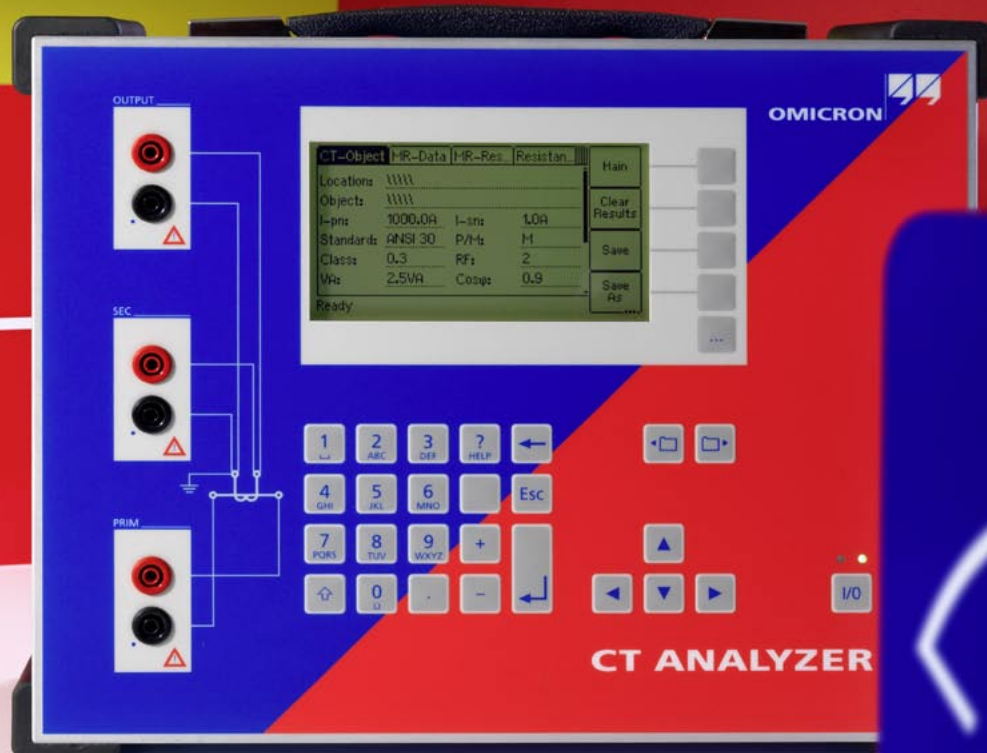


CT Analyzer

Test Set for Analysis of Metering Current Transformers
According to IEEE C57.13 Standard



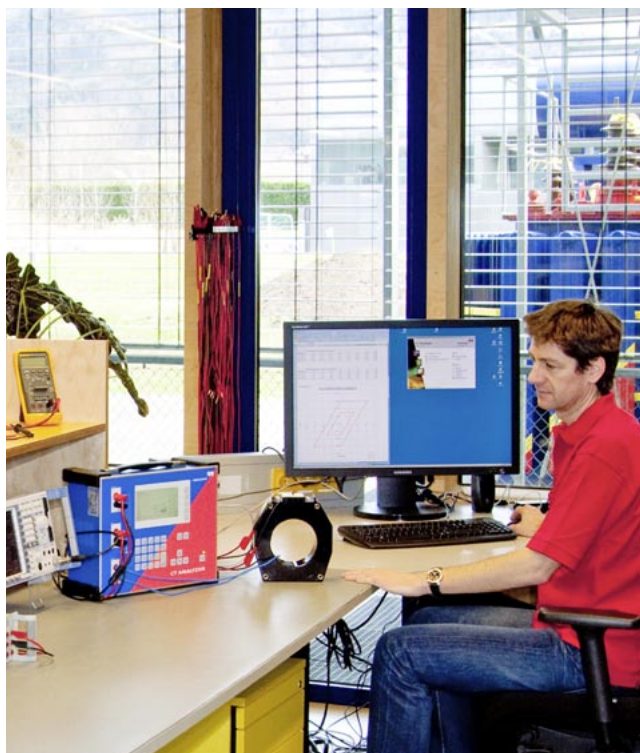
The New Standard in Metering CT Testing



In today's competitive electricity market, it is important to have the entire metering chain calibrated. The meter is only as accurate as the instrument transformers sourcing it. Therefore testing of current transformers is essential.

