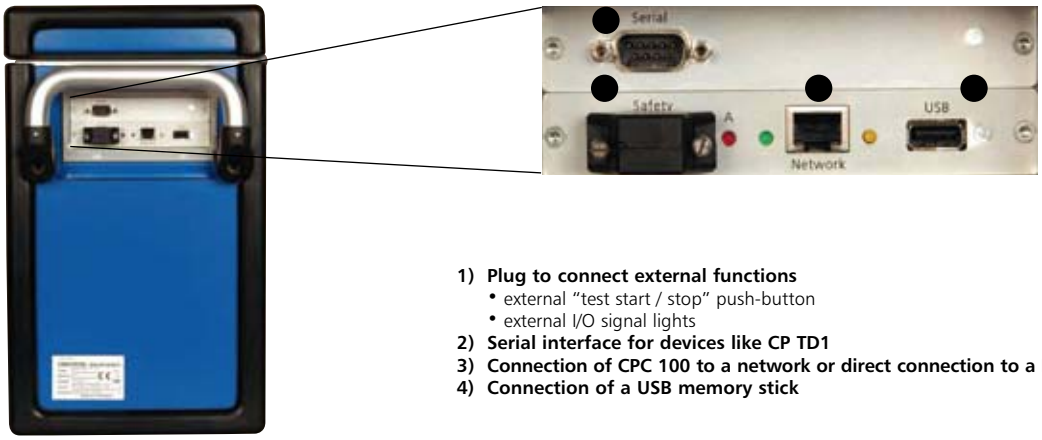
**17) Advanced jog-dial hand wheel with "click" (Enter) function**
The hand wheel allows for navigation within test cards, within other views, or across views, and it also allows for the entering of values. In 'entering' mode, the wheel's adaptive acceleration function will increase / decrease the input value in ever bigger steps, if the wheel is turned fast. Slow turning will increase / decrease the value in ever smaller steps.

**18) Up / down keys for navigation and entering values**

**19) Test start / stop button**

# CPC 100 Technical Data

## *INTERFACE ELEMENTS (CONTINUED)*




1) **Plug to connect external functions**
   - external "test start / stop" push-button
   - external I/O signal lights
2) **Serial interface for devices like CP TD1**
3) **Connection of CPC 100 to a network or direct connection to a PC's network connector**
4) **Connection of a USB memory stick**




1) **Grounding terminal**
2) **High AC Voltage Output 2 kV AC** (1 A...5 A AC)
3) **Ext. BOOSTER**
   for the connection of the booster options
4) **High DC current output 400 A DC**
5) **High AC current output 800 A AC**
6) **Mains power supply,** 1 phase, 85 V-264 V AC
7) **Overcurrent protection**
8) **POWER O/I**

# CPC 100 Technical Data

## TECHNICAL DATA

The output is either voltage or current, and is automatically selected by the software or manually by the user. Current and voltage outputs are overload and short circuit proof and protected against over temperature.

### Generator / Output

#### Current outputs

| Range | Amplitude | $t_{max}$[1] | $V_{max}$[2] | $Power_{max}$[2] | f |
|---|---|---|---|---|---|
| **800 A AC**[3] | 0...800 A | 25 s | 6.0 V | 4800 VA | 15-400 Hz |
| | 0...400 A | 8 min | 6.4 V | 2560 VA | 15-400 Hz |
| | 0...200 A | > 2 h | 6.5 V | 1300 VA | 15-400 Hz |
| **6 A**[10] | 0...6 A | > 2 h | 55 V | 330 VA | 15-400 Hz |
| 3 A[10] | 0...3 A | > 2 h | 110 V | 330 VA | 15-400 Hz |
| **400 A DC** | 0...400 A | 2 min | 6.5 V | 2600 W | DC |
| | 0...300 A | 3 min | 6.5 V | 1950 W | DC |
| | 0...200 A | > 2 h | 6.5 V | 1300 W | DC |
| **6 A DC**[4, 10] | 0...6 A | > 2 h | 60 V | 360 W | DC |
| **2000 A AC**[3] with an optional Current Booster. Please see page 21 for details. | | | | | |

#### Voltage outputs

| Range | Amplitude[5] | $t_{max}$ | $I_{max}$ | $Power_{max}$[5] | f |
|---|---|---|---|---|---|
| **2 kV AC**[3] | 0...2 kV | 1 min | 1.25 A | 2.5 kVA | 15-400 Hz |
| | 0...2 kV | > 2 h | 0.5 A | 1.0 kVA | 15-400 Hz |
| 1 kV AC[3] | 0...1 kV | 1 min | 2.5 A | 2.5 kVA | 15-400 Hz |
| | 0...1 kV | > 2 h | 1.0 A | 1.0 kVA | 15-400 Hz |
| 500 V AC[3] | 0...0.5 kV | 1 min | 5.0 A | 2.5 kVA | 15-400 Hz |
| | 0...0.5 kV | > 2 h | 2.0 A | 1.0 kVA | 15-400 Hz |
| **130 V AC**[10] | 0...130 V | > 2 h | 3.0 A | 390 VA | 15-400 Hz |

#### Internal measurement of outputs

| Output | Range | Guaranteed accuracy | | | Typical accuracy[6] | | |
|---|---|---|---|---|---|---|---|
| | | Amplitude | | Phase | Amplitude | | Phase |
| | | Reading | Full Scale | Full Scale | Reading | Full Scale | Full Scale |
| **800 A AC** | - | 0.20 % | 0.20 % | 0.20 ° | 0.10 % | 0.10 % | 0.10 ° |
| **400 A DC** | - | 0.40 % | 0.10 % | - | 0.20 % | 0.05 % | - |
| **2 kV AC** | 2000 V | 0.10 % | 0.10 % | 0.20 ° | 0.05 % | 0.05 % | 0.10 ° |
| | 1000 V | 0.10 % | 0.10 % | 0.30 ° | 0.05 % | 0.05 % | 0.15 ° |
| | 500 V | 0.10 % | 0.10 % | 0.40 ° | 0.05 % | 0.05 % | 0.20 ° |
| | 5 A | 0.40 % | 0.10 % | 0.20 ° | 0.20 % | 0.05 % | 0.10 ° |
| | 50 mA | 0.10 % | 0.10 % | 0.20 ° | 0.05 % | 0.05 % | 0.10 ° |

Guaranteed values valid over one year within 23 °C± 5 °C (73 °F± 10 °F), in the frequency range of 45 ... 65 Hz or DC. Accuracy values indicate that the error is smaller than +/- (Value read * Reading error + Full Scale of the range * Full Scale Error).

1 With mains voltage 230 V with 2 x 6 m high current cable at 23 °C± 5 °C (73 °F± 10 °F) ambient temperature.

2 Signals below 50 Hz or above 60 Hz with reduced values possible.

3 Output can be synchronized with mains.

4 The input / output is protected with surge arrestors between the pins and against protective earth. In case of energies above a few hundred Joule the lightning arrestors apply a permanent short circuit to the input / output.

5 Signals below 50 Hz or above 200 Hz with reduced values possible.

6 98 % of all units have an accuracy better than specified as Typical.

7 Input is galvanically separated from all other inputs.

8 V1 and V2 are galvanically coupled but separated from all other inputs.

9 There are power restrictions for mains voltages below 190 V AC.

10 Fuse protected.

11 Error of reading < than ± value.

### Inputs

#### Measuring inputs

| Input | Imped. | Range | Guaranteed accuracy | | | Typical accuracy[6] | | |
|---|---|---|---|---|---|---|---|---|
| | | | Amplitude | | Phase | Amplitude | | Phase |
| | | | Reading | Full Scale | Full Scale | Reading | Full Scale | Full Scale |
| **I AC/DC**[4,7] | < 0.1 Ω | 10 A AC | 0.10 % | 0.10 % | 0.20 ° | 0.05 % | 0.05 % | 0.10 ° |
| | | 1 A AC | 0.10 % | 0.10 % | 0.30 ° | 0.05 % | 0.05 % | 0.15 ° |
| | | 10 A DC | 0.05 % | 0.15 % | - | 0.03 % | 0.08 % | - |
| | | 1 A DC | 0.05 % | 0.15 % | - | 0.03 % | 0.08 % | - |
| **V1 AC**[8] | 500 kΩ | 300 V | 0.10 % | 0.10 % | 0.20 ° | 0.05 % | 0.05 % | 0.10 ° |
| | | 30 V | 0.10 % | 0.10 % | 0.20 ° | 0.05 % | 0.05 % | 0.10 ° |
| | | 3 V | 0.20 % | 0.10 % | 0.20 ° | 0.10 % | 0.05 % | 0.10 ° |
| | | 300 mV | 0.30 % | 0.10 % | 0.20 ° | 0.15 % | 0.05 % | 0.10 ° |
| **V2 AC**[8] | 10 MΩ | 3 V | 0.05 % | 0.15 % | 0.20 ° | 0.03 % | 0.08 % | 0.10 ° |
| | | 300 mV | 0.15 % | 0.15 % | 0.20 ° | 0.08 % | 0.08 % | 0.10 ° |
| | | 30 mV | 0.20 % | 0.50 % | 0.30 ° | 0.10 % | 0.25 % | 0.15 ° |
| **V DC**[4, 7] | 500 kΩ | 10 V | 0.05 % | 0.15 % | - | 0.03 % | 0.08 % | - |
| | | 1 V | 0.05 % | 0.15 % | - | 0.03 % | 0.08 % | - |
| | | 100 mV | 0.10 % | 0.20 % | - | 0.05 % | 0.10 % | - |
| | | 10 mV | 0.10 % | 0.30 % | - | 0.05 % | 0.15 % | - |

- Automatic range switching
- Galvanically separated potential groups: **I AC/DC** ; **V1 & V2** ; **V DC**
- AC frequency range 15 - 400 Hz
- Protection of **I AC/DC** input: 10 A FF fuse[4]

**Binary input for dry contacts or voltages up to 300 V DC**[7] - see (7) on page 5

| | |
|---|---|
| Trigger criteria | Toggling with potential free contacts or voltages of up to 300 V. |
| Input impedance | > 100 kΩ |
| Response time | 1 ms |

#### Ω meter (DC)

| Mode | Connection | Range | Current | Accuracy (full scale) | |
|---|---|---|---|---|---|
| | | | | Guaranteed | Typical |
| 0.5 µΩ ... 12.5 mΩ | 4-wire | 400 A DC | 400 A | 0.85 % | 0.45 % |
| 10 µΩ ... 1 Ω | 4-wire | 6 A DC | 6 A | 0.60 % | 0.35 % |
| 100 µΩ ... 10 Ω | 4-wire | 6 A DC | 1 A | 0.40 % | 0.25 % |
| 0.2 Ω ... 20 kΩ | 2-wire | V DC in | <5 mA | 1.00 % + 0.2 Ω[11] | 0.50 % + 0.1 Ω[11] |

### General

| | | |
|---|---|---|
| Display | | 1/4 VGA greyscale LCD display |
| USB Memory | | USB 2.0 |
| | | Guaranteed communication of USB sticks supplied by OMICRON |
| **Power Supply** | | |
| Single-phase, nominal[9] | | 100 V AC ... 240 V AC, 16 A |
| Single-phase, permissible | | 85 V AC ... 264 V AC (L-N or L-L) |
| Frequency, nominal | | 50/60 Hz |
| Power consumption | | <3500 VA (<7000 VA for short time < 10 sec) |
| Connection | | IEC320/C20 |
| **Environmental conditions** | | |
| Operating temperature | | -10 ... +55 °C (+14 ... +131 °F) |
| Storage temperature | | -20 ... +70 °C (-4 ... +158 °F) |
| Humidity range | | Rel. humidity 5 ... 95 %, non-condensing |
| Shock | | IEC68-2-27 (operating) 15 g / 11 ms half sine |
| Vibration | | IEC68-2-6 (operating) 10 ... 150 Hz : 2g |
| **EMC Emission** | Europe | EN 61000-6-4, EN 61000-3-2 |
| | International | IEC 61000-6-4; IEC 61000-3-2 |
| | USA | FCC Subpart B of Part 15 Class A |
| **EMC Immunity** | Europe | EN 61000-6-2; EN 61000-4-2/3/4/8 |
| | International | IEC 61000-6-2; IEC 61000-4-2/3/4/8 |
| **Safety** | Europe | EN 61010-1 |
| | International | IEC 61010-1 |
| | | Produced and tested in an EN ISO 9001 certified company |
| **Weight** | | 29 kg (64 lbs), robust case with cover |
| **Dimensions** | | 468 x 394 x 233 mm (18.6 x 15.5 x 9.2 ") |
| | | (W x H x D with cover, without handles) |

# CPC 100 Applications

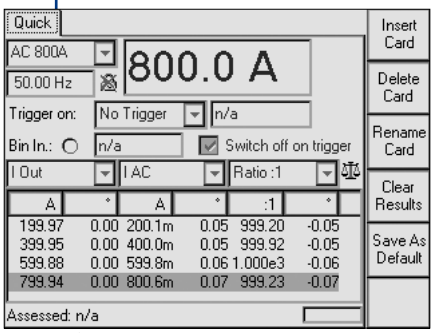
## APPLICATIONS



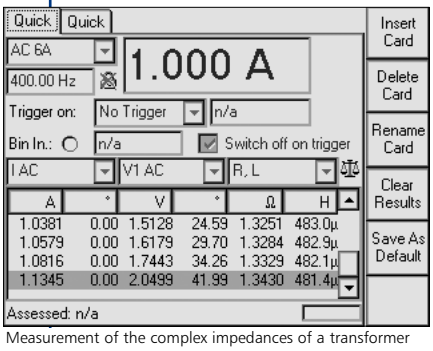

The software described in the Software section runs in the embedded processor within the CPC 100 and can be operated with front panel control.

