

Primary Test Manager

What's New in Version 4.30



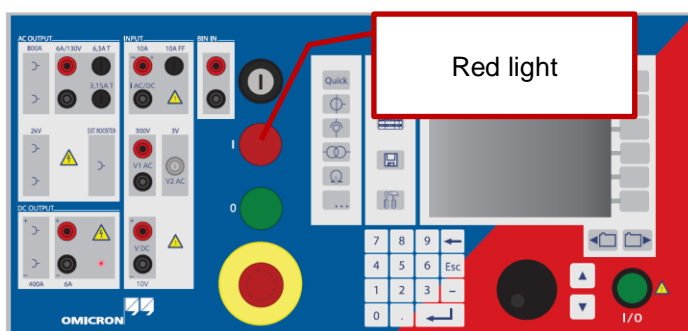
1 CPC 100 Safety improvement

1.1 Description

In software versions prior to 4.20 SR2, if an error occurs in the test device during a DC winding resistance measurement and the measurement is aborted, the CPC 100 discontinues the monitoring of the discharge status before the test object might be completely discharged.

The CPC 100 shows an error message and a green light in this case. This could erroneously be interpreted as a safe state, although the test setup might still carry potentially hazardous voltage / current.

The CPC will now continue to signal a red light when the described error occurs, to reduce the risk of misinterpretation. This improvement is included in software releases from 4.20 SR2 onwards.



Ensure that all CPC 100 devices in your organization have received an update to version 4.20 SR2 or higher.

We are happy to provide you with a list of the serial numbers, which are linked to your organization. Please feel free to contact our Technical Support hotline numbers

1.2 No downgrade to versions prior to 4.30

As an additional safety mechanism, CPC devices updated to version 4.30 will prevent a downgrade to previous versions. Thus, installing an older firmware image on a CPC running version 4.30 or higher will not be possible.

1.3 Support

If you have any questions, please contact our Technical Support directly:



You can reach Technical Support around the clock - competent and free of charge – via the following numbers:

Americas: +1 713 830-4660 or +1 800-OMICRON

Asia-Pacific: +852 3767 5500

Europe / Middle East / Africa: +43 59495 4444

Additionally, you can find our Service Center or Sales Partner closest to you at www.omicronenergy.com.

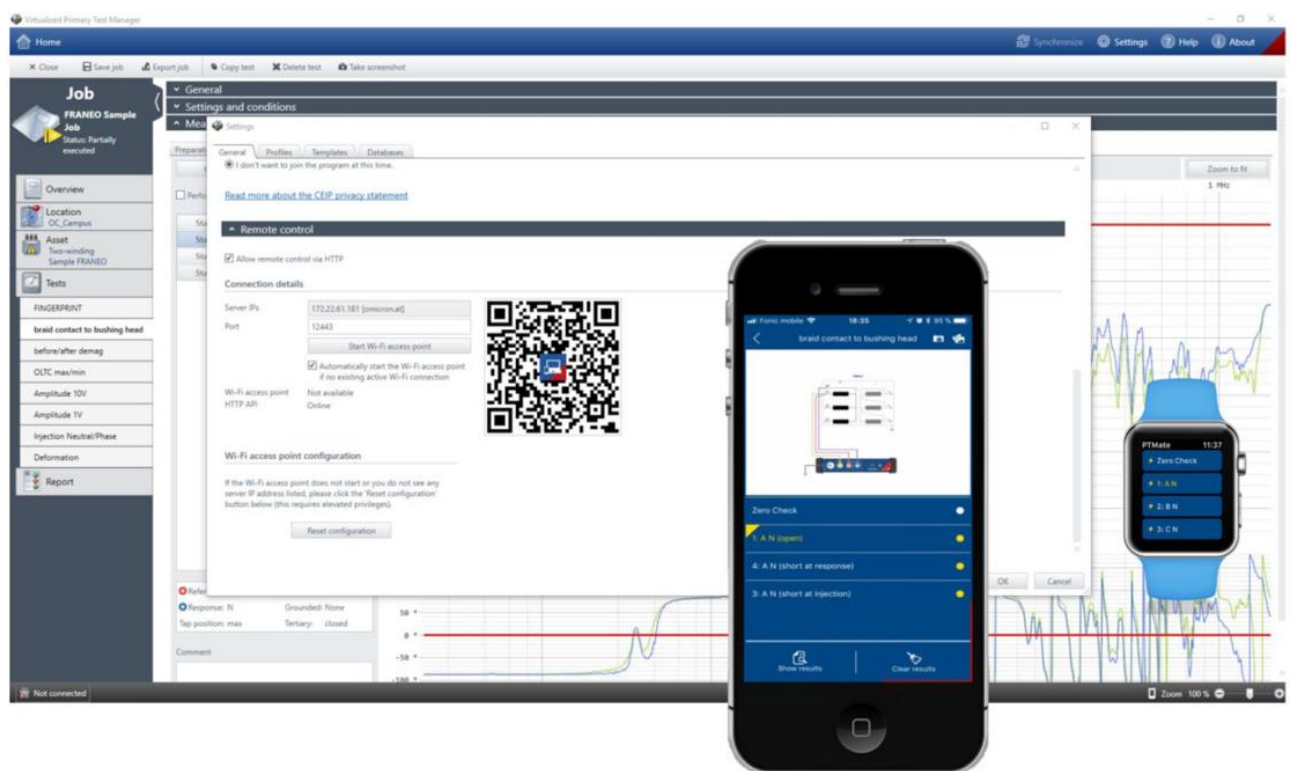
2 PTM 4.30 General New Features & Improvements