Determining whether or not a current transformer complies with a relevant international standard requires highly accurate measuring of many different parameters - and a lot of experience.

OMICRON's CT Analyzer offers a new and automated way of testing and verification of high accuracy CTs on site and in the workshop.



Areas of Application

All types of current transformers can be tested:

- > On-site in the power system
- > In the metering workshop
- > At production facilities and test / development labs of manufacturers

Range of Measurements

The CT Analyzer offers a wide range of measurements, such as:

- > CT ratio and phase-angle accuracy with consideration of nominal and operational burden
- > CT polarity
- > CT winding resistance
- > CT excitation / saturation
- > Burden impedance
- > Saturated and unsaturated inductance

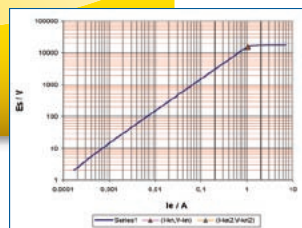
Automated Testing Procedure

The CT Analyzer is designed to accurately measure all relevant CT parameters and compare them to the requirements of the IEEE C57.13 standard. Due to this automated assessment, testing engineers can get the decision about 'pass or fail' within seconds.

Step 1

Measurement of parameters

Measurement of CT parameters like excitation curve, eddy current, ratio etc.



Step 2

Modelling

Definition of CT model elements and calculation of CT parameters through embedded mathematical functions

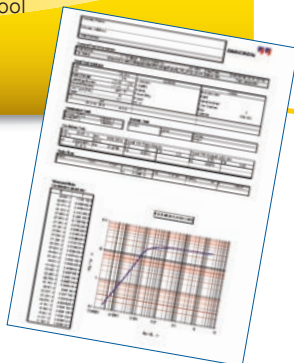
$$\Psi(t) = \Psi'_0 + \int_0^t (V_s(t) - R_{CT} I_{CT}(t)) dt - L_{CT} \frac{d}{dt} I_{CT}(t)$$

$$V_C(t) = V_s(t) - R_{CT} I_{CT}(t) - L_{CT} \frac{d}{dt} I_{CT}(t)$$

Step 4

Reporting

All data are delivered in an XML file and can be displayed via the reporting tool



Step 3

Assessment according to IEEE C57.13 standard

Automated comparison of test results with the defined values according to IEEE C57.13 and C57.13.6 standard

| POWER | | Current ratio error in % at % of rated current | | | | | | | | |
|-------|-------|--|--------|--------|--------|--------|--------|--------|--------|--------|
| VA | cos φ | Data type | 1% | 5% | 10% | 20% | 50% | 100% | 120% | 200% |
| 15 | 0.8 | String value | -0.023 | -0.023 | -0.021 | -0.018 | -0.013 | -0.010 | -0.009 | -0.008 |
| | | Float value | -0.023 | -0.023 | -0.021 | -0.018 | -0.013 | -0.010 | -0.009 | -0.008 |
| 7.5 | 0.8 | String value | -0.008 | -0.010 | -0.010 | -0.008 | -0.006 | -0.004 | -0.003 | -0.002 |
| | | Float value | -0.008 | -0.010 | -0.010 | -0.008 | -0.006 | -0.004 | -0.003 | -0.002 |
| 3.75 | 1 | String value | 0.005 | 0.001 | 0.000 | -0.001 | 0.000 | 0.000 | 0.001 | 0.001 |
| | | Float value | 0.005 | 0.001 | 0.000 | -0.001 | 0.000 | 0.000 | 0.001 | 0.001 |