No additional PC is required.

### Quick Manual Control




CPC 100 front panel displaying a CT ratio measurement




Measurement of the complex impedances of a transformer

## Quick

Testing almost any function using direct manual control of the current and voltage outputs and measurements

This function allows any manipulation of the selected output range of the CPC 100. All output terminals available on the CPC 100 can be selected and controlled.

Measuring two quantities in two columns such as AC or DC voltages in amplitude and phase angle, AC or DC currents in amplitude and angle, or the frequency of any selected output, is easily done by selecting the desired quantities.

Quick also automatically performs calculations derived from the quantities described above, such as S, P, Q, Z, R, R-X, $R_s$-$L_s$, $R_s$-$C_s$, ratio:1, ratio:5, $\Delta V$ and $\Delta I$, and displays them in the third column.

Any relevant measured value can easily be stored by pressing Keep Result. Thus, all important results are arranged and displayed in a table, and can be further investigated at any time. The entire testing session can be saved as a file.

A trigger functionality allows for triggering to a certain event, such as reaching a threshold value or the switching of a contact. The trigger can be binary or analog, or it can be an overload of the unit. For each trigger event, both the current output value and the delay time are measured, which allows the testing of pick up and drop off values of primary relays.

Complex impedances of transformers, inductors or capacitors can be measured. The amplifier technology used enables a wide range of testing frequencies different from the mains frequency. The built-in digital filters allow for sensitive and selective measuring without interference problems. With this concept, a lot of tests can be performed with small test signals (instead of using big and heavy conventional test equipment with high test signals at mains frequency).

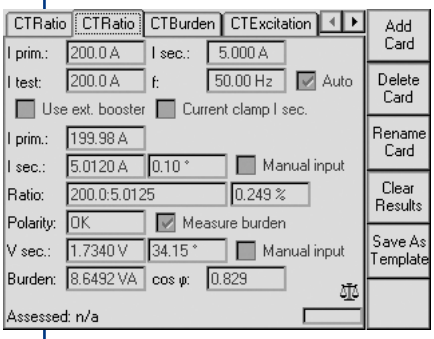
Reporting is done automatically.

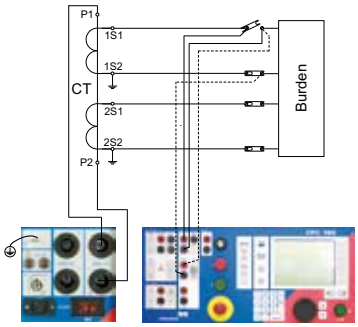
# CPC 100 Applications

## CURRENT TRANSFORMER (CT)

### CT Ratio, Burden, and Excitation

Note: for input current measuring, the direct current input or the current probe can be used.



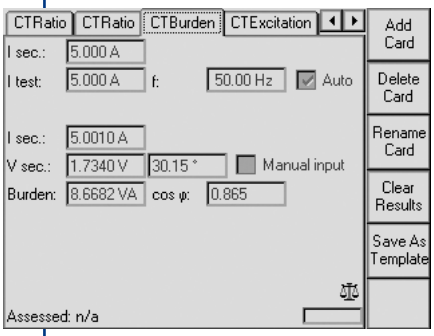

## CT Ratio Burden

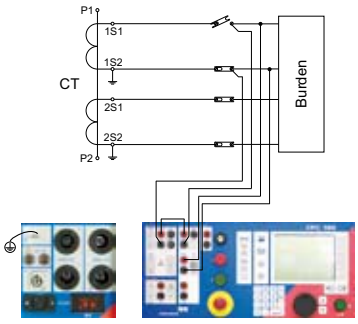
Tests ratio, polarity (and burden) with direct injection to CT primary current input and measuring of secondary output

After entering I primary, I secondary and test current, and pressing the Start button, the test card measures:

- Secondary current with magnitude and angle (CT angle error)
- Ratio with error in percent
- Polarity on the CT terminals
- Connected burden in VA and power factor (cos φ)

Duration of the test: ~ 3s including automatic reporting
Output: up to 800 A (2000 A) AC
Input: up to 10 A AC / 3 V or 300 V via current clamp.



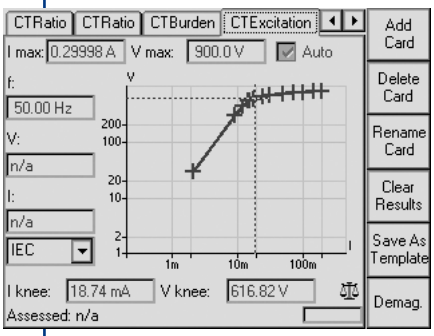

## CT Burden

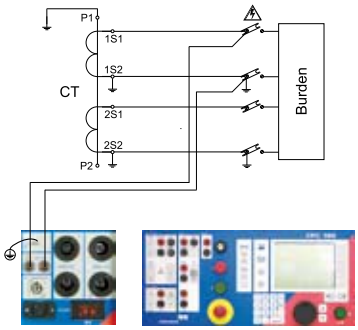
Measures connected CT burden load with direct injection of secondary current with disconnected CT

After entering the secondary nominal current and the test current, and pressing the Start button, the test card measures:

- Secondary voltage in magnitude and angle
- Connected burden in VA and power factor (cos φ)

Duration of the test: ~ 3s including automatic reporting
Output: up to 6 A AC
Input: up to 10 A AC / 3 V via current clamp and 300 V



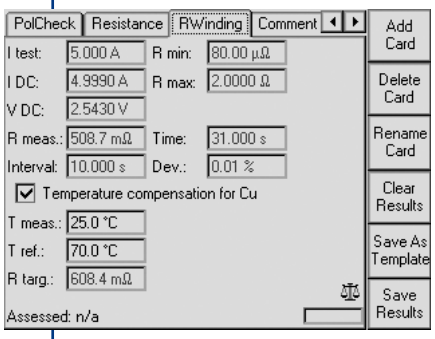

## CT Excitation

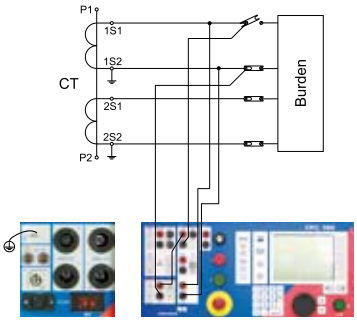
Tests the excitation curve

The necessary wiring is only two leads from the voltage output to the open secondary wiring of the CT. After entering the current and voltage limits and pressing the Start button, the test card will automatically record the CT excitation curve according to IEC 60044-1, ANSI 45°, or ANSI 30° standards, and the knee point will be automatically calculated. After the test the core is demagnetized. The test is done using a regulated voltage source.

Duration of the test: ~ 30 s including automatic reporting with recorded excitation curve, and calculated knee point voltage.
Output: up to 2000 V AC

## Winding Resistance, Voltage Withstand Test, and CT Ratio V



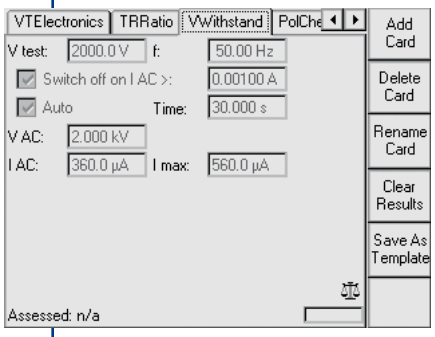

## Winding Resistance

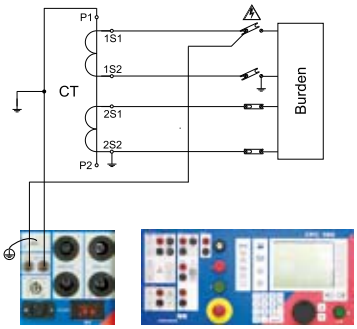
Measures CT winding resistance

After entering the test current and pressing the Start button, the test card

- displays the deviation of the measurement over time during the period of charging the winding
- automatically performs a discharging of the winding after saving the measurement
- measures the DC voltage
- measures the resistance
- (optionally) compensates the temperature behavior of copper, where the applied temperature compensation calculates the resistance for working temperature

Duration of the test: depending on the charging time. After the charging period, the user creates the report by pressing Save Results.
Output: up to 6 A DC or 100 A DC (6.5 V)
Input: up to 10 V DC




## Voltage Withstand

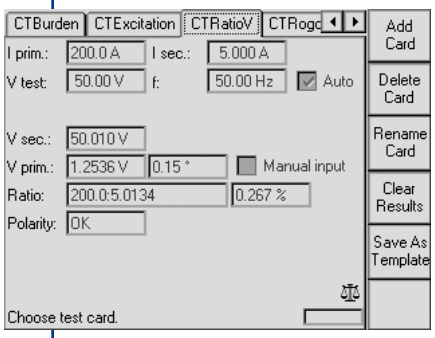
Tests the voltage withstand capability of the insulation between primary and secondary winding or ground and secondary winding

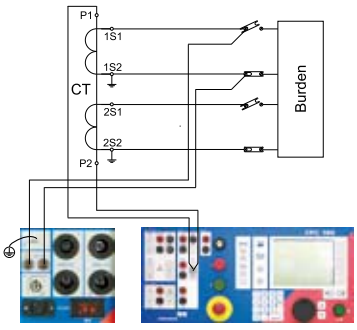
After entering the test voltage and the duration, and pressing the Start button, the test card

- determines the leakage current flowing through the insulation.

The current threshold for maximum leakage current can be entered. The CPC 100 will automatically switch off if the maximum leakage current is exceeded.

Duration of the test: can be set by the user; the test report will be created after the test automatically.
Output: up to 2 kV AC




## CT Ratio V

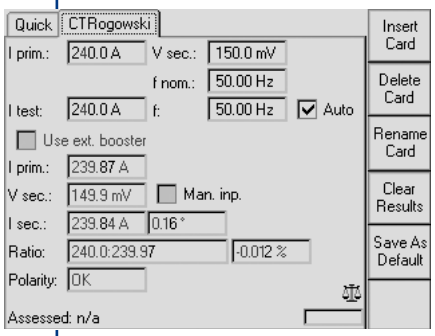
Tests ratio and polarity with direct injection of the voltage to the CT secondary input (common method for bushing CTs)

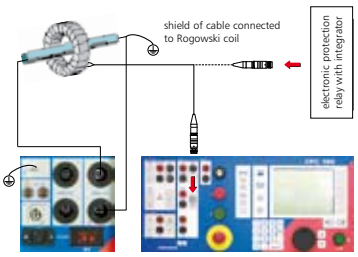
After entering primary and secondary current and the test voltage, and pressing the Start button, the test card

- measures the actual ratio
- calculates the deviation of amplitude and phase angle of the voltage of the CT primary side.