2.1 New PTMate App

PTMate is a simple, fast and easy-to-use companion *Primary Test Manager*TM software:

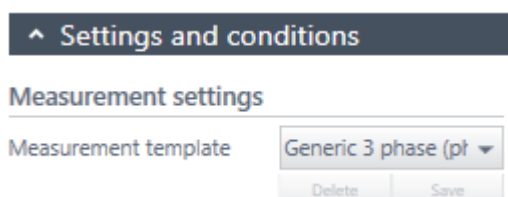
- > Send images as attachments, either coming directly from your mobile phone's camera or from the photo gallery
- > Enhance your location data with GPS coordinates
- > Inspect the wiring diagram of the selected test remotely on your phone's display
- > Enjoy a unique feature set for the FRANEO 800 tests: start and stop individual measurements, remotely clear incorrect results and consult results graph

PTMate is available for iOS (in the App Store) and for Android (in the Google Play Store).



2.2 New Manual SFRA Test for FRANEO 800

- > Use the manual sweep frequency response analysis (SFRA) test for different assets, e.g. for rotating machines
- > Configure the measurement traces corresponding to your needs
- > Use predefined generic measurement templates for a fast test preparation



3 PTM 4.30 Features & Improvements for Power Transformer Testing

3.1 New Power Transformer Tests for TESTRANO 600

- > **Grouping of tests for automatic test execution**
With this functionality, you can run grouped tests in a sequence without having a user interaction in between. Supported tests are:
 - DC Winding Resistance
 - Dyn. OLTC Scan (DRM)
 - Transformer Turns Ratio
 - Demagnetization
- > **Vector group check**
The vector group check comprises a three-phase turns ratio measurement, neutral detection and a series of single-phase measurements to determine the vector group.

3.2 Improvements of Existing Tests for TESTRANO 600

- > **DRM manual mode**
With this additional feature, you can perform dynamic resistance measurements without connecting TESTRANO 600 to the tap changer cabinet.
- > **New vector group for power losses at low voltage test**
This test is performed during factory acceptance tests and for routine checks to comply with the GOST 3484.1 standard, in countries where it is applicable.
TESTRANO 600 currently supports the power losses at low voltage test on transformers with vector groups YNd11, Yd11 and YNyn0.

3.3 Additional features for TESTRANO 600

- > **Control tap changer up/down**
When you connect TESTRANO 600 to PTM, the tap switch command in the bottom bar is available. You can use the arrow buttons to switch a connected OLTC when no measurement is running.
During the measurement, the tap changer can be switched if the user deactivates the “Automatic Tap control” setting.
- > **Device self-test**
In the “Connected to device” dialog box, you can run a self-test to check the hardware components.

4 PTM 4.30 Features & Improvements for Switch Gear Testing

4.1 New In-Service Tests for CIBANO 500

- > **First trip test**
The new first trip test measures the trip operation of a circuit breaker after a long in-service idle time. You can use a trigger input at CIBANO 500 to start the test, and current clamps to read the relevant current signals from the secondary side of current converters.
- > **Timing (in-service) test**
With the timing (in-service) test, CIBANO 500 can evaluate operating times of breakers which are still in service. You can use a trigger input at CIBANO 500 to start the test, and voltage signals from the secondary side of voltage converters to read the relevant voltage signals.

4.2 Improvements of Existing Tests for CIBANO 500

- > **Measure motor current with current clamps**
The already existing motor current test now supports current clamps to be used for motor current recording. Additionally, you can use an external trigger voltage signal to start the test.
- > **Dry contact operation for timing and dynamic contact resistance tests**
Using the IOB1 module, CIBANO 500 system now supports operating circuit breakers with control boards. Therefore, you can use the IOB1 module as a set of dry contacts that is easily interfaced by the CIBANO 500 and provides excellent timing precision.
- > **Main contact state indication for single-side grounded circuit breakers**
The already existing state indication for circuit breaker main contacts is now available for wiring setups with CIBANO 500 and CB MC2s, if the circuit breaker is in single-side grounded condition.