Your Benefits:

- > Field verification of up to 0.15 accuracy class CTs due to extremely high accuracy (0.02 % typical)
- > Compact and lightweight (< 17.4 lbs / 8 kg)
- > Automatic assessment according to IEEE C57.13 and IEEE C57.13.6
- > Reduced testing and commissioning time (typically < 1 min)
- > High level of safety - testing at low voltages (120 V)

Highly Accurate CT Verification Made Mobile

Difficulties in On-Site Testing of Metering Current Transformers

Until now, current transformers used for metering purposes have been tested mainly in laboratories as portable test equipment lacks the accuracy or the noise immunity to achieve the necessary results on-site.

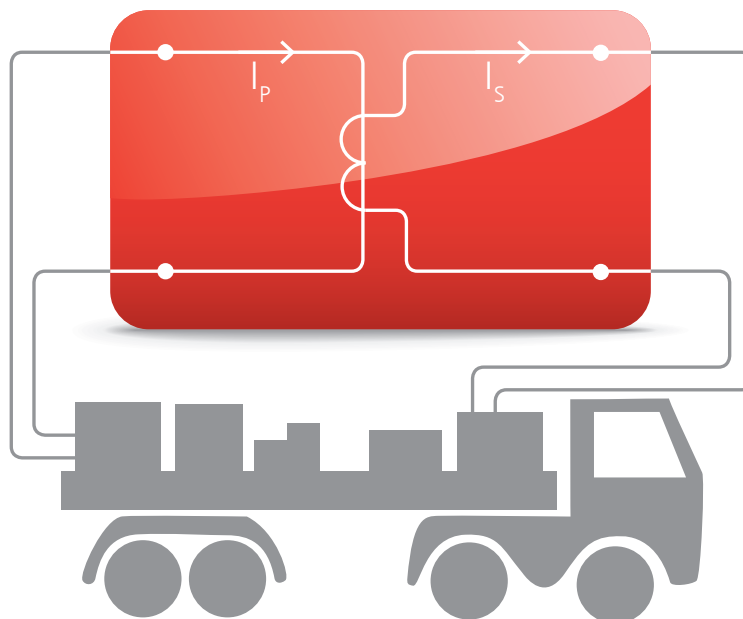
However, on-site testing has become more important due to the following facts:

- > Large-scale upgrade of metering systems which require CTs with higher accuracy class (e.g. according to C57.13.6)
- > Increased maintenance of metering systems due to aging factors

The test setup for on-site testing conventionally involved many different pieces of test equipment (heavy primary current injection set, reference CT, external burden box, phase angle meter etc.). All equipment needs to be moved, setup and then moved again for the next test. In addition, according to IEEE C57.13, accuracy tests are required at different percentages of rated burden and multiples of rated primary current. As each point has to be tested manually the required effort is very high.

Therefore on-site testing of metering CTs was very costly and labor intensive in the past.

Test setup for on-site testing



Primary current injection set, phase meter,
reference CT, burden box etc.

Various
tests
needed

Time-consuming, individual tests have to be carried out for desired burden value and primary current

> 2 t

Requires a lot of heavy equipment such as large cables, current booster equipment etc.

V knee-
point
limited

Determination of knee-point voltage is limited to the available output voltage

No noise
immunity

Selective measurements are needed due to disturbances from energized power lines close to the CT under test