Duration of the test: ~ 3s including automatic reporting
Output up to 130 V.
Input: up to 3 V and 300 V AC

## CT Ratio Rogowski, CT Ratio Low Power



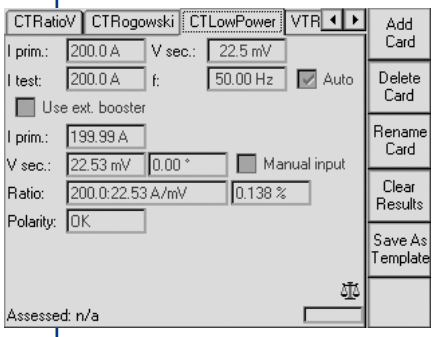

### CT Ratio Rogowski

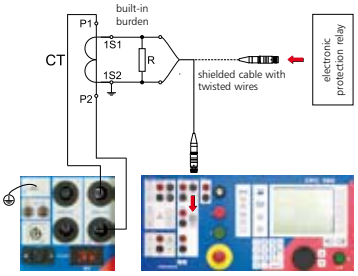
Measures the ratio for CTs with Rogowski coil principle (induced voltage is proportional to the conductor current differentiated with respect to time)

After entering primary current, secondary voltage, test current, nominal frequency and pressing the Start button, the test card

- measures the amplitude of the injected current
- measures the Rogowski coil's output voltage and phase angle
- calculates the actual ratio
- calculates the deviation from the nominal ratio

Duration of the test: ~ 5 s including automatic reporting
Output: up to 800 A (2000 A with Current Booster CP CB2)
Input: up to 3 V AC




### CT Ratio Low Power

Measures the ratio for CTs with low power principle (output voltage is proportional to primary current)

After entering primary current, secondary voltage, and the test current, and pressing the Start button, the test card

- measures the amplitude of the injected current
- measures the low power output voltage and phase angle
- calculates the actual ratio
- calculates the deviation from the nominal ratio

Duration of the test: ~ 5 s including automatic reporting
Output: up to 800 A (2000 A with Current Booster CP CB2)
Input: up to 3 V AC

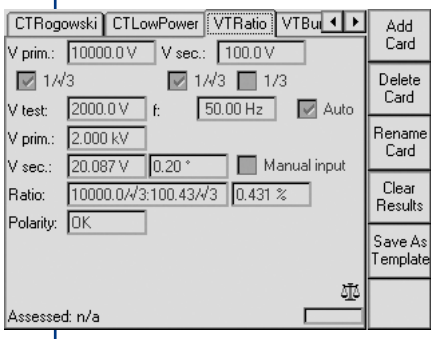
### Polarity Checker

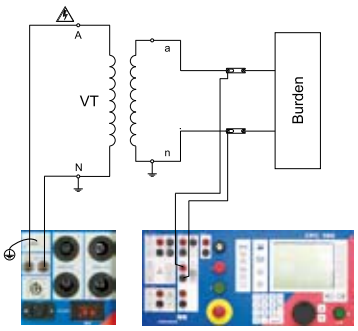
The Polarity Checker option can be found in the Accessories section, page 21.

# CPC 100 Applications

## VOLTAGE TRANSFORMER (VT)

### VT Ratio, Polarity, and Burden, Electronic VT



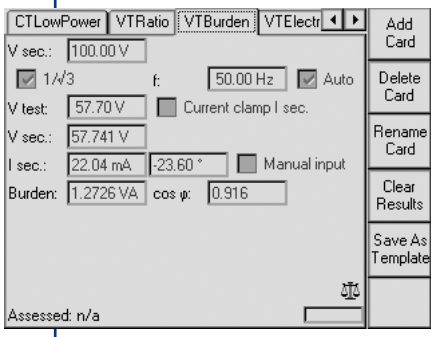

## VT Ratio and Polarity

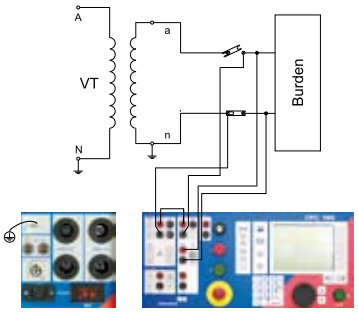
Measures the capacitive or inductive VT ratio and polarity

After entering the primary voltage, secondary voltage and test voltage, and pressing the Start button, the test card

- measures amplitude and phase of the voltage on the transformer's secondary side
- calculates the actual ratio, the deviation and the polarity

Duration of the test: ~ 5 s including automatic reporting
Output up to 2 kV
Input: up to 300 V AC



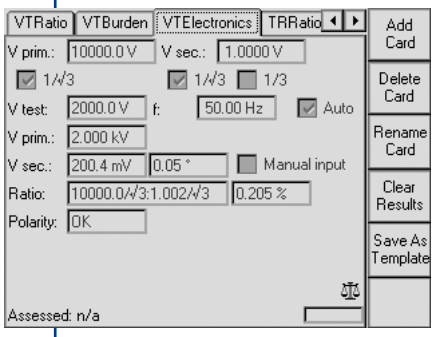

## VT Burden

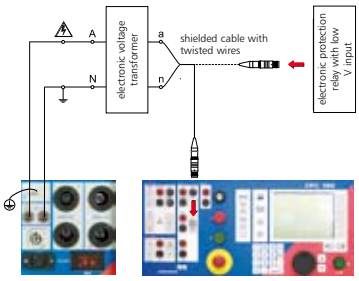
Measures the connected secondary burden of the VT

After entering the nominal secondary voltage and the test voltage, and pressing the Start button, the test card measures

- the connected secondary burden with voltage injection on the VT's secondary side
- the connected secondary burden in VA and the power factor (cos φ) including the secondary current and the angle between voltage and current

Duration of the test: ~ 5s including automatic reporting
Output up to 130 V AC
Input: up to 10 A AC and 300 V AC




## Electronic Voltage Transformer

Measures ratio and polarity of non-conventional electronic VTs

After entering the primary voltage, the secondary voltage and the test voltage, and pressing the Start button, the test card

- measures the low level secondary voltage
- calculates the actual ratio, the deviation, and the polarity.

Duration of the test: ~ 5s including automatic reporting
Output: up to 2 kV
Input: up to 3 V or 300 V AC

## Voltage Withstand Test

The voltage withstand test is described in the CT section, page 10.

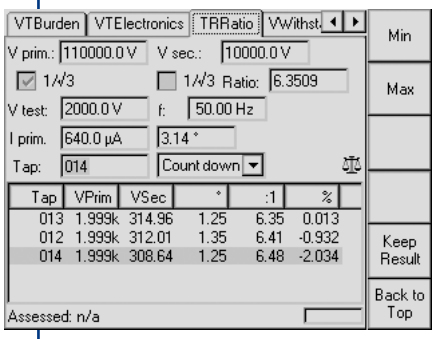
## Polarity Checker

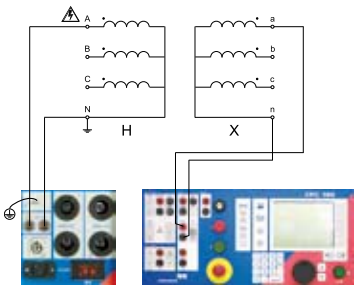
The Polarity Checker option can be found in the Accessories section, page 21.

# CPC 100 Applications

## POWER TRANSFORMER

### Power Transformer Ratio, Tap Changer Test



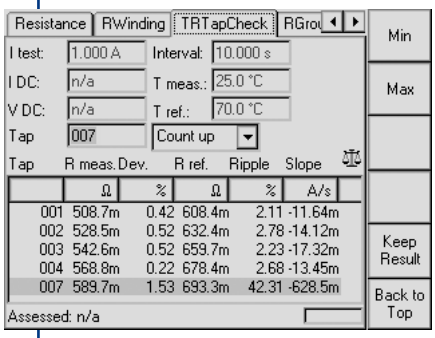



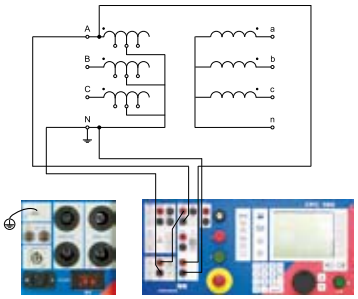

## Transformer Ratio (per Tap)

Measures ratio and excitation current per tap

For this test, a test voltage of up to 2 kV is injected on the transformer high voltage side. This voltage is measured internally with high precision. The voltage (amplitude and phase angle) on the low level voltage winding is measured back via the measuring input. The ratio is calculated automatically. The excitation current in amplitude and phase angle is also measured and reported.

Duration of the test: ~ 5 s per tap including automatic reporting
Output: up to 2 kV
Input: up to 300 V



## Resistance and Continuity of OLTC (per Tap)

Measures winding resistance per tap and detects interruptions of on-load tap changer (OLTC) diverter switches

The voltage drop at the winding resistance is measured with a sense line. The resistance value of each tap can easily be saved to a table containing all taps. An automatic temperature compensation is possible. Interruptions of the current because of a faulty diverter can be detected.

Duration of the test: depends on the inductivity of the winding inductance. Due to the high output voltage of up to 65 V, testing time is reduced
Output: up to 6 A DC (65 V) or up to 100 A DC (6.5 V)
Input: up to 10 V DC and 10 A DC

## Leakage Reactance

A test template to determine the leakage reactance is provided. For the measurement the sequencer card is used and the results are carried out in Excel.

## Voltage Withstand Test

The voltage withstand test is described in the CT section, page 10.

## Winding Resistance

The winding resistance test is described in the CT section, page 10.

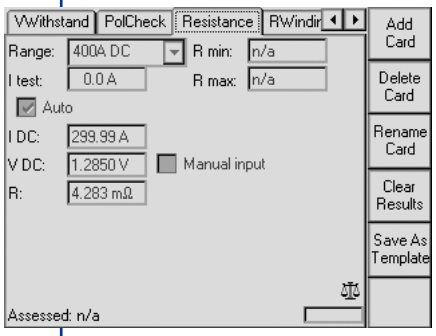
## Power Factor

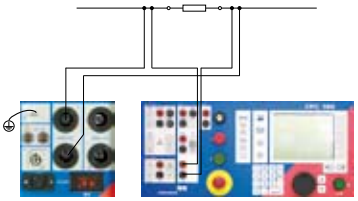
See CPC 100 Accessories - CP TD1 tangent delta / power factor measuring, page 18.

# CPC 100 Applications

## RESISTANCE

### Resistance μΩ measurement, Ground Resistance



## Resistance μΩ Measurement

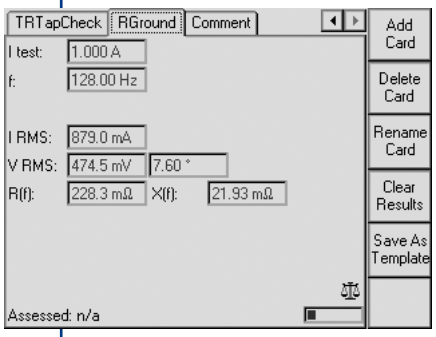
Measures test objects with very low resistance such as contacts of circuit breakers and buswire connectors

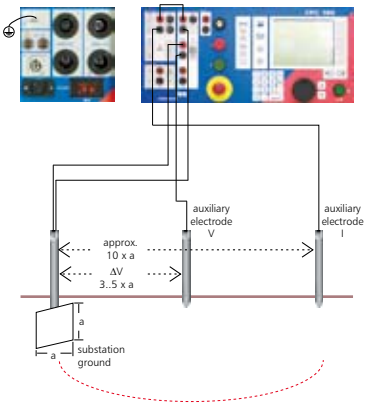
After connecting the test object (4-wires), entering the test current, and pressing the Start button, the test card measures

- the resistance of the test object.

The test current can be selected from 0 ... 400 A.

Duration of the test: ~ 5 s including automatic reporting
Output: up to 400 A DC
Input: up to 10 V DC




## Ground Resistance

Measures ground resistance or soil resistivity

The ground resistance of substations can be measured with two auxiliary electrodes which are put into the ground. To avoid influences from the mains current and its harmonics, this measurement should preferably be carried out with 128 Hz. The high output power of the CPC 100 ensures a high ratio of the signal level to the noise level. Thanks to the signal processor technology, the measuring procedure is very selective and disturbances by ground currents are reduced to a minimum. For large grounding systems, the auxiliary electrode for the current injection is replaced by a second grounding system which is connected to the current output of the CPC 100 via an auxiliary line. For this application the use of CP CU1 (see page 19) is recommended to obtain higher output power. For measuring the soil resistivity four auxiliary electrodes are used.

Duration of the test: ~ 5 s including automatic reporting
Output: up to 6 A AC
Input: up to 3 V or 300 V AC and 10 A AC

## Winding Resistance

The winding resistance test is described in the CT section, page 10.

## AUTOMATIC TEST PROCEDURES

### Sequencer and Ramping

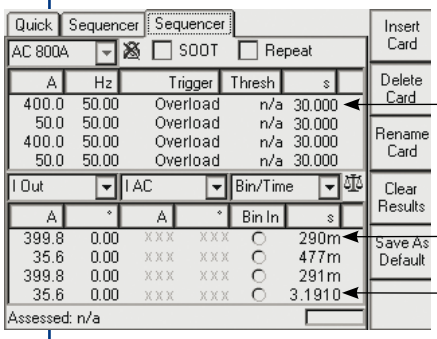
With general application cards, some simple testing of single phase relays is possible, such as the determination of trip times of I>, V>, V<, or frequency relays. With Sequencer and Ramping the user can create her/his own automatic test procedures.