4.3 Additional Features for CIBANO 500

- > **Offline hardware configuration**
Configure the hardware settings and accessory modules in your tests and test groups without a real CIBANO 500 device connected to PTM. The new connection simulator allows to completely prepare tests to be used in the field. Simply set up your test set in the simulator and configure the tests with active simulator.
- > **Graphical comparison**
You can compare up to ten different tests with graphical results in the same chart. Use this feature to compare the performance of different assets or evaluate a measurement compared to reference data.

5 PTM 4.30 Features & Improvements for Instrument Transformer Testing

5.1 Improvements of Existing Tests for CPC 100

- > **Excitation curve measurement for IEC 61869 current transformers**
The excitation curve measurement is now supported for current transformers according to the IEC 61869 standard.
- > **CT composite error measurement for IEC protection current transformers**
The indirect composite error measurement is now also supported according to the IEC 60044 and IEC 61869 standard. This measurement is available on IEC protection current transformers (P and PR classes).

6 PTM 4.30 Features & Improvements for Rotating Machines Testing

6.1 New Rotating Machines Tests with CPC 100 + CP TD1

- > **DC winding resistance for stator and rotor**
Use the CPC 100 to measure the DC winding resistances of a rotating machine. Two separate tests support the resistance measurement for the stator and rotor of single-phase or three-phase rotating machines.

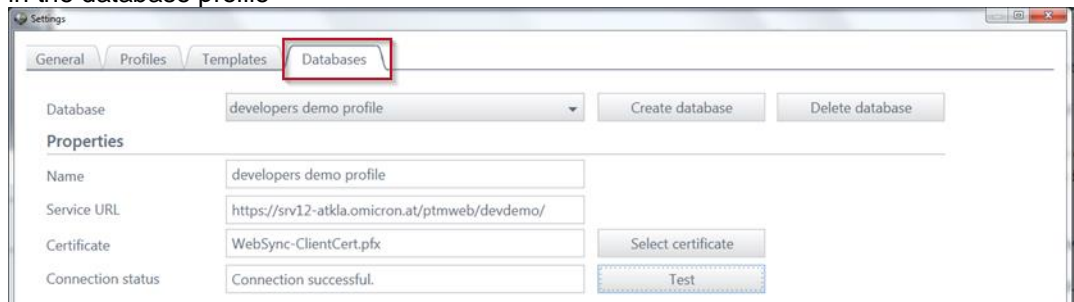
PTM

What's New Version 4.20



1 PTM 4.20 General New Features & Improvements

- New application “grounding system testing” implemented, thus easy data management, diagnostic testing and condition assessment of grounding systems
- New features for data management
 - Switching between multiple local databases is now possible via the Settings/Databases dialog. For each of the local databases an optional link to a server database can be defined in the database profile



- Multiple selection of data for bulk import and export of locations, assets and jobs
- Import of DTA6/DTA7 file format
- Fully customized reporting via Microsoft Excel™ reporting templates

2 PTM 4.20 Features & Improvements for Power Transformer Testing

2.1 New power transformer tests for TESTRANO 600

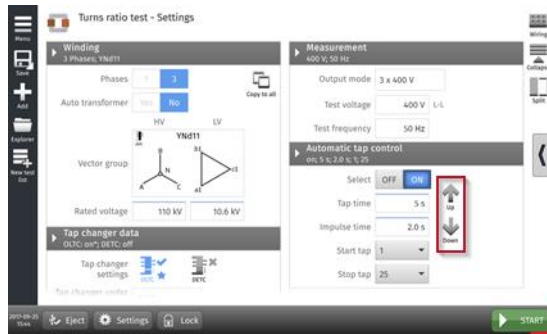
- **Short-circuit impedance/Leakage reactance test per phase**
With the per phase short-circuit impedance/leakage reactance test an in-depth analysis of the individual phases is possible. As the test setup and procedure of the frequency response of stray losses (FRSL) test is the same, it can be performed simultaneously in order to detect short-circuits between parallel strands and local overheating.
- **High-voltage transformer turns ratio test (HV TTR)**
With this test the turns ratio of the power transformer is determined. Using the CP TD1 with the capability to output up to 12 kV the insulation can be put under a higher electrical stress.
- **Power loss at low voltage**
This test is required for testing according to the GHOST 3484.1-88 standard.