CT Analyzer - Accurate and Cost-Effective On-Site Testing

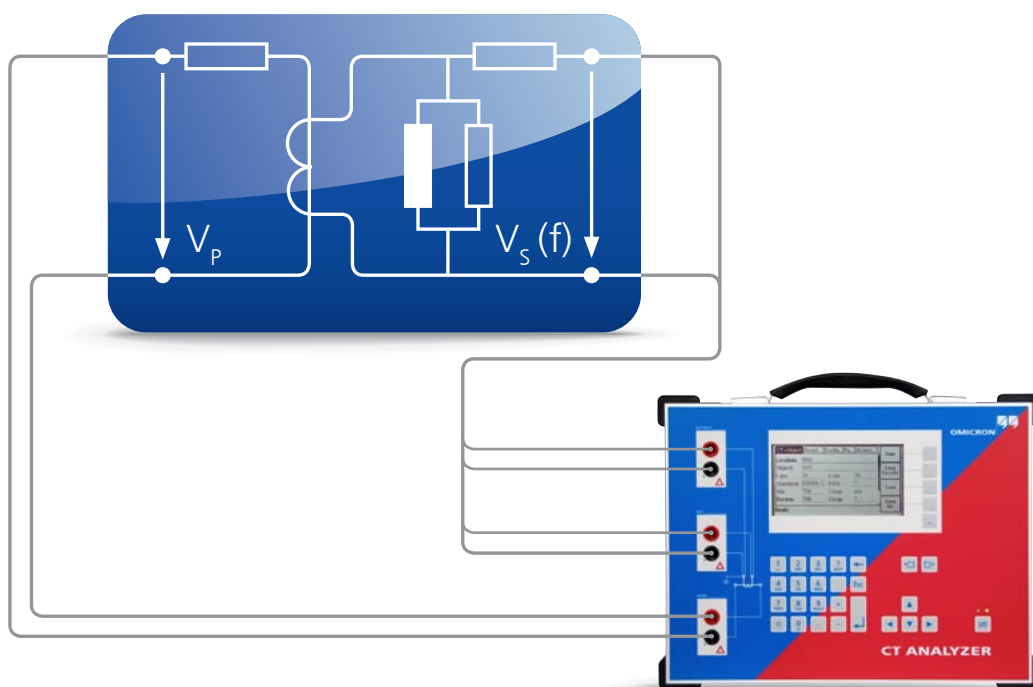
With its weight of < 17 lbs the equipment is optimized for use in the field. Additionally a high level of safety for the equipment operator is guaranteed as the maximum output voltage is 120 V (to test effective knee-point voltage of up to 4 kV) compared to typical methods requiring voltages up to 2,000 Volts.

Due to the fully automatic test procedure, the CT Analyzer is extremely easy to operate. Losses in the CTs are measured and an accurate electrical model is built by the software. Based on the model, the results at different rated currents and burdens are automatically calculated without the need to use an external load box.

Thus within seconds a test report, including an automatic assessment according to IEEE C57.13 or C57.13.6, is generated. The CT Analyzer offers a very high testing accuracy of 0.05 % (0.02 % typical) for current ratio and 3 minutes (1 min typical) for phase displacement.

With the CT Analyzer, the users now have a cost-effective, quick and accurate way of testing metering CTs on site with only one light-weight portable equipment.

CT as an electrical model



One test
needed for
all burdens

From the CT model, ratio and phase accuracy can be determined for any burden and primary current - burden box is not needed

17.4 lbs /
8 kg

Most lightweight and smallest test device in its class for convenient handling on site

V knee-
point up
to 4 kV

Knee-point voltages (up to 4 kV) can be measured with low output voltage

High noise
immunity

Power system frequency noise is suppressed - ideal for on-site measurements even when active lines are close to the test object

Extraordinary Features

| Resistance | Excitation | Ratio | Assessme... |
|--------------|--------------------------|--------|-------------|
| Nominal | Current ratio error in % | | |
| Burden | at % of rated current | | |
| VA/Cosφ | 120 | 400 | |
| 45,00 /0,900 | -0.064 | -0.051 | |
| 22,50 /0,900 | -0.036 | -0.028 | |
| 11,25 /0,900 | -0.020 | -0.016 | |
| 5,63 /0,900 | -0.011 | -0.009 | |

| | |
|-------------------|-----------|
| Standard: ANSI 45 | P/M: M |
| Class: 0.6 | RF: 4 |
| VA: 45,0VA | Cosφ: 0.9 |