## Sequencer

**Typical Applications**

- Testing of auto-reclosure cycles with primary current injection up to 2000 A; opening/closing of the circuit breaker contact is detected internally by the OMICRON hardware, so no extra wiring is required;
- Measurement of the opening/closing time of circuit breakers;
- Testing of primary overcurrent relays;
- Testing of low voltage circuit breakers with protection functions; etc.
- Automatic testing with different amplitudes (e.g. CT ratio at 0.05 In, 0.2 In, 0.5 In, 1 In and 1.2 In)

The user can define consecutive states and the transition between states, which can be initiated by a time-out, a trigger, or a combination of the two. Seven successive automatic measurements on predefined levels are possible. Further, the signals can be generated with a repeat function, so that the sequence can be run in an "endless loop"; up to 100 results can be recorded.



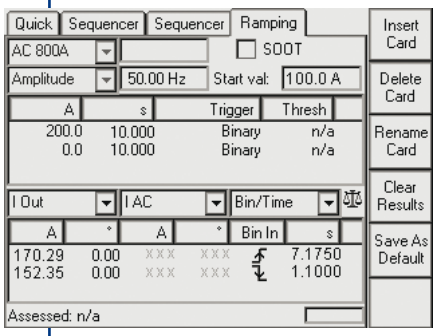

**Example: Overcurrent relay with auto-reclosure function**

**State 1: wait for the circuit breaker (CB) to open**
Output 400 A until the trigger condition "Overload" occurs.
The measurement table displays: relay time + the CB opening time = 290 ms

**State 2: wait for the CB to close (short dead time)**
Output 50 A until the "Overload" condition that started state 2 clears.
The measurement table displays: short dead time + CB closing time = 477 ms

**State 3: wait for the CB to open**
Like state 1

**State 4: wait for the CB to close (long dead time)**
The measurement table displays: long dead time + CB closing time = 3.1910 s




## Ramping

The functionality of the Ramping test card includes the automatic measurement of the pick up and drop off values of overcurrent relays. Also, CB contact resistances can be measured with ramp functions to avoid induced voltages in CT windings. Up to five ramps can be defined, with detailed results being available for each.

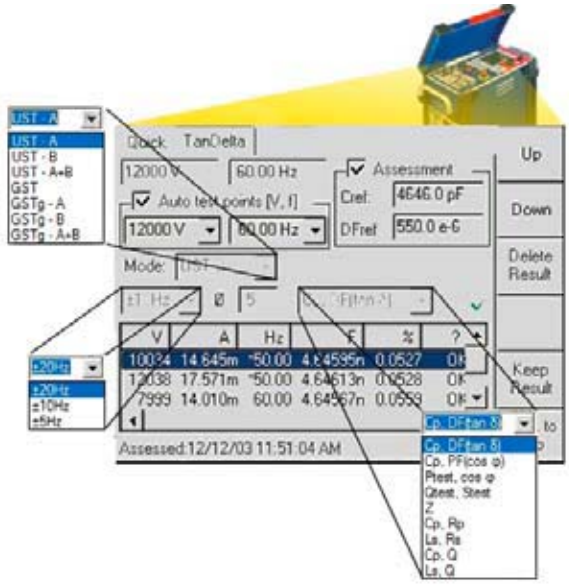
# CPC 100 Applications

## POWER FACTOR & IMPEDANCE MEASURING

TD1

### Insulation Diagnosis (Tangent Delta / Power Factor Test)

The condition of the insulation is an essential aspect for the operational reliability of electrical power transformers, generators, and other high voltage equipment.




CPC 100 + CP TD1 provide laboratory precision for capacitance and dissipation / power factor measurements in the field.

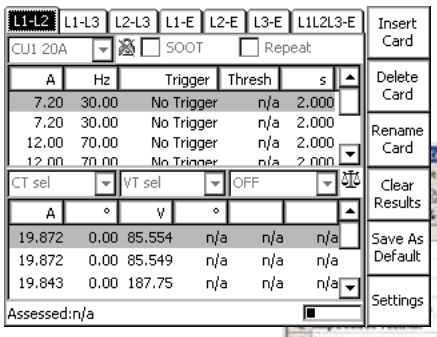
Quantities measured include:

- Capacitance Cp
- Dissipation factor tan δ (tangent delta)
- Power factor cos φ
- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance, Q)

CU1

### Primary Measurements (Line & Ground Impedances, k-factors, mutual coupling)

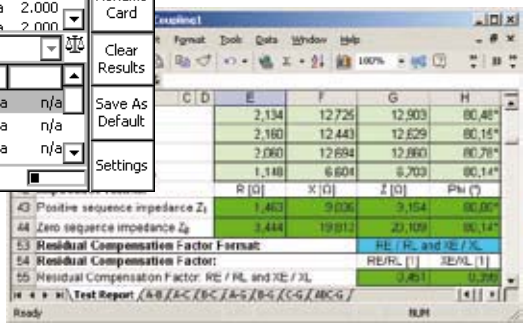
Accurate data of the primary lines, feeders, and grounding are critical for operational reliability of electrical power systems where modeling programs are used for design or when protective settings are applied.




CPC 100 + CP CU1 coupling unit provides the ability to safely and accurately measure parameters of overhead lines, power cables, and grounding grids. This system can determine:

- Line Impedances & k-factors of overhead lines or power cables,
- Mutual coupling of parallel lines,
- Coupling of power lines to signal cables,
- Ground Impedances of large substations,
- Step & touch voltages

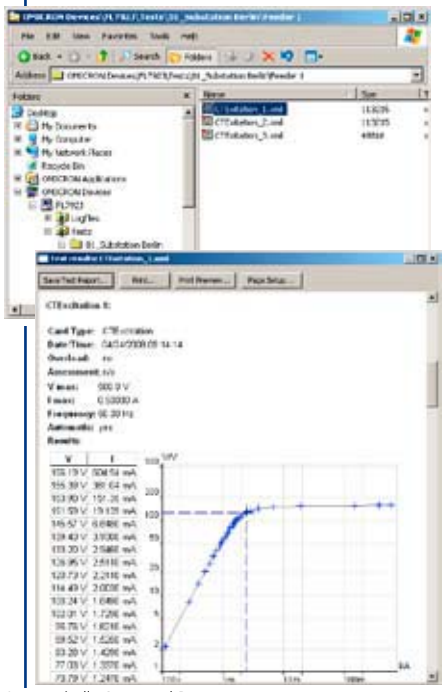
*Transferred measurement results >*



# CPC 100 Report/Test Preparation

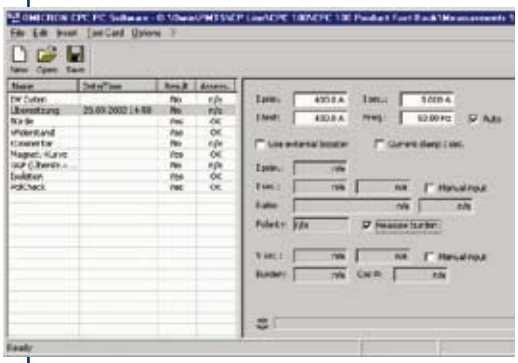
## REPORTS & OFFLINE TEST PREPARATION

### Reports



Automatically Generated Report



## "OMICRON Device Browser" and "CPC Explorer"

The OMICRON Device Browser which is embedded in the Microsoft ™ Windows Explorer, and the CPC Explorer are PC Software tools that are shipped together on the CPC 100 Explorer CD.

You have access to your stored data and tests on the CPC 100 which allows easy management and organization of test data, like:

- direct reporting
- direct editing of tests (only with the OMICRON Device Browser)
- copy and paste data from and to the CPC 100
- easy upgrading of CPC 100 software
- service and maintenance (remote trouble-shooting)
- direct connection to a data base for data exchange (only with the OMICRON Device Browser)

The CPC 100 provides internet connectivity through an Ethernet connection, both in a network and via a directly connected PC.

## Automatic saving of all results or test parameters

All test results are automatically saved and stored with the test. This data can be organized according to the user's needs. Saving tests as templates allows easy reproduction of any test at any time no matter how complex.

## Customized Reports & Standard Reports

A standard report of your results can be created at any time via the Microsoft ™ Windows Explorer using the OMICRON Device Browser or CPC Explorer (PC software). Since the test data is stored in XML format (a standard format for data exchange), the report is provided in HTML format.
Custom reports can be created with the CPC Excel File Loader, Microsoft ™ Word, databases, or any standard text editor software, as XML format is used.

## CPC Excel File Loader (Reporting and Analysis Tool)

Using the CPC Excel File Loader you can load your test results into Microsoft ™ Excel for further calculations of your measurements and for creating your own reports. With the OMICRON Device Browser you can directly open your tests from the CPC 100.

## CPC Templates & Customized Templates

Save time by using the provided CPC templates or by using your own templates. Perform the test with the CPC 100. Load the results into the corresponding CPC Excel File Loader template. Post-processing will be done automatically and you get your calculated results and your report (for example) for:

- Transformer Tap Changer
- Transformer Ratio and Dissipation/Power Factor
- Accuracy Limiting Factor for CT's
- Line Impedance
- …

## CPC Editor

Reduce on-site testing time to a minimum by preparing tests offline on a standard PC. The CPC Editor allows setting up single test cards, or entire tests with several test cards. Saved tests can be used as templates or procedures.

# CPC 100 Accessories

## CP TD1
## TANGENT DELTA & POWER FACTOR

The CP TD1 capacitance and tangent delta / power factor measuring instrument is an accessory unit to the CPC 100, completing its use for power transformer testing with the ultimate insulation diagnosis solution. Controlled by the CPC 100, the CPC 100 + CP TD1 combination provides fully automated testing and reporting capabilities for the comprehensive testing of transformer parameters within one portable system.

The application of innovative measurement techniques and the use of high precision components in the CP TD1 bring laboratory precision with a rugged design into the field of insulation condition testing. The CP TD1 also offers new test methods such as testing with frequency sweeps. A custom-built trolley allows for practical handling on and off-site along with easy and quick breakdown into portable components.

Quantities measured include:
- Capacitance Cp
- Dissipation factor tan δ (tangent delta)
- Power factor cos φ
- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance, Q)




*CP TD1 with transport trolley*

## Technical Data CP TD1 (with CPC 100)

The CP TD1 is connected via interfaces to the CPC 100 and thus does not need further control elements.

| High voltage output | | | |
|---|---|---|---|
| V | I | $t_{max}$ | at f (Hz)[1] |
| 0…12 kV AC | 300 mA | >2 min | 15 … 400 |
| | 100 mA | >60 min | |

| Voltage / current measurement | | |
|---|---|---|
| Range | Resolution | Accuracy |
| 12000 V AC | 1 V | error < 0.3 % reading + 1V |
| 5 A AC | 5 digits | error < 0.5 % reading |
| 8 mA AC | | error < 0.3 % reading + 100 nA |

| Capacitance Cp (equivalent parallel circuit) | | | |
|---|---|---|---|
| Range | Resolution | Accuracy | Conditions |
| 1 pF … 3 μF | 6 digits | error < 0.05 % reading + 0.1 pF | < 8 mA |
| | | error < 0.2 % reading | > 8 mA |

[1] Signals below 45 Hz with reduced values possible. Capacitive linear loads.

| Dissipation factor DF (tan δ) | | | |
|---|---|---|---|
| Range | Resolution | Accuracy | Conditions |
| 0 … 10 % (capacitive) | 5 digits | error < 0.1 % reading + 0.005 % | 15 … 70 Hz |
| | | | < 8 mA |
| 0 … 100 (0..10000 %) | 5 digits | error < 0.5% reading + 0.02 % | - |

| Power factor cos φ | | | |
|---|---|---|---|
| Range | Resolution | Accuracy | Conditions |
| 0 … 10 % (capacitive) | 5 digits | error < 0.1 % reading + 0.005 % | 15 … 70 Hz |
| | | | < 8 mA |
| 0 … 100 % | 5 digits | error < 0.5 % reading + 0.02 % | - |

**Representation of the following values is also possible:**
- Power (active, reactive, apparent)
- Impedance (absolute value, phase, inductivity, resistance, Q)

| | |
|---|---|
| Nominal voltage CPC 100 | 1 x 100 ... 240 VAC / 50 ... 60 Hz / 16 A |
| Operating temperature | -10 … +55 °C (+14 ... +131 F) |
| Transport and storage | -20 … +70 °C (-4 ... +158 F) |
| Relative humidity | 5 ... 95 %, non condensing |

# CPC 100 Accessories

## CP CU1
## LINE & GROUND IMPEDANCE

The multifunctional primary test system CPC 100, in combination with the coupling unit CP CU1, is the world-wide unique measurement system for:

- Line impedances and k-factors of overhead lines or power cables,
- Mutual coupling of parallel lines,
- Coupling of power lines into signal cables,
- Ground impedances of large substations,
- Step and touch voltages.