2.2 Improvements of existing tests for TESTRANO 600

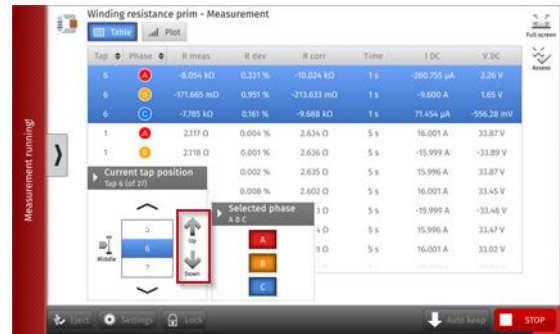
Automatic result keeping functionality for Winding Resistance test

If “Automatic result” is checked, TESTRANO 600 will measure all three phases sequentially in case no tap changer or a DETC is selected without the need of further user interaction.

- **Manual tap control** (only TouchControl for 4.20)
With this feature it is possible to **manually** switch the tap changer position if TESTRANO 600 is connected to the tap changer cabinet.



Set Automatic tap control to **ON** in Settings view: Check the cabling of the auto tap control feature using **Up/Down** button.

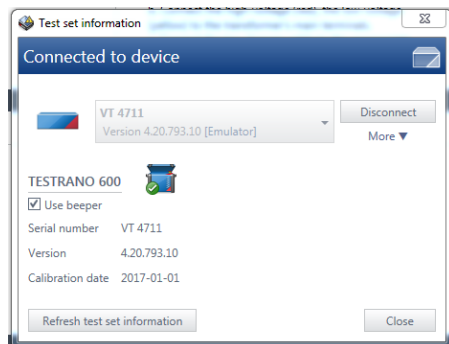


Set Automatic tap control to **OFF** in Settings view: Switch taps manually using TouchControl while a measurement is running.

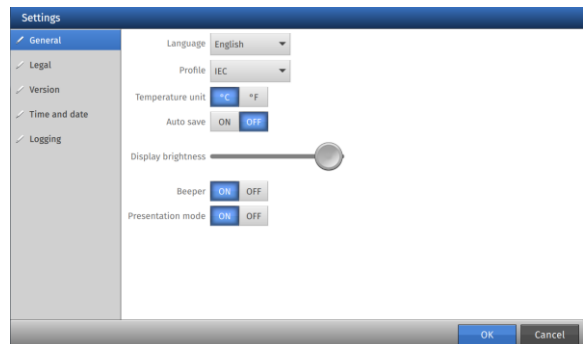
- **Multi-select functionality in result table** (only TouchControl for 4.20)
With a long tap on results in a result table, multiple results can be selected for a faster and easier deletion.

2.3 Additional features for TESTRANO 600

- **New beeper function as additional acoustic signal during testing**
The beeper is an additional indicator for the main device status but does not compensate for the warning lights on the TESTRANO 600 front and side panel. The beeper must be manually activated during connection to the device.



Activate **Use beeper** in Test set information view



Set the beeper to **ON** in Settings view

3 PTM 4.20 Features & Improvements for Switch Gear Testing

3.1 Improvements of existing tests for CIBANO 500

- **Extension of PIR measurement capabilities**
The measurement of pre-insertion resistor (PIR) states is now even possible, when only using the CIBANO 500 main device. Additionally, *Primary Test Manager™* calculates the "PIR close time" reflecting the time period when the PIR was active.
- **200A source with CB MC2 modules**
Primary Test Manager™ now allows to combine both current channels of each CB MC2 module to a 200A current source. Benefit from the power of 200A in timing tests as well as dynamic- and static contact resistance tests using CB MC2 modules.

3.2 Additional features for CIBANO 500

- **Automatic execution of grouped tests**

Perform a series of pre-configured tests automatically one after another. Just create a group of tests and start the series in the “Test control” section on group level. Before each test, *Primary Test Manager™* takes care that the breaker main contacts are brought into the correct position.

| Test control | | |
|------------------------------|--------------|---|
| Stop all | Clear all | Open breaker Close breaker Supply motor |
| Motor Current | Executed | Not assessed |
| C Timing | Executed | Not rated |
| Contact Resistance | Executed | Not rated |
| O Timing | Executed | Not rated |
| C Dynamic Contact Resistance | Executed | Not rated |
| O Dynamic Contact Resistance | Executing... | Not assessed |
| Minimum Pickup | Not executed | Not assessed |

- **New CIBANO programming interface**

The CIBANO 500 system now provides a programming interface (API) that allows to operate the system using your own software. This way, it is possible to e.g. automate a testing process with the CIBANO 500 system without using the *Primary Test Manager™*.