Calculation of Ratio Errors Depending on the Rating Factor

- > Current ratio error and phase displacement table according to the rating factor
- > Rating factor selectable via the setting menu (1.0 up to 4.0)
- > Ratio error and phase displacement for different burdens



Data Handling and Reporting

- > Test reports can be saved on the Compact Flash Card and can be transferred to a PC
- > Data can be shown via the Excel™ file loader program
- > Customizable report templates available for:
 - > Different standards, classes and applications
 - > Single and multi-core CTs
 - > Multi-tap CTs
 - > Three-phase testing
 - > Core testing

CT - Test Settings

Settings: 31-35 | Multi Ratio CT

Location: Station: _____ Feeder: _____ Phase: _____
 Company: _____ Country: _____ IEC-ID: _____

Object: Serial No.: _____ Core: _____ Taps: _____
 Manufacturer: _____ Type: _____ Optional 1: _____

I-pr: 600 A I-se: 5 A
 Std: ANSI 45 P/M: M
 Class: 0.3 RF: 1.5

f: 60 Hz
 Rated burden: 7 VA cosφ: 1
 Op. burden: 7 VA Op. cosφ: 1

Comment: _____

CHANGE SETTINGS EDIT REPORT APPLY

LOAD FILE SAVE SETTINGS AS

OPTIONS SAVE REPORT AS PRINT TEST STATUS CANCEL

Remote Control

- > Full access to all functions via the PC using the remote interface
- > Optimizes the integration into a fully automated test environment at production facilities
- > Data export into Excel™ and Word™
- > Customizable test reports

"Guessing" Nameplates

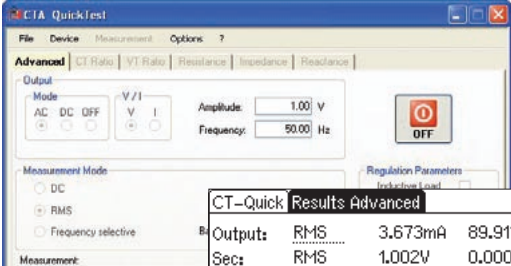
- > Determination of unknown CT data
- > Older CTs can be classified and put into service without contacting the manufacturer
- > Parameters determined include:
 - > CT type
 - > Class
 - > Ratio
 - > Knee point
 - > Power Factor
 - > Nominal and operating burden
 - > Winding resistance (primary and secondary)

| before test | CT-Object Resistan... Excitati... Ratio | | | |
|-------------|---|---------|--------|-------|
| | Location: | Object: | I-prn: | I-sn: |
| | WVV | WVV | ?A | ?A |
| | Standard: | ANSI 45 | P/M: | ? |
| | VA: | ?VA | Cosφ: | n/a |
| | Burden: | ?VA | Cosφ: | ? |

| after test | CT-Object Resistan... Excitati... Ratio | | | |
|------------|---|---------|---------|-------|
| | Location: | Object: | I-prn: | I-sn: |
| | WVV | WVV | 2000.0A | 5.0A |
| | Standard: | ANSI 45 | P/M: | M |
| | Class: | 0.3 | RF: | 2 |
| | VA: | 22.5VA | Cosφ: | 0.9 |

Multimeter with Integrated Source: QuickTest

- > Use of CT Analyzer as a multimeter with integrated current or voltage source
- > Perform manual tests (L, Z, R, ratio, polarity, burden etc.) for trouble-shooting or quick verification purposes
- > VT ratio check
- > Available as a PC tool



| CT-Quick Results Advanced | | | |
|---------------------------|---------|---------|---------|
| Output: | RMS | 3.673mA | 89.91° |
| Sec: | RMS | 1.002V | 0.000° |
| Prim: | RMS | 15.44μV | 85.15° |
| cosφ: | 0.0015 | Z: | 272.7Ω |
| Rp: | 181.2kΩ | Cp: | 9.728μF |