The test system overcomes the problem of power system frequency interference that has previously made it necessary to use extremely large, high-power equipment to carry out these measurements. The use of switched mode amplifiers and frequency-shift techniques facilitates accurate measurements with compact portable equipment.



The CP CU1 can be ordered with several accessory kits which facilitate and speed up measurements of step and touch voltages as well as ground impedances of large substations.

*CP AL1 with Adapter*




*Multifunctional primary test system CPC 100 in combination with the coupling unit CP CU1 and the grounding box CP GB1*

*CP CU1 requires the CPC 100 to have the CP Sequencer card to work*
*CPC 100 includes the transport case*

## Technical Data CP CU1 (with CPC 100)

For detailed information on the CP CU1 please see our product information brochure "CP CU1 - Extension to the CPC 100".

| Current Output Ranges | |
|---|---|
| Current range | Compliance voltage |
| 0 ... 10 A rms | 500 V rms |
| 0 ... 20 A rms | 250 V rms |
| 0 ... 50 A rms | 100 V rms |
| 0 ... 100 A rms | 50 V rms |

| Measuring Transformers | | |
|---|---|---|
| VT | 600 V : 30 V | class 0.1 |
| CT | 100 A : 2.5 A | class 0.1 |

**Mechanical Data**

| | |
|---|---|
| Protection | IP 20 |
| Dimensions (w × h × d) | 450 x 220 x 220 mm / 17.7 x 8.7 x 8.7 inch |
| Weight | 28.5 kg / 63 lb |

**Environmental Conditions**

| | |
|---|---|
| Operating temperature | -10 ... +55 °C / 14 ... 131 °F |
| Transport & storage Temperature | -20 ... +70 °C / -4 ... 158 °F |
| Relative humidity | 5 ... 95 %, non condensing |
| Safety | EN 61010-1 |
| Prepared for | IEEE 510, EN 50191 (VDE 104), EN 50110-1 (VDE 105 Part 100), LAPG 1710.6 NASA |

[1] At an ambient temperature of 23 °C ± 5 °C / 73 °F ± 10 °F

## Technical Data CP GB1

**Electrical Data**

| | |
|---|---|
| Nominal ac spark-over voltage | <1000 V rms |
| Short circuit proof | up to 30 kA for 100 ms |

**Mechanical Data**

| | |
|---|---|
| Dimensions (Ø × h) | 200 x 190 mm / 7.9 x 7.5 inch |
| Weight | 6.8 kg / 13.2 lb (including grounding cable) |

**Accessories**

Special accessories for step, touch and ground impedance on request

## Overall System (with CPC 100)

**Output Power**[1]

5000 VA, cos φ < 1.0 for 8 s @ 230 V ac mains voltage
5000 VA, cos φ < 0.4 for 8 s @ 115 V ac mains voltage

| Accuracy[1] | | |
|---|---|---|
| Measured value | Typical accuracy | Current range |
| 0.05 ... 0.2 Ω | 1.0 ... 0.5 % | 100 A |
| 0.2 ... 2 Ω | 0.5 ... 0.3 % | 100 A |
| 2 ... 5 Ω | 0.3 % | 50 A |
| 5 ... 25 Ω | 0.3 % | 20 A |
| 25 ... 300 Ω | 0.3 % ... 1.0 % | 10 A |

For detailed information about the CP CU1 please ask for our respective product brochure.

# CPC 100 Accessories

## 12 KV OIL TEST CELL, COMPENSATING REACTOR

### 12 kV Oil Test Cell CP TC12

The CP TC12 is used in conjunction with the CPC100 and the CP TD1 to measure the Permittivity and Tangent Delta / Power Factor of insulation liquids, e.g. transformer oil. The three-electrode design with guard allows precise measurement, especially of small losses.

The circular electrodes are constructed from rigid stainless steel and require a sample of 1.2 to 2 liters (41 to 68 fl.oz.). Electrical connection to the Test Cell is made using the standard cables provided with the CP TD1.




**Technical Data**

| | |
|---|---|
| Cell Type: | Three-terminal, guarded |
| Cell Gap Spacing: | 11 mm (2.31"), nominal |
| Sample Volume: | 1.2 liters (min) to 2 liters (max)<br>(41 to 68 fl.oz.) |
| Cell Capacitance: | 65 pF, nominal (in air) |
| Maximum Test Voltage: | 12 kV rms |
| Voltage Operating Range: | 2.5 to 12 kV for a stress of 200 to 1100 V/mm (7.87 to 43.31 V/inch) |
| Connectors: | 6 mm (0.24") sockets for high voltage cable<br>4 mm (0.15") sockets for measuring cables |
| Dimensions: | 22 x 25 cm (8.7" x 10.2")<br>[diameter x height] |
| Weight: | approx.. 6 kg (13.2 lbs.) |
| Article No.: | VEHZ0601 |

### Compensating Reactor CP CR500

The CP CR500 allows Power Factor / Tangent Delta measurements of large motors and generators. In combination with the multifunctional Primary Test Set CPC 100 and the Tangent Delta / Power Factor unit CP TD1 one CP CR500 compensates capacities of up to 500 nF.

To compensate even larger capacities, two devices can be connected in parallel. This allows compensation of up to 1000 nF.




Benefits:
- Portable high power solution due to size and weight
- Flexible by using different numbers of units and/or by changing the test frequency (35 ... 85 Hz)

**Technical Data** (with one CP CR500)

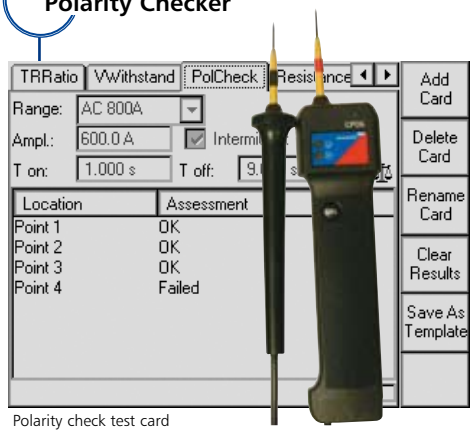
| | |
|---|---|
| Maximum Test Voltage: | 12 kV rms (≥ 50 Hz) |
| Inductors: | 2 x 40 H |
| Current Compensation: | 2 x 1 A |
| Capacity Compensation: | 2 x 250 nF (50 Hz)<br>2 x 500 nF (35 Hz) |
| Dimensions: | 468 x 394 x 233 mm / 18.6 x 15.5 x 9.2" |
| Weight: | 33 kg / 73 lbs |
| Article No.: | VEHZ0602 (single unit)<br>VEHZ0603 (set of two units) |

For detailed information on these products please see our product information sheet "12 kV Oil Test Cell - CP TC 12" and "Compensating Reactor CP CR 500".

# CPC 100 Accessories

## POLARITY CHECKER, CURRENT BOOSTER

### Polarity Checker




Polarity check test card

CPOL polarity checker

### Current Booster CP CB2






The Current Booster CP CB2 connected to CPC 100

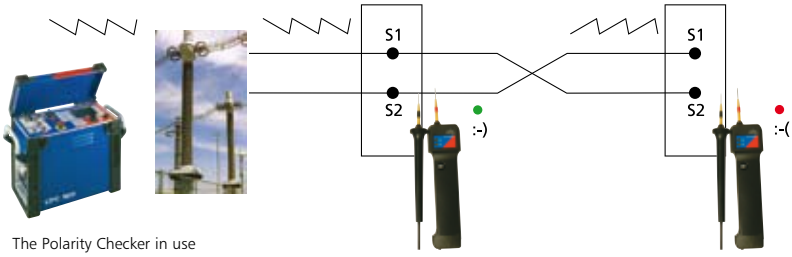
## Polarity Checker (Replacement for Battery Checking Method)

Checks a series of test points for correct wiring

Just inject a the special continuous test signal at one point with the CPC 100 and check the polarity at all terminals with CPOL as shown in fig. 1, getting a clear indication whether the polarity is OK (green LED) or not (red LED).

This procedure is much faster than the conventional method and can easily be performed by a single person.

Duration of the test: depending on the number of test points; 3-5 s per test point




The Polarity Checker in use

## Current Booster CP CB2

Tests applications requiring up to 2000 A

The output current of the CPC 100 can be increased to up to 2000 A by an electronically controlled current booster. The CP CB2 can be connected close to the busbar using short high current leads and to the CPC 100 with a long control cable.

| Current outputs | | | | | |
|---|---|---|---|---|---|
| **Range** | **Amplitude** | **$t_{max}$**[1] | **$V_{max}$**[2] | **$Power_{max}$**[2] | **f** |
| **1000 A AC**[3] | 0...1000 A | 25 s | 4.90 V | 4900 VA | 15-400 Hz |
| | 0...500 A | 30 min | 5.00 V | 2500 VA | 15-400 Hz |
| **2000 A**[4] | 0...2000 A | 25 s | 2.45 V | 4900 VA | 15-400 Hz |

| Internal measurement of outputs | | | | | | |
|---|---|---|---|---|---|---|
| **Output** | **Guaranteed accuracy** | | | **Typical accuracy** | | |
| | **Amplitude** | | **Phase** | **Amplitude** | | **Phase** |
| | **Reading** | **Full Scale** | **Full Scale** | **Reading** | **Full Scale** | **Full Scale** |
| **2000 A AC** | 0.25 % | 0.25 % | 0.50 ° | 0.13 % | 0.13 % | 0.25 ° |
| **1000 A AC** | 0.25 % | 0.25 % | 0.50 ° | 0.13 % | 0.13 % | 0.25 ° |

**Dimensions**: 186 x 166 x 220 mm (7.3 x 6.5 x 8.7 "), without handle
**Weight**: 16.0 kg, 35.3 lbs

[1] With mains voltage 230 V at 23 °C ± 5 °C (73 F± 10 F) ambient temperature.
[2] Signals below 50 Hz or above 60 Hz with reduced values possible.
[3] Outputs in series.
[4] Outputs in parallel.



High current cable set for CP CB2
4 x 1.5 m with 95 $mm^2$ with plugs and clamps
1 x 0.6 m with 95 $mm^2$ for serialization of outputs
VEHK0610



Connection cable to CPC 100 for CP CB2
20 m, 3 x 2.5 $mm^2$
VEHK0611

Includes in option:

- CP CB2 Current Booster
- Connection cable to CPC 100
- High current cable set for CP CB2
- Grounding cable (same as for CPC 100 shown on page 22)
- Transport case (similar model as for CPC 100 shown on page 22, but with different inner shell)

# CPC 100 Accessories

## Cables, clamps and plugs ( ● supplied with CPC 100 Standard Package)



● High current cable set (800 A, 70 mm²)

standard: 2 x 6 m VEHK0612
alternative: 2 x 9 m VEHK0617



● High voltage cable set
(2000 V, screened, 0.5 mm²)
standard: 2 x 6 m VEHK0613
alternative: 2 x 10 m VEHK0618



● Connection clamps for high voltage for connection with banana plugs 4 mm
VEHZ0610



● Grounding cable (GR/YE) 1 x 6 m, 6 mm² with connection clamp
VEHK0615



● Measurement cable set (2.5 mm²)

standard: 6 x 6 m VEHK0614
alternative: 6 x 10 m VEHK0619

Crocodile clamps for connection of banana plugs 4 x 4 mm VEHZ0620



● Low voltage adapter VEHK0623 for V2 AC low voltage level input (0-3 V)

low voltage plug VEHS0610



● Power cord with:

open ends VEHK0621 (standard)
VII connector VEHK0616 (alternative)
ZA connector VEHK0620 (alternative)
BS connector VEHK0624 (alternative)



### Current Clamp

Active ac and dc current probe with voltage output.

| | |
|---|---|
| 2 measuring ranges: | 10 A and 80 A |
| Frequency range: | dc to 10 kHz |
| Accuracy: | error < 2 % for currents up to 40 A and frequencies up to 1 kHz |
| Phase error: | <0.5° at 50/60 Hz |
| Length: | 230 mm (9.1") |
| Article No.: | VEHZ4000 |



● 

### USB memory stick

512 MB,
Article No.: VEHZ0666
(symbol picture)

## Transport cases

OMICRON offers sturdy transport cases with hard-form interiors. Recommended for heavy transport stress or for shipping.