- **Improved reporting functionality for customized reports**

Load your customized reporting template and use it to create Microsoft Excel™ or PDF reports that show exactly what you need.

4 PTM 4.20 Features & Improvements for Instrument Transformer Testing

4.1 New current transformer tests with CPC 100

- **Composite error test**

Perform a dedicated composite error test on C-class protection CT's and use the results for an assessment according to IEEE C57.13 (2016)

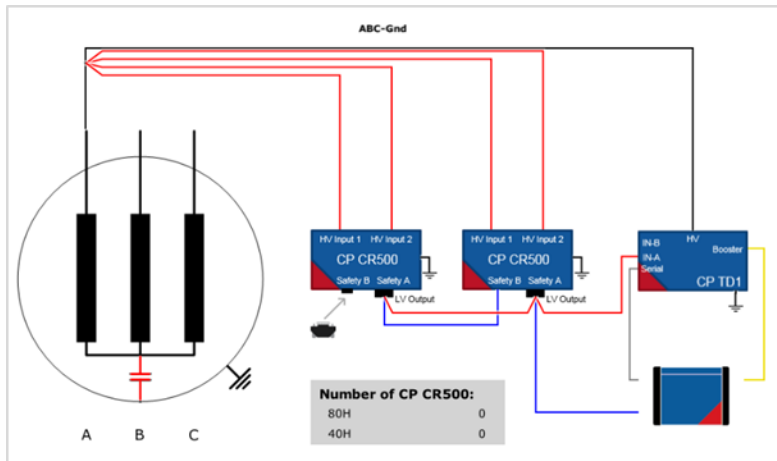
| Composite error | | | | |
|-----------------|---------------|-----------------------|----------------------------|------------|
| Core 1 | | | | |
| Tap | Ipr : Isr | Composite error @ Isr | Composite error @ 20 x Isr | Assessment |
| X1 - X2 | 10000 A : 5 A | 0,1161 % | 0,0527 % | Pass |

5 PTM 4.20 Features & Improvements for Rotating Machines Testing

5.1 New rotating machines tests with CPC 100 + CP TD1

Stator winding power/dissipation factor and capacitance test (Stator winding PF & Cap test)

Perform a guided test of the stator winding with CPC 100 + CP TD1 + CP CR500 for power/dissipation factor and capacitance measurements. Automated connection schemes and compensation calculation for phase-to-ground and phase-to-phase measurements are provided.



6 PTM 4.20 Features for Grounding System Testing

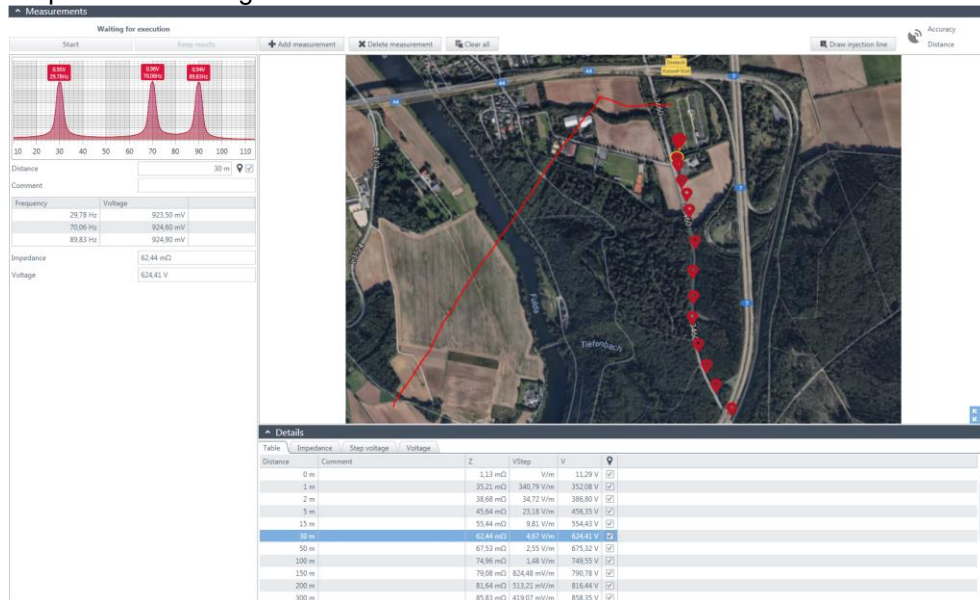
6.1 New grounding system tests with CPC 100 + HGT1

- **Comfortable testing with CPC 100 and HGT1**

Comfortable testing of grounding systems using a tablet with GPS sensor, CPC 100 as signal source and HGT1 as measurement device. You benefit from:

- Fully automated testing, for GPS tracking of test points, download of BING maps, auto detection of test signal
- Guided Workflow for test setup, execution and assessment for easy analysis without expert knowledge
- Assessment according to international, relevant standards
- Optimized for tablet usage
- Portable solution, just one person is required for all available tests
- Easy generation of reports by just clicking one button

- **Implementation of common diagnostic tests**
Available tests for grounding system testing are:
 - Ground Impedance
 - Step & Touch Voltage



PTM

What's New Version 4.10



1 PTM 4.10 General New Features & Improvements

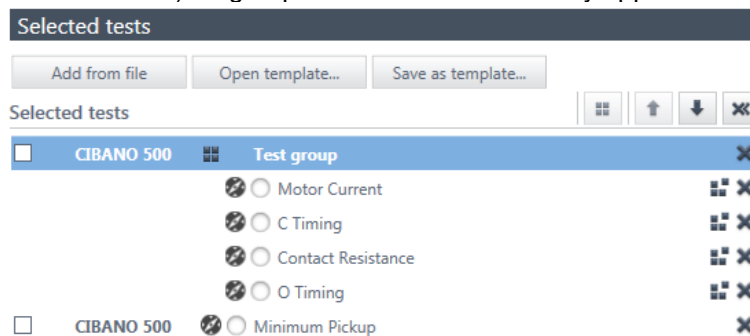
- **Primary Test Manager now offers the new asset “Rotating Machine” and corresponding tests**
- **New features for DIRANA**
 - Dielectric response analysis for testing of instrument transformers and rotating machines
 - Customized categories for moisture and oil conductivity
 - Excel export

2 PTM 4.10 Features & Improvements for Transformer Testing

- **Transformer testing with TESTRANO 600**
 - **Dynamic OLTC-Scan (DRM) including static winding resistance** – Single phase measurement and graphical representation of the current during switching of the OLTC on all available phases. Filters can be applied for phase parity of the tap and up or down cycle. This method can be used to evaluate the switching process of resistor type tap changers with respect to timing, discontinuities, contact wear and resistors. The test also includes the measurement of the static winding resistance for each tap so no additional test of the winding resistance is required.
 - **Fully automated excitation current test with up to 12 kV** – Single phase measurement of excitation (no load) current of transformers with a test voltage of up to 12 kV. Measurements can be performed on all tap positions in full automatic mode using tap changer control of TESTRANO 600. CP TD1 accessory required.
 - **Calculation of voltage or turns ratio** – When performing ratio measurements, PTM 4.10 offers the option to either calculate the voltage or the turns ratio.
 - **Automatic assessment of phase shift** – When performing 3 phase ratio measurements, PTM 4.10 offers automatically alerts the user of any abnormal deviations between the measured phase shift and the nominal phase shift based on the specified vector group
 - Automatic calculation of tap voltages based on % deviation from nominal position
- **Transformer testing with CPC 100**
 - **Dynamic OLTC-Scan (DRM) including static winding resistance** – The dynamic OLTC-Scan (DRM) test in CPC 100 now also includes the measurement of the static winding resistance for each tap so no additional test of the winding resistance is required.
 - **Calculation of voltage or turns ratio** – When performing ratio measurements, PTM 4.10 offers the option to either calculate the voltage or the turns ratio.
 - **More flexibility when comparing winding resistance measurements** - The user has the option to compare static winding resistance measurements from different transformers regardless of the number of phases or tap positions that were tested. Before the number of phases and tap positions and the order in which they were tested had to match between two tests in order to be able to compare them. It is now also possible to compare static winding resistance values captured during a Dynamic OLTC-Scan (DRM) tests with the results of a winding resistance test.
 - **Automatic calculation of tap voltages** based on % deviation from nominal position
 - **New Line Impedance Test Card:**
The new line impedance test card makes line impedance testing much easier and faster, due to:
 - Guided workflow implemented in test card
 - Significant improvements on the User Interface
 - Final results are now displayed on test card, no EXCEL template needed anymore on-site

3 PTM 4.10 Features & Improvements for Switch Gear Testing

- **GIS Timing test**
 - Primary Test Manager now offers a dedicated timing test for gas insulated switchgears. This test makes use of the Current Sensor Measurement (CSM) and provides graphical as well as numerical results similar to the non-GIS timing test.
- **Demagnetize current transformers**
 - The CIBANO system is now capable of demagnetizing the current transformers in the circuit breaker's main contact path (e.g. GIS or dead tank breakers). The demagnetization routine can be done from the primary side and does not need access to the current transformer's secondary side.
- **Bounce filter for main and auxiliary contacts**
 - The new bounce filter can be applied to the measurements of main and auxiliary contacts. It removes contact gaps from the measurement that are smaller than a given duration. The user can define separate minimum durations for main contacts and auxiliary contacts separately.
- **Bounce analysis for main contact measurements**
 - When measuring circuit breaker main contacts, Primary Test Manager analyses the duration and amount of contact bouncing. The results are provided numerically within the results tables.
- **Test groups**
 - When defining a test list in Primary Test Manager, it is possible to combine several tests to a test group. This allows the user to define common settings (Hardware configuration, settings and conditions) on group level which automatically applies to all tests within the group.