Verification for Different Burdens and Currents

- > Existing measurement data can be loaded to the CT Analyzer at any time
- > Recalculation of the CT parameters for different burdens and primary currents
- > No further on-site measurements are necessary to verify whether a change in the burden will influence the accuracy of a CT

| POWER | | Current ratio error in % at % of rated current | | | | | | | |
|-------|---------|--|--------|--------|--------|--------|--------|--------|--------|
| VA | cos Phi | Data type | 1% | 5% | 10% | 20% | 50% | 100% | 200% |
| 15 | 0.8 | String value | -0.023 | -0.023 | -0.021 | -0.018 | -0.013 | -0.010 | -0.009 |
| | | Float value | -0.023 | -0.023 | -0.021 | -0.018 | -0.013 | -0.010 | -0.009 |
| 7.5 | 0.8 | String value | -0.008 | -0.010 | -0.010 | -0.008 | -0.006 | -0.004 | -0.003 |
| | | Float value | -0.008 | -0.010 | -0.010 | -0.008 | -0.006 | -0.004 | -0.003 |
| 3.75 | 1 | String value | 0.005 | 0.001 | 0.000 | -0.001 | 0.000 | 0.000 | 0.001 |
| | | Float value | 0.005 | 0.001 | 0.000 | -0.001 | -0.000 | 0.000 | 0.001 |
| 0 | 1 | String value | 0.007 | 0.005 | 0.004 | 0.003 | 0.003 | 0.003 | 0.004 |
| | | Float value | 0.007 | 0.005 | 0.004 | 0.003 | 0.003 | 0.003 | 0.004 |

| POWER | | Phase displacement in [min] at % rated current | | | | | | | |
|-------|---------|--|------|------|------|------|------|------|------|
| VA | cos Phi | Data type | 1% | 5% | 10% | 20% | 50% | 100% | 200% |
| 15 | 0.8 | String value | 1.76 | 1.14 | 0.84 | 0.57 | 0.27 | 0.10 | 0.06 |
| | | Float value | 1.76 | 1.14 | 0.84 | 0.57 | 0.27 | 0.10 | 0.06 |
| 7.5 | 0.8 | String value | 1.42 | 1.01 | 0.80 | 0.59 | 0.34 | 0.19 | 0.08 |
| | | Float value | 1.42 | 1.01 | 0.80 | 0.59 | 0.34 | 0.19 | 0.08 |
| 3.75 | 1 | String value | 1.34 | 1.03 | 0.87 | 0.68 | 0.46 | 0.31 | 0.28 |
| | | Float value | 1.34 | 1.03 | 0.87 | 0.68 | 0.46 | 0.31 | 0.28 |
| 0 | 1 | String value | 1.04 | 0.82 | 0.70 | 0.57 | 0.39 | 0.28 | 0.25 |
| | | Float value | 1.04 | 0.82 | 0.70 | 0.57 | 0.39 | 0.28 | 0.25 |

Technical Features

- > Automatic assessment according to IEEE C57.13 for CTs of all metering accuracy classes, including 0.15 and 0.15S for the IEEE C57.13.6 High Accuracy Instrument Transformer Standard
- > CT ratio measurement with consideration of nominal and connected secondary burden
- > CT phase and polarity measurement
- > CT excitation / saturation characteristic recording
- > CT winding resistance measurement (primary and secondary)
- > Secondary burden measurement
- > Measurement of ratio, ratio error and phase displacement at currents of up to 400 % of the rated value (for different burdens), without the need to (re-)connect burden hardware, independent of the application (e.g. bushings and GIS)
- > Small and lightweight (< 17.4 lbs / 8 kg)
- > Short testing time due to fully automatic testing
- > High level of safety using low voltages for all tests (max. 120 V) with patented variable frequency method
- > "Nameplate guesser" function for CTs with unknown data
- > QuickTest: Manual testing interface
- > Remote control interface
- > Display readable in bright sunlight
- > Simulation of measured data with different burdens and currents
- > High accuracy, typical 0.02 % for ratio and 1 min for phase displacement
- > Excellent noise immunity against disturbances from energized power lines close to the measurement
- > Easily adaptable reports (customizable)
- > Up to 4 kV knee-point voltage can be measured
- > Automatic demagnetization of the CT after the test