| Case model | For CPC 100 | Carry bag for CPC 100 auxiliaries | For Current Booster CP CB2 |
|---|---|---|---|
| **Capacity** | CPC 100, manual, power cord | Cable sets, current clamps | CP CB2, connection cable, high current cable set |
| **Dimensions (L x H x D)** | 700 x 450 x 500 mm (27.6" x 17.7" x 19.7") | 400 x 250 x 450 mm (15.7" x 9.8" x 17.7") | 700 x 450 x 360 mm (27.7" x 17.7" x 14.2") |
| **Weight** | 10.8 kg (23.8 lb.) | 9.2 kg (20.3 lb.) | 9.0 kg (19.8 lb.) |
| Article No. | VEHP0061 | VEHP0069 | VEHP0071 |

# CPC 100 Package Options

## PACKAGE OPTIONS

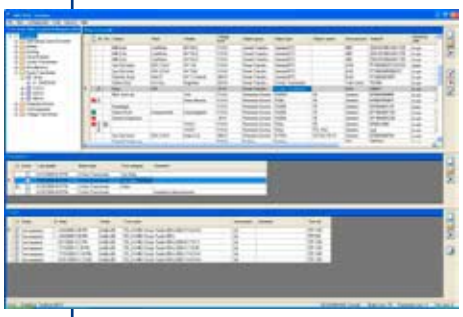
### CPC 100 Package Overview

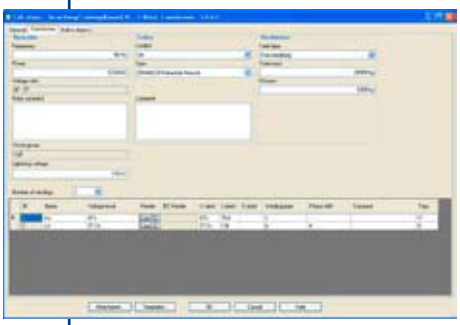
| Item No.: | Description: | Packages[1]: CPC 100 – Standard, VE000611 | CPC 100 – Enhanced, VE000621 | CP TD1 Test Set, VE000640 | CP Transformer Test Set, VE000645 |
|---|---|---|---|---|---|
| | **CPC 100** – Multifunctional Primary Test System including hardware and built in software for testing of the CT's, VT's, power transformers, resistance etc. The basic system includes:<br>• CPC 100 multifunctional test set hardware 110/230 V 50/60 Hz with AC 800 A; AC 2000 V; DC 400 A<br>• QUICK test card (manual control of the test set)<br>• Transport case with wheels for CPC 100 (VEHP0061)<br>• Carry bag for CPC 100 accessories (VEHP0069) | ✓ | ✓ | ✓ | ✓ |
| **VESM0610** | **CP CT test cards:** ratio (V), ratio (I), excitation curve, burden, winding resistance, voltage withstand test (2 kV), Rogowski coils, Low power CT's | ✓ | ✓ | | |
| **VESM0615** | **CP VT test cards:** ratio, burden, voltage withstand test (2 kV), electronic voltage transformers | ✓ | ✓ | | |
| **VESM0620** | **CP transformer test cards:** winding resistance, tap changer check, ratio, voltage withstand test (2 kV) | ✓ | ✓ | | ✓ |
| **VESM0625** | **CP resistance test cards:** contact resistance (μΩ…mΩ), winding resistance (μΩ…kΩ) | ✓ | ✓ | | |
| **VESM0630** | **CP ramping test card:** programmable ramping generator and determination of thresholds | | ✓ | | |
| **VESM0635** | **CP sequencer test card:** sequencer test card for testing with different states (required to use CP CU1) | | ✓ | | ✓ |
| **VESM0640** | **CP GR - ground resistance test option:** includes testing software + hardware accessory (VEHZ0660) | | ✓ | | |
| **VESM0645** | **CPOL:** polarity checking for CT/VT wiring including software + hardware accessory (VEHZ0650) | | ✓ | | |
| **VESM0665** | **CP TD1 test card:** capacitance and dissipation / power factor measurements | | | ✓ | ✓ |
| **VESM0670** | **CPC editor software:** for offline test preparation on a PC | ✓ | ✓ | ✓ | ✓ |
| **VEHK0612** | **High current cable set:** Standard: 2 x 6 m, 70 mm² ( 800 A ) | ✓ | ✓ | | ✓ |
| **VEHK0617** | Alternative: 2 x 9 m, 70 mm² ( 800 A ) | ❑ | ❑ | | |
| **VEHK0613** | **High voltage cable set** (2 kV, screened): Standard: 2 x 6 m, 0.5 mm² | ✓ | ✓ | | ✓ |
| **VEHK0618** | Alternative: 2 x 10 m, 0.5 mm² | ❑ | ❑ | | |
| **VEHK0614** | **Measurement cable set:** Standard: 6 x 6 m, 2.5 mm², 1 x 0.5 m, 2.5 mm² | ✓ | ✓ | | ✓ |
| **VEHK0619** | Alternative: 6 x 10 m, 2.5 mm², 1 x 0.5 m, 2.5 mm² | ❑ | ❑ | | |
| **VEHZ0610** | **High voltage clamps:** connection with banana plugs 4 mm (1 red, 1 black + 2 Kelvin clamps) | ✓ | ✓ | | ✓ |
| **VEHZ0620** | **Crocodile clamps** for connection of the banana plugs 4 mm (2 red + 2 black) | ✓ | ✓ | | ✓ |
| **VEHK0615** | **Grounding cable** (GR/YE) 1 x 6 m; 6 mm² with connection clamp | ✓ | ✓ | ✓ | ✓ |
| **VEHK0622** | **Ethernet PC connection cable**, 3 m | ✓ | ✓ | ✓ | ✓ |
| **VEHK0623** | **Low voltage adapter:** 4 mm banana to low voltage plug | ✓ | ✓ | | ✓ |
| **VEHZ0666** | **USB memory stick** 512 MB | ✓ | ✓ | ✓ | ✓ |
| **VESD0601** | User manual | ✓ | ✓ | ✓ | ✓ |
| **VESD0600** | Reference manual (included on the CPC Explorer CD-ROM) | ✓ | ✓ | ✓ | ✓ |
| **VEHZ0665** | **CP SA1 - surge arrestor box** for 100 A winding resistance measurement from firmware v1.4 > | ✓ | ✓ | | ✓ |
| **VEHZ0644** | **TH3631- temperature / humidity measurement unit** for humidity / ambient & surface temperature measurement | | | | ✓ |
| | **Power cord** | ✓ | ✓ | ✓ | ✓ |
| | VII connector for most of EU/M.East (VEHK0616) / ZA connector for South Africa, Namibia and India (VEHK0620) | | | | |
| | BS connector for UK, Hong Kong etc. (VEHK0624) / C 19; 3 x 1.5 mm; 2.5 m, with open ends (VEHK0621) | | | | |
| | **TestBase database system for test object administration (available in the packages listed below)** | | | | |
| **OS700002** | Standard CPC package, single-user version | | | | |
| **OS700004** | Upgrade to Enhanced CPC Package, single-user version | | | | |
| **OS700015** | Server License TestBase Enterprise Edition; refer to page 25 | | | | |
| **OS700019** | Client License TestBase CPC Enhanced Package | | | | |
| | **Accessories** | | | | |
| **VESM0660** | **CP amplifier test card:** for using the CPC 100 like an amplifier | | | | |
| **VEHZ0660** | **Ground resistance accessory set:** 4 electrodes, 50 m cable reel red, 100 m cable reel black | | | | |
| **VEHZ0630** | **CP CB2 - current booster up to 2000 A:** includes connection cable to CPC (VEHK0611), ground cable w/ clamp (VEHK0615), high current cable set w/ plugs & clamps (VEHK0610), including transport case with wheels (VEHP0071). | | | | |
| **VE000641** | **CP TD1 - TanDelta / Power Factor upgrade** includes: CP TD1 12 kV hardware w/ref capacitor + TanDelta test card, TD1 Accessories (cable drums w/ HV & Measure cables, 20 m) + Trolley; (eIFC card if needed - VEHZ0646) | | | | |
| **VEHZ0601** | **CP TC12 - 12 kV test cell** for measuring permittivity and TanDelta (Power Factor) of insulation liquids like transformer oil | | | | |
| **VEHZ0602** | **CP CR500 - compensating reactor** that includes two inductors rated 40 H each, 2 A compensation w/ inductors paralleled (500 nF) | | | | |
| **VEHZ0671** | **CP CU1 & CP GB1:** includes CP CU1 coupling unit w/ accessories for line impedance, k-factor, mutual coupling, ground impedance, step and touch voltage, and signal cable coupling measurements. Includes CP GB1 grounding box (VEHZ0672).[2] | | | | |
| **VEHZ0625** | **Step and touch voltage set** for CP CU1 (incl. CP AL1 FFT voltmeter, pair of foot electrodes, ground electr. and accessory cables | | | | |
| **VEHZ0622** | **Ground impedance set** for CP CU1 (includes: GPS Garmin eTrex, Rogowsky coil, 6 cable reels and 3 ground electrodes) | | | | |

[1] Customized packages with individual combinations are available on request.
[2] Requires CP Sequencer Test Card

# TestBase

## TESTBASE: TEST & MAINTENANCE MANAGEMENT








OMICRON TestBase is a database application for test administration and maintenance management of electrical assets in the electrical power supply industry. TestBase provides a unique repository for power system management data such as name plate content, test templates and test results. The browsing and filtering options provide an immediate overview on all test objects installed with their most important data.

TestBase is available in two packages which are specially designed for usage with the CPC 100 freeing staff from many administrative tasks and paperwork.

TestBase is available in two packages for use with primary technology:
TestBase CPC Standard and TestBase CPC Enhanced Package. Both packages are available in a single-user version (**Personal Edition**) and with client/server architecture (**Enterprise Edition**). These packages can be combined with the TestBase CMC packages to form a comprehensive database system.

TestBase uses MS SQL server and runs on Windows 2000, XP Pro, and Vista.

### Standard CPC package, single-user version — OS700002

The TestBase CPC Standard Package Personal Edition, which comes at no extra cost with new CPC units, provides the following features:

**Management of Primary Assets**
Typical name plate data and important life cycle data for many primary objects are stored in TestBase and can be administered and directly exported to other programs (e.g. MS Excel). Location changes and object replacements can be easily managed within TestBase and are tracked automatically. Specific object models for power transformers, bushings, diverter switches and instrument transformers are defined. For other kinds of power supply networks equipment, general data can be assessed in the object group “miscellaneous”.

**Browsing and Filtering Mechanism**
A configurable tree view browser and comprehensive filter mechanisms facilitate navigation between the objects. The display can be sorted by various parameters, e.g. by location, object type, installation date.

**Test Administration**
TestBase allows the consistent use of test templates for specified test categories. OMICRON CPC templates and Excel templates can be automatically filled with name plate data and specific parameters when they are launched from TestBase. With the OMICRON device browser, the templates and test results can be transferred between TestBase and the CPC. The test results are stored in TestBase and can be automatically visualized in the CPC Excel file loader. Most 3rd party file-based systems are supported by TestBase by opening the application and saving the test document formats directly from TestBase (e.g. doc-files, xls-files, 3rd party formats).

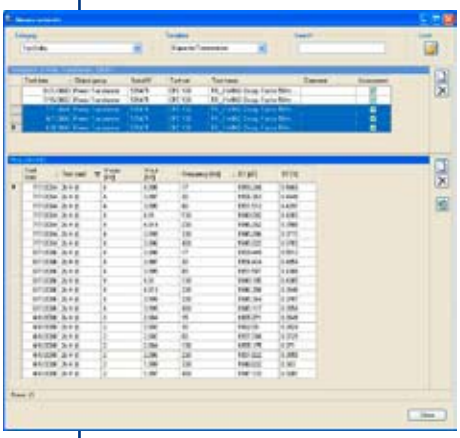
**Document Management**
With the integrated document management system, the user gets easy access to the information required during testing (e.g. manuals, test specifications, safety instructions, factory tests, certificates, individual notes).

**Reminder Function**
The user can define actions for each individual object and is reminded by an alarm signal light if an action is due.

**Reporting**
The following reports are included: technical data, activities on an object and test results.

# TestBase

## TESTBASE: ENHANCED & ENTERPRISE



### Upgrade to Enhanced CPC Package, single-user version OS700004

Upgrade to the enhanced package provides the following additional features:

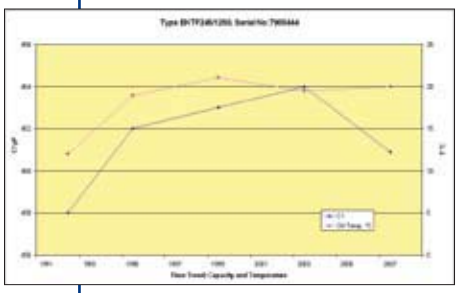
**Management of Additional Assets within Power Utilities**
In addition to the standard package object models for batteries, rectifiers and uninterruptible power supplies are supported. The user can model further equipment into the system. With the general link option objects can be assigned to a parent object. The "link inspector" displays such relations between objects.