- **Allow to operate motor during Permanent Power Supply**
 - Primary Test Manager now allows to operate the motor supply while the permanent power supply is active. This feature makes it possible to run a motor current test even if the breaker needs to be supplied continuously.
- **Breaker state indication**
 - Primary Test Manager now shows the circuit breaker state in the user interface of Timing tests with the CIBANO 500 main unit. The main contact state of each pole is indicated by symbols. Possible states are Open, Closed or Unknown which indicates that the main contact state could not be detected.
- **Additional changes**
 - Digital motion measurement: Correction of a time offset for the digital motion measurements. Old measurements will automatically be corrected while loading the test. New measurements will have the correct timing.

4 PTM 4.10 Features & Improvements for Instrument Transformer Testing

Instrument transformer testing with DIRANA

- Dielectric response analysis
- Insulation resistance, polarization index (PI) as well as dielectric absorption rate (DAR) tests

5 PTM 4.10 Features & Improvements for Rotating Machines Testing

New asset “Rotating Machines” added

Rotating machines testing with CPC 100 + CP TD1

- Manual tan delta test

Rotating machines testing with DIRANA

- Dielectric response analysis
- Insulation resistance, polarization index (PI) as well as dielectric absorption rate (DAR) tests

PTM

What's New Version 4.00



1 PTM 4.00 – General New Features & Improvements

Additional test sets supported

With the addition of DIRANA and TESTRANO, PTM now supports the following test sets:

- CPC 100 / CPC 80 with accessories
- TESTRANO 600
- FRANEO 800
- DIRANA
- CIBANO 500

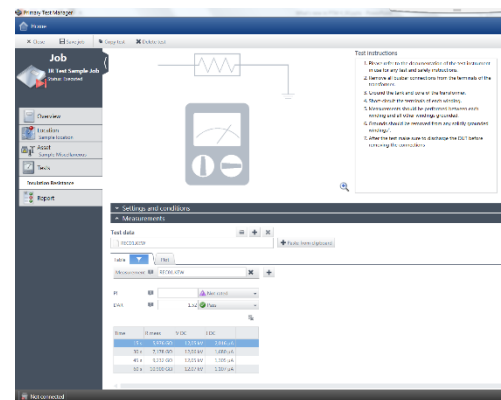


Data synchronization

- Visualization of changed jobs / assets
- “Select all” for subscribing locations

Insulation resistance test added

- Perform HV DC insulation resistance tests with any 3rd party HV DC IR tester on the market and enter the data to PTM via direct input, data interfaces, Excel import or via clipboard
- Create IR test reports with PTM

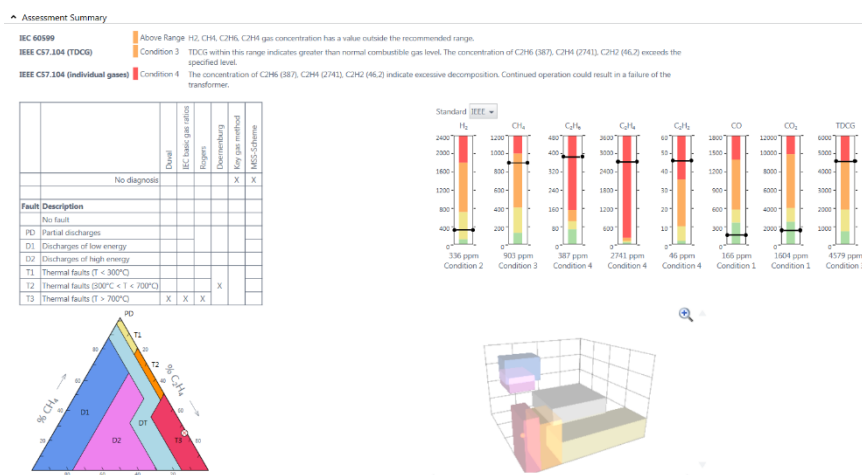


2 PTM 4.00 Features & Improvements for Transformer Testing

Oil Analysis

DGA analysis for the transformer main tank according to IEC60599 and IEEE C57.104:

- Assessment summary
- Duval triangle 1, 4 and 5
- IEC basic ratios including 3D-graph visualisation
- Rogers, Doernenburg and MSS ratio methods
- Key gas method
- DGA trending



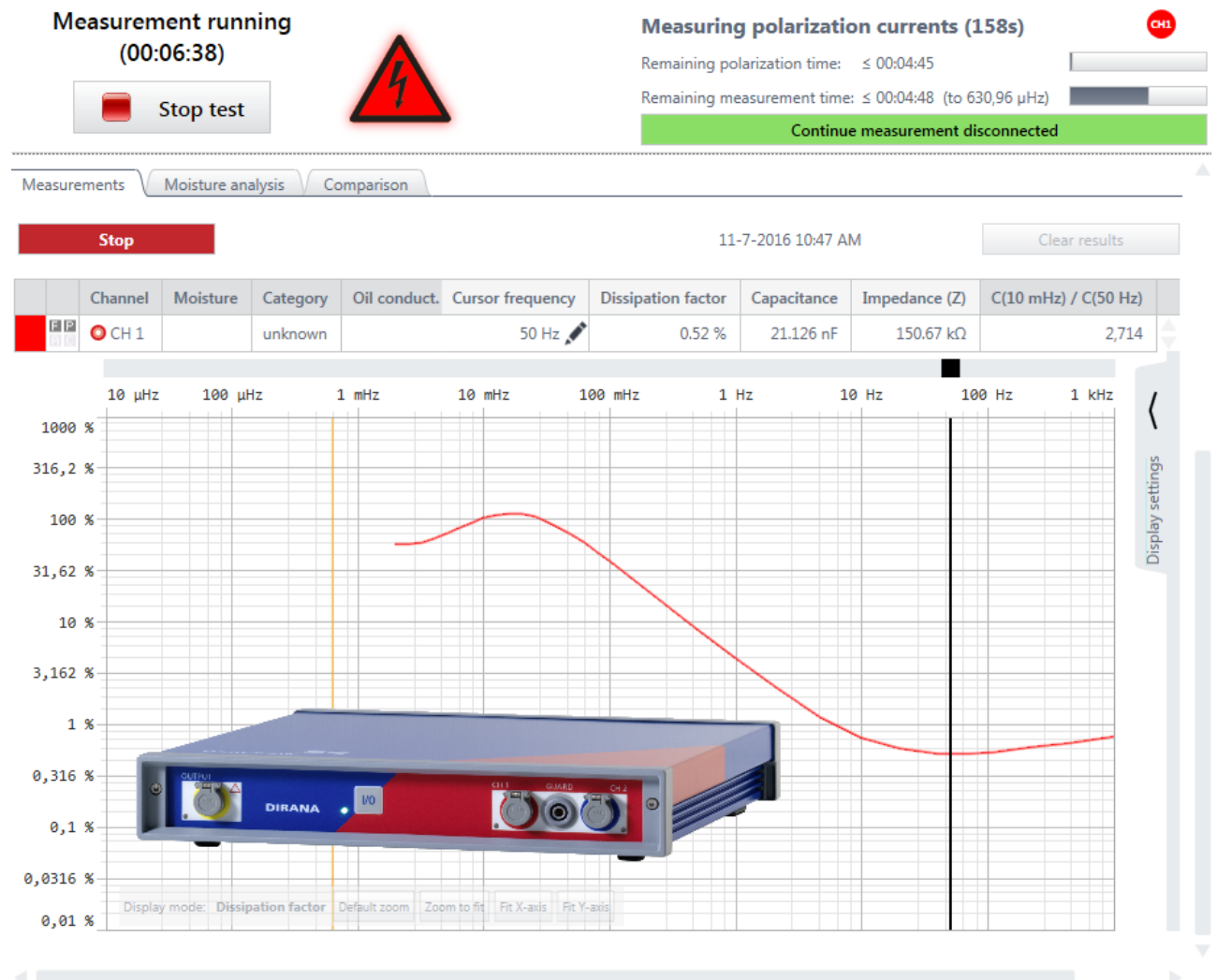
Transformer testing with TESTRANO 600

- Both guided and manual workflows supported
- DF & Cap, short-circuit impedance, turns ratio, DC winding resistance and demagnetization tests

DIRANA test

- Full integration of DIRANA for power transformers including moisture analysis, dielectric response test, $\tan(\delta)/PF$, capacitance, insulation resistance, PI, DAR...
- Up to 20x faster testing than before due to revolutionary FDS & PDC+ combination
- Automatic frequency range setting: Detects the optimum frequency range and ensures minimum measurement time
- Fully automatic measurement & assessment mode ensures optimal results without expert knowledge
- Integration in PTM database
- Databases for ester-filled transformers
- Powerful reporting