Ordering Information

IEEE Metering Test Set
(VE000658)

CT Analyzer Test Set for metering CTs according to the IEEE C57.13 standard

IEEE Metering –
Advanced Upgrade
(VESM0656)

Software upgrade of the IEEE Metering Test Set to the CT Analyzer Advanced Package

Technical Data

Information about the CT Analyzer

| | | | |
|---------------------------|--|---|---|
| Current Ratio Accuracy | | Environment Conditions | |
| Ratio 1 - 2000 | 0.02 % (typical) / 0.05 % (guaranteed) | Operating Temperature | 14° F up to 122° F / -10° C up to + 50° C |
| Ratio 2000 - 5000 | 0.03 % (typical) / 0.1 % (guaranteed) | Storage Temperature | -13° F up to 158° F / -25° C up to + 70° C |
| Ratio 5000 - 10000 | 0.05 % (typical) / 0.2 % (guaranteed) | Humidity | Relative humidity 5% up to 95% not condensing |
| Phase Displacement | | EMC | |
| Resolution | 0.1 min | The product adheres to the electromagnetic compatibility (EMC) Directive 2004 / 108 / EC (CE conform) | |
| Accuracy | 1 min (typical) / 3 min (guaranteed) | | |
| Winding Resistance | | Emission | |
| Resolution | 1 mΩ | USA | FCC Subpart B of Part 15 Class A |
| Accuracy | 0.05 % (typical) / 0.1 % + 1 mΩ (guaranteed) | International | IEC 61326-1 Class A |
| Power Supply | | Europe | EN 61326-1 Class A |
| Input Voltage | 100 - 240 Vac | Immunity | |
| Permissible Input Voltage | 85 - 264 Vac | International | IEC 61326-1 |
| Frequency | 50 / 60 Hz | Europe | EN 61326-1 |
| Permissible Frequency | 45 - 65 Hz | Safety | |
| Input Power | 500 VA | The product adheres to the low voltage Directive 2006 / 95 / EC (CE conform) | |
| Connection | Standard AC socket 60320 | | |
| Output | | USA | UL 61010-1 |
| Output Voltage | 0 - 120 Vac | International | IEC 61010-1 |
| Output Current | 0 - 5 Aeff (15 A peak) | Europe | EN 61010-1 |
| Output Power | 0 - 400 VAeff (1500 VA peak) | Canada | CSA C22.2 No. 1010.1-92 |
| Physical Dimensions | | Certificates from Independent Test Institutes | |
| Size (W x H x D) | 9.2 x 7.2 x 3.7 in 360 x 285 x 145 mm | KEMA Test Report | |
| Weight | 17.4 lbs / 8 kg (without accessories) | PTB Test Report | |

Information about the CTs to be tested

| | | | |
|----------|--------------------------------|----------------------|------------|
| Standard | IEEE C57.13 / IEEE C57.13.6 | CT Knee-Point | 1 V - 4 kV |
| Class | 0.15 / 0.15S / 0.3 / 0.6 / 1.2 | CT Nominal Frequency | 60 Hz |
| CT Ratio | up to 99000:1 / 99000:5 | | |

Accessories

Accessories (Part of IEEE Metering Test Set)

Coax cables

VEHK0651 - with banana plugs
2 x 9.8 ft / 2 x 3 m,
1 x 32.8 ft / 1 x 10 m



Battery clamps

VEHZ0652 - with 0.2 in / 4 mm banana sockets (primary side connection)