**Management of Additional Objects and Parameters**
The user can define customized object groups or adapt existing models by adding certain parameters (e.g data used for testing).

**Maintenance Planning Support**
Maintenance cycles can be defined for individual assets or asset groups. Alarm signals show object status not due, due or overdue for maintenance.

**Journaling**
TestBase automatically tracks important events (change of operating state, asset exchange, activities planned and done, etc.) in an event journal. The user is able to generate additional events.

**Customization Tool**
TestBase provides a tool where various data like the state of parameters and tests, event types etc. can be individually defined and changed by the user.



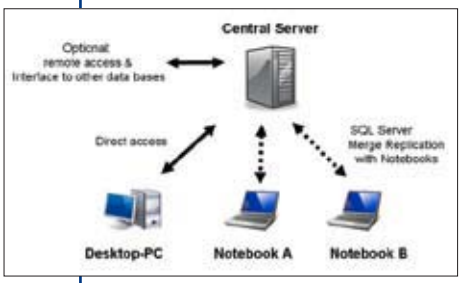
**Measurements and data analysis**
For tan delta tests, the detailed measurements are automatically extracted from CPC test documents and also from other 3rd. party test documents (e.g. Doble) into a measurement structure. By filtering the user is able to analyze and compare results (e.g. different CPC tests with Doble) and to transfer them into Excel graphs (e.g. time trending).

**Reporting**
Reports on multiple objects, maintenance schedules, maintenance reports.

### TestBase Enterprise edition

The TestBase Enterprise edition can be individually tailored according to the customer's needs and provides the following additional features:

**Offline Mode with Data Replication**
TestBase supports automated synchronization when connected to the server. The user has access to all features when working on site without a server connection.




**Software Integration**
TestBase can be integrated into the existing IT infrastructure, including migrating existing asset data from other applications (e.g. existing local databases). Establishing data exchanges between TestBase and ERP (enterprise resource planning) system software avoids double input and mismatch of data.

The TestBase Enterprise edition works with a client/server architecture while one server and several clients communicate in a network environment (e.g. LAN). The central TestBase database is installed on the Microsoft SQL server, and the TestBase applications run on the clients.

**Ordering Information**

| | |
|---|---|
| OS700015 | Server License TestBase Enterprise Edition |
| OS700018 | Client License TestBase CPC Standard Package |
| OS700019 | Client License TestBase CPC Enhanced Package |
| OS700024 | Client License TestBase User Defined Package |

For detailed information about TestBase please ask for our respective product brochure.

# Current Transformer Testing

## *CT Analyzer*

OMICRON's CT Analyzer delivers a unique capability for the fast comprehensive testing and calibration of current transformers, for protection and metering engineers as well as CT and switchgear manufacturers.

The equipment provides automatic testing and calibration for all types of low leakage flux current transformers both on-site in the power system as well in the controlled environment of CT and switchgear manufacturers.

A wide range of measurement functions can be provided:

- Burden measurement
- CT Winding resistance measurement
- CT Excitation characteristic recording
- CT transient behavior measurement (IEC 60044-6)
- CT ratio measurement with consideration of nominal and connected burden
- CT phase and polarity measurement
- Determination of accuracy limiting factor (ALF), instrument security factor (FS), secondary time constant (Ts), remanence factor (Kr), transient dimensioning factor (Ktd), knee point voltage/current, class, saturated and non saturated inductance
- Assessment according to defined standards: IEC 60044-1, IEC 60044-6, IEEE C57.13-1993




*CT Analyzer - The unique analyzing solution for current transformers.*
[European Patent EP 1 398 644 B1 and EP 1 653 238 B1]

## Unique CT Analyzer Features & Benefits

- Extremely small and lightweight (< 8 kg / 17 lb), particularly beneficial for on-site testing.
- Reduced commissioning time due to fully automatic testing according to IEC 60044-1, IEC 60044-6 and IEEE C57.13. Results within seconds.
- First portable device that can test CTs built according to IEC 60044-6 with defined transient behavior.
- Calibration of measuring transformers: A typical accuracy of 0.02 % / 1' enables field calibration and verification of class 0.1 CTs for metering.
- Automated assessment according to the defined standards (IEC 60044-1, IEC 60044-6 or IEEE C57.13-1993) also of specialized CTs such as PX, TPS, TPX, TPY and TPZ
- Allows testing of CTs for power frequencies from 16.7 to 400 Hz.
- "Name plate guesser" function allows automatic parameter search and analysis of CTs with unknown data (European Patent EP1 653 238 B1).
- High level of safety - all tests use low voltages (120 V) (European Patent EP 1 398 644 A1).
- Precise measurement of ratio error and phase displacement up to x-times the rated current and for all burden values without the need to connect burden hardware, independent of the application (e.g. bushings and GIS).
- Test of CTs with very high knee point voltages (up to 30kV)
- Automatic demagnetization of the CT after the test.

**Calibration**
A typical accuracy of 0.02 % / 1' enables field calibration and verification of class 0.1 CTs for metering.

**Assessment**
Automatic result assessment according to the defined standard (IEC 60044-1, IEC 60044-6 or IEEE C57.13-1993) using implemented expert knowledge even for CTs defined according to IEC 60044-6 with defined transient performance (TPS, TPX, TPY, TPZ).

**Reporting**
Comprehensive viewing and printing of test reports on a PC for different applications, standards and classes using the predefined Microsoft Excel™ templates.

**Simulation**
Existing test reports can be loaded at any time to recalculate the test results for different burden values and primary currents. This way, no further on-site measurements are necessary to verify whether a changed burden influences the behavior of a CT. The recalculation of the test results can be easily performed in the laboratory using the existing measurement data

**Remote Control and Test Automation**
Remote interface to integrate CT-Analyzer into an automatic production process. CT-Analyzer can fully be controlled over the remote interface. All parameters can be read from the device or from a test report with a simple to use software interface.

**Ordering Information**
CT Analyzer CT1 incl. accessories VE000652
CT Analyzer standard package VE000650
Accessories set for CT Analyzer

For detailed information about the CT Analyzer please ask for our respective product brochure.

# Sweep Frequency Response Analyzer

## *FRAnalyzer*

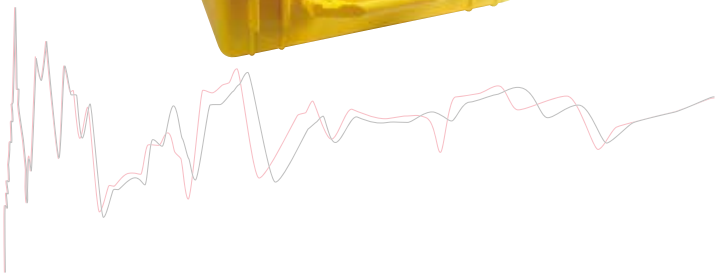
The FRAnalyzer detects defects in power transformer windings and faults in the magnetic core. After the transportation of transformers or following through faults with high currents the frequency response test should be made to ensure that the windings or core were not damaged.

Unique features of FRAnalyzer:
- High reliability of results due to the applied measurement method (SFRA) and innovative connection technique specially designed for SFRA testing
- Extremely small size of the test instrument through the use of leading edge technology
- Ease of use because of creative software
- Portability resulting from battery operation

For high frequencies the equivalent circuit diagram of a transformer winding can be drawn as a complex network of resistors, inductors and capacitors. The frequency response of this network is unique like a fingerprint. Winding deformation causes one or more of the capacitors in this network to be changed. To identify these changes, which can be quite small, the new fingerprint is compared to reference results. Deviations are an indicator of:

- Coil deformation - axial & radial
- Faulty core grounds
- Partial winding collapse
- Hoop buckling
- Broken or loosened clamps
- Shorted turns & open windings





**Highest possible repeatability**
of the test results due to screw-type-connection clamps which provide reliable electrical contact to the transformer and an innovative double-braid solution which forms a shield around the bushing.

## Technical Data FRAnalyzer

**Frequency range** 10 Hz to 20 MHz

**Source Output**

| | |
|---|---|
| FRA Method | Sweep frequency |
| Output impedance | 50 Ω |
| Connector | BNC (double shielded) |
| Amplitude | 2.83 V p-p |

**Inputs (Reference - CH1, Measurement - CH2)**

| | |
|---|---|
| Impedance | 50 Ω // 1 MΩ (selectable) |
| Connector | BNC (double shielded) |
| Dynamic range | > 120 dB |
| Accuracy | < 0.1 dB down to -80 dB,<br>< 0.3 dB down to -100 dB |

**Mechanical data / supply voltage**

| | |
|---|---|
| Weight | |
| Instrument: | < 2 kg / 4.4 lbs without measuring cables |
| Complete set: | 21 kg / 46.3 lbs |
| Dimensions (w × h × d) | |
| Instrument: | 26 x 5 x 26.5 cm / 10.25 x 2 x 10.5 inch |
| Complete case: | 42 x 21 x 55 cm / 16.5 x 8.3 x 21.5 inch |
| DC power supply | DC 10 V to 24 V / 10 W |

**PC Software for**
- operation of the FRAnalyzer
- diagnosis of the measuring results
- database handling
- reporting

**PC requirements (minimum)**

| | |
|---|---|
| Interface | USB 1.1 |
| PC operating system | Windows™ XP or Windows™ Vista |
| Processor | Pentium™ 1 GHz or higher |
| Memory | 1 GB RAM or higher |
| Drive | CD-ROM |

**Ordering Information**

| | |
|---|---|
| VE000660 | FRAnalyzer complete set<br>(transport case included) |
| VEHZ0673 | Clamp set for short bushings |

For detailed information about the FRAnalyzer please ask for our respective product brochure or the product video available on our homepage.

# Dielectric Response Analyzer

## DIRANA

DIRANA determines the dissipation factor of nearly any kind of insulation including transformers, bushings, cables, electrical machines in an extremely short time. Using an advanced analysis software, it determines the water content and oil conductivity in oil-paper-insulations.

### Applications

- Measurement of dissipation factor, capacitance, permittivity, resistance and polarization current of HV insulations
- Analysis of water content in oil-paper-insulations of power and instrument transformers (also for insulations of aged transformers)
- Diagnosis of OIP, RBP and RIP HV bushings
- Diagnosis of generator and motor insulations
- Diagnosis of cable insulations

Water is an ageing product and accelerates the further deterioration of cellulose through de-polymerization. In addition high water content in oil may cause bubble formation and lead to unexpected electrical breakdowns. DIRANA uses two well-established dielectric response measuring methods: The Polarization Depolarization Current (PDC) method in the time domain and the Frequency Domain Spectroscopy (FDS) in the frequency domain.

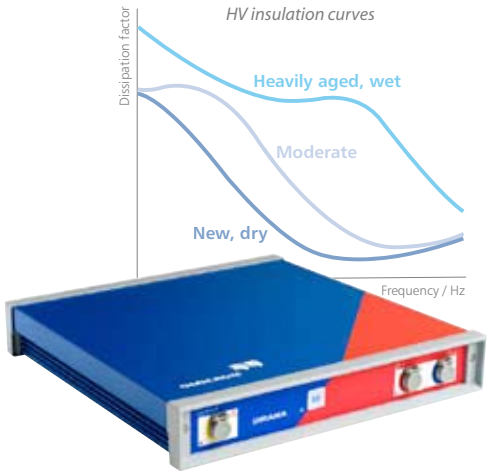
The time domain method enables a fast measurement, but has limited accuracy at higher frequencies. In practice the typical upper frequency limit is 1Hz. The frequency domain method can be applied to low and high frequencies, but it needs a long measuring time for very low frequencies. The combined use of both methods makes DIRANA the fastest dielectric response analyzer on the market. Measurements at higher frequencies are done in frequency domain, whereas the built-in PDC device accelerates the measuring time for the frequencies below 0.1 Hz.

The combination of the time and frequency domain measuring method reduces the measuring duration by 53 % compared to mere frequency domain measurements. For instance, data acquisition for a frequency domain measurement from 1 kHz down to 0.1 mHz will typically take 6 hours, DIRANA will acquire this data in less than 3 hours.

Two measurement channels instead of one channel enable the simultaneous measurement of two insulation gaps like HV to LV winding and LV to Tertiary winding which results in an additional time savings of 50 %.

The easy-to-use software determines moisture content in the solid insulation. DIRANA analyzes the dielectric response and determines the humidity in the solid insulation. The automated algorithm compensates for disturbing influences such as temperature, insulation geometry, oil conductivity and aging by-products.

Conductive aging by-products appear as water and cause an overestimation of the moisture content leading to unnecessary drying. DIRANA compensates for this influence and thus reliably detects moisture even in aged transformers.




### Technical Data

Test modes: UST A, UST B, UST A+B, GST, GSTa, GSTb, GSTa+b

| | |
|---|---|
| PDC: | |
| Current measurement | |
| Range: | ± 20 mA, |
| Resolution: | 0.1 pA |
| Input resistance: | 10 kOhm |
| Accuracy: | 0.5 % ± 0.1 pA |
| Voltage source | |
| Measurement voltage: | ± 200 V, variable |
| Maximum continuous output current: | 50 mA |
| Time range: | 1-10,000 s ≙1-0.0001 Hz |
| FDS: | |
| Measurement voltage: | 0-200 V peak |
| Measurement current: | 0-50 mA peak |
| Capacitance: Range: | 10 pF – 10 uF |
| Dissipation factor range: | 0 - 10 |
| Dissipation factor accuracy: | 0.5 % + $10^{-4}$ |
| Dissipation factor resolution: | 0 ...10, $10^{-5}$ |
| Frequency range: | 5,000-0.0001 Hz |
| Ranges for the combination PDC + FDS: | |
| Frequency: | 0.1 mHz – 5 kHz |
| (Switch frequency to time domain: 0.1 Hz) | |
| Capacitance: | 10 pF – 10 uF |
| Weight | |
| Instrument: | < 2.3 kg / 5 lb |
| Complete case: | 16 kg / 34 lb |

### Ordering Information

| | |
|---|---|
| VE000670 | Complete DIRANA set (transport case and accessories included) |
| VEHZ0607 | DIRANA accessories |
| VEHP0072 | Transport case for DIRANA |

For detailed information about DIRANA please ask for our respective product brochure.

# PD Analysis System

## *MPD 600*

The mtronix MPD 600 Partial Discharge Analysis System is a high-end, high-precision, modular acquisition and analysis toolkit for detecting, recording and analyzing partial discharge events in both laboratory and on-site applications of transformers, rotating machines and cable systems (including HV and EHV cables).

### Features and Benefits

The fully digital system guarantees:

- true parallel and synchronous multi-channel PD measurements of large systems due to easy expandability to up to 960 channels
- no noise entry from mains supply due to battery operation
- significantly reduced basic noise level due to optical fiber connections
- highest measurement accuracy and sample rate
- a significant improvement in safety and accuracy due to a complete electrical insulation between individual acquisition units and the control PC via a fiber optical network

Active noise suppression means:

- perfect adaptation of the measurement settings to the on-site conditions with a freely selectable center frequency
- outstanding SNR (signal-to-noise-ratio) due to variable bandwidth filters
- easy suppression of phase-fixed noise signals by an unlimited number of gates
- optimum ability to separate internal and external PD using an external gating unit
- dynamic noise gating which enables gating out of unwanted cyclical, non-phase relational pulses
- easy-to-use 3PARD (Three-Phase Amplitude Relation Diagram) and 3CFRD (3 Center Frequency Relation Diagram) functionality which separate noise from inner PD

Innovative user interface provides:

- different user interface modi according to user demands
- multiple visualization possibilities of PD events to match the user requirements
- full overview of all relevant data like PD level, test voltage, system status etc. according to IEC 60270-2000
- intuitive oscilloscope functionality and view
- support of RIV and DC measurements

Real-time & data post processing:

- replay of the measurement enables comprehensive assessment of the PD measurement back in the office
- easy-to-use 3PARD functionality allows the separation of several PD faults
- Microsoft® Excel-based report generator gives the possibility to create customized reports

### Applications

Detection, recording and analysis of partial discharges in both laboratory and on-site applications of transformers, rotating machines and cable systems (including HV and EHV cables).



### Technical Data

| | |
|---|---|
| Power Supply: | 8 – 12 V DC<br>external 100 – 240 V, 50 – 60 Hz<br>Li-Ion battery 11.2 V / 4.8 Ah |
| Connectors: | 1 x fiber optical network<br>2 x BNC |
| Indicators: | 2 x LED |
| Temperature: | 0 °C … 55 °C (operating)<br>-10 °C … 70 °C (storage) |
| Humidity: | 5 % ~ 100 % non-condensing |
| Inp. Frequency Range: | V input: 0 Hz – 4.3 kHz<br>PD input: 0 Hz – 20 MHz |
| Inp. Impedance: | V input: 1 MΩ, in parallel 1 µF<br>PD input: 50 Ω |
| Input Voltage: | V input: 60 V rms (max)<br>PD input: 10 V rms (max) |
| Dynamic Range: | V input: 102 dB<br>PD input: 132 dB (overall)<br>70 dB (per input range selection) |
| Measurement Uncertainty: | PD level: ± 2 % of calibrated PD value<br>voltage: ± 0.05 % of calibrated voltage<br>frequency: ± 1 ppm |

### Ordering Information

| | |
|---|---|
| VE004110 | Single-Channel PD measuring system |
| VE004130 | Three-Channel PD measuring system |
| VE004120 | Hardware Gating system |
| VESM4101 | Optional software module ADVANCED |
| VESM4102 | Optional software module CABLE |
| VESM4103 | Optional software module REPORT |

Various charge calibrators and signal aquisition accessories available upon request

For detailed information about the MPD 600 please ask for our respective product brochure or the product video series available on our homepage.

# TanDelta Measuring System

## *MI 600*



The mtronix MI 600 universal current measuring system is a high-precision, modular acquisition and analysis system for gauging current and key characteristics of high-voltage equipment, including dissipation factor / power factor and capacitance. Complete electrical insulation between acquisition units and the control PC provide superior safety in high-voltage setups. High-resolution digital processing enables exceptional measurement precision. The easy-to-use control software features various real-time visualization and monitoring options, and integrates with multiple mtronix products.

### System Features

- Modular, compact design. The MI 600 consists of two acquisition units, a fiber optical USB controller and a PC. USB 2 technology allows for plug-and-play with any recent desktop, rack-mount, or laptop computer.
- Complete electrical insulation between the acquisition units and the control station is achieved by means of optical fibers, each of which can be up to 2 km in length. This guarantees unprecedented safety and flexibility.
- Maintenance-free operation. No controls are present on the acquisition units. All functions are available under remote control from the software.
- Superior precision and performance. The MI 600 features latest digital technology and advanced software design. High-speed and high-resolution A/D converters coupled with sophisticated digital processing algorithms deliver outstanding accuracy.
- Low power consumption. Optimized for battery operation due to a power consumption of less than 4 W in measuring mode. In standby mode, each acquisition unit consumes less than 10 mW.
- Wide input range. The MI 600 features an 11-level input gain control that is adjustable via the control software. Its high-sensitive input reliably resolves currents as low as 20 $\mu$A. An on-board shunt, automatically deployed under software control, enables input currents of up to 100 mA to be directly measured without the need for an external shunt.

### Specifications Acquisition Unit

| | |
|---|---|
| Dimensions (w x d x h) | 110 x 190 x 44 mm |
| Power Supply | 9 – 12 V DC, External 100 – 240 V, 50 – 60 Hz) battery pack incl., Li-Ion battery 11.2 V / 4.8 Ah |
| Indicators | 2 x LED: Stand-by / Power, Optical Fiber Data Integrity |
| Fiber Optics | 2 x ST |
| Input Conn. | 1 x TNC |
| Temp. | 0 °C … 45 °C (Operating), -10 °C … 60 °C (Storage) |
| Humidity | 5 % ~ 80 % Non-condensing |
| Input Freq. | 5 Hz – 50 kHz |
| Input Imped. | 50 Ohms |
| Input Current | 20 $\mu$A – 100 mA rms (direct) |
| Extern. Shunts | 4 A, 15 A, 28 A |

### Measurement Accuracy

| | |
|---|---|
| Dissipation factor / power factor | ± ($2E^{-5}$ + 2 % of Display Value) |
| Test Object Capacitance | ± 0.25 % of Display Value |

### MI 600 Requirements

| | |
|---|---|
| Operating System | Windows™ 2000 Professional, XP or VISTA |
| Processor | Pentium® 4 (≥2.5 GHz), or M (≥1.5 GHz), Core™ or Core™ 2, AMD Athlon™ 64 or Turion™ 64 processor |
| Memory | 512MB RAM (1 GB RAM recommended) |
| Interface | USB 2.0 compatible |

### Ordering Information

| | |
|---|---|
| VE004400 | MI 600-2 Dual-Channel TanDelta Measurement System: = 2 x measurement unit MI 600, controller unit MCU 502 with USB cable, precision shunt 4 A, basic SW package, user manual, fiber optic cables, measurement cables, power supplies, batteries and charger |

Separately available accessories:

| | |
|---|---|
| VEHZ4112 | 4 A precision shunt |
| VEHZ4114 | 15 A precision shunt |
| VEHZ4113 | 28 A precision shunt |
| VEHZ4105 | MPP 600 Li-Ion battery set incl. combined charger / power supply and cable |
| VEHZ4106 | MPP 600 Li-Ion battery, 11.2 V / 4.8 Ah |
| VEHP0040 | mtronix aluminum case MBT 560 for 600 series |
| VEHZ4121 | Adapter for measurement tap of Micafil bushing type RTKG |
| VEHZ4122 | Adapter for measurement tap of F&G (HSP) bushing type EKTF |
| VEHZ4123 | Adapter for measurement tap of HSP bushing type SETF |

For detailed information about the MI 600 please ask for our respective product brochure.

# Worldwide

## CONTACT ADDRESSES

### North and South America

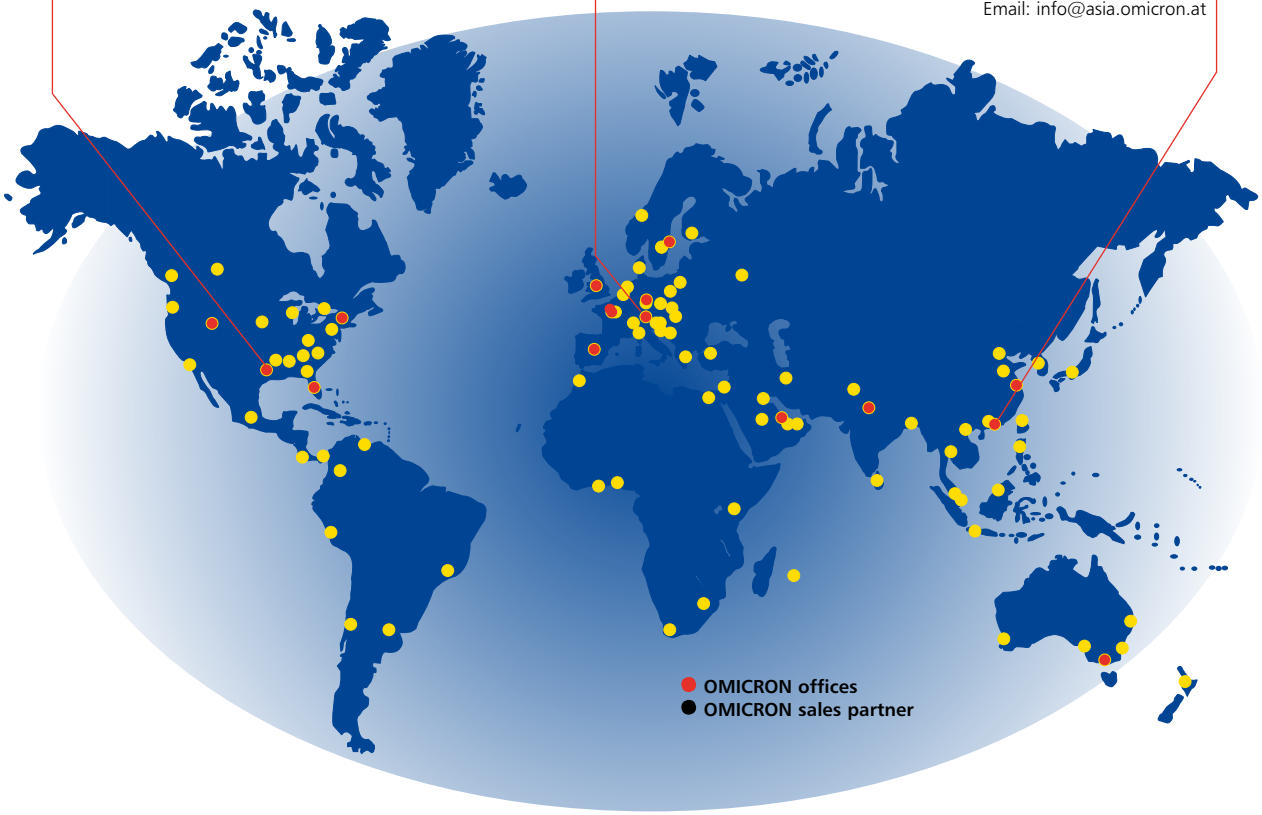
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