Crocodile clamps

VEHZ0656 - with 0.2 in / 4 mm banana sockets (secondary side connection)



0.8 in / 20 mm opening width, 2 x red, 2 x black

Flexible terminal adapters

VEHS0009 - with 12 x 0.2 in / 4 mm banana socket



Compact Flash card

VEHZ0654 - 128 MB
Memory space for at least 416 test reports



Compact Flash card reader

VEHZ0655 - USB 2.0 Compact Flash card reader



User manual

VESD0605 - User manual



Carry bag

VEHP0018 - CT Analyzer carry bag



Grounding (PE) cable

VEHK0615 - 1 x 19.7 ft / 1 x 6 m,
0.01 sq in / 6 mm²,
(protective earth connection)



USB - RS232 converter cable

VEHZ0014 - with Nullmodem cable



Power cord

depend - country-dependent

CT Analyzer PC software toolset

VESM0800 - remote control software, QuickTest, Excel File Loader etc.

Additional Accessories

Training CT

VEHZ0643 - 300:5, class 0.5 FS 5



Coax cable

VEHK0657 - with Kelvin clamps,
9.8 ft / 3 m



CT Analyzer
Calibration CT

VEHZ0649 - 2000:1 / 2000:5,
class 0.02



Coax cables

VEHK0654 - 9.8 ft / 3 m *
VEHK0652 - 19.7 ft / 6 m *
VEHK0653 - 32.8 ft / 10 m *
VEHK0655 - 49.2 ft / 15 m *
VEHK0656 - 328.1 ft / 100 m *



* with banana plugs

Pluggable winding

VEHK0658 - Pluggable 23 turns
winding



Transport case

VEHP0068 - Transport case with
wheels



CT SB2 upgrade kit

VEHZ0696 - CT Analyzer switch
box CT SB2 inclusive
accessories



Primary resistance
extension set

4 pol cable 49.2 ft / 15 m
(CT SB2 to CTprim),
2x clamps



OMICRON is an international company serving the electrical power industry with innovative testing and diagnostic solutions. The application of OMICRON products provides users with the highest level of confidence in the condition assessment of primary and secondary equipment on their systems. Services offered in the area of consulting, commissioning, testing, diagnosis, and training make the product range complete.

Customers in more than 130 countries rely on the company's ability to supply leading edge technology of excellent quality. Broad application knowledge and extraordinary customer support provided by offices in North America, Europe, South and East Asia, Australia, and the Middle East, together with a worldwide network of distributors and representatives, make the company a market leader in its sector.

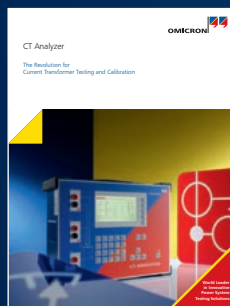
The following publications provide further information:



*Testing Solutions for
Measurement Equipment*



*Datasheet CT SB2
Switch Box*



*CT Analyzer
Standard Brochure*

For a detailed list of literature currently available please visit the Literature & Videos section of our website.

Americas

OMICRON electronics Corp. USA
12 Greenway Plaza, Suite 1510
Houston, TX 77046, USA
Phone: +1 713 830-4660
+1 800-OMICRON
Fax: +1 713 830-4661
info@omicronusa.com

Asia-Pacific

OMICRON electronics Asia Limited
Suite 2006, 20/F, Tower 2
The Gateway, Harbour City
Kowloon, Hong Kong S.A.R.
Phone: +852 2634 0377
Fax: +852 2634 0390
info@asia.omicron.at

Europe, Middle East, Africa

OMICRON electronics GmbH
Oberes Ried 1
6833 Klaus, Austria
Phone: +43 5523 507-0
Fax: +43 5523 507-999
info@omicron.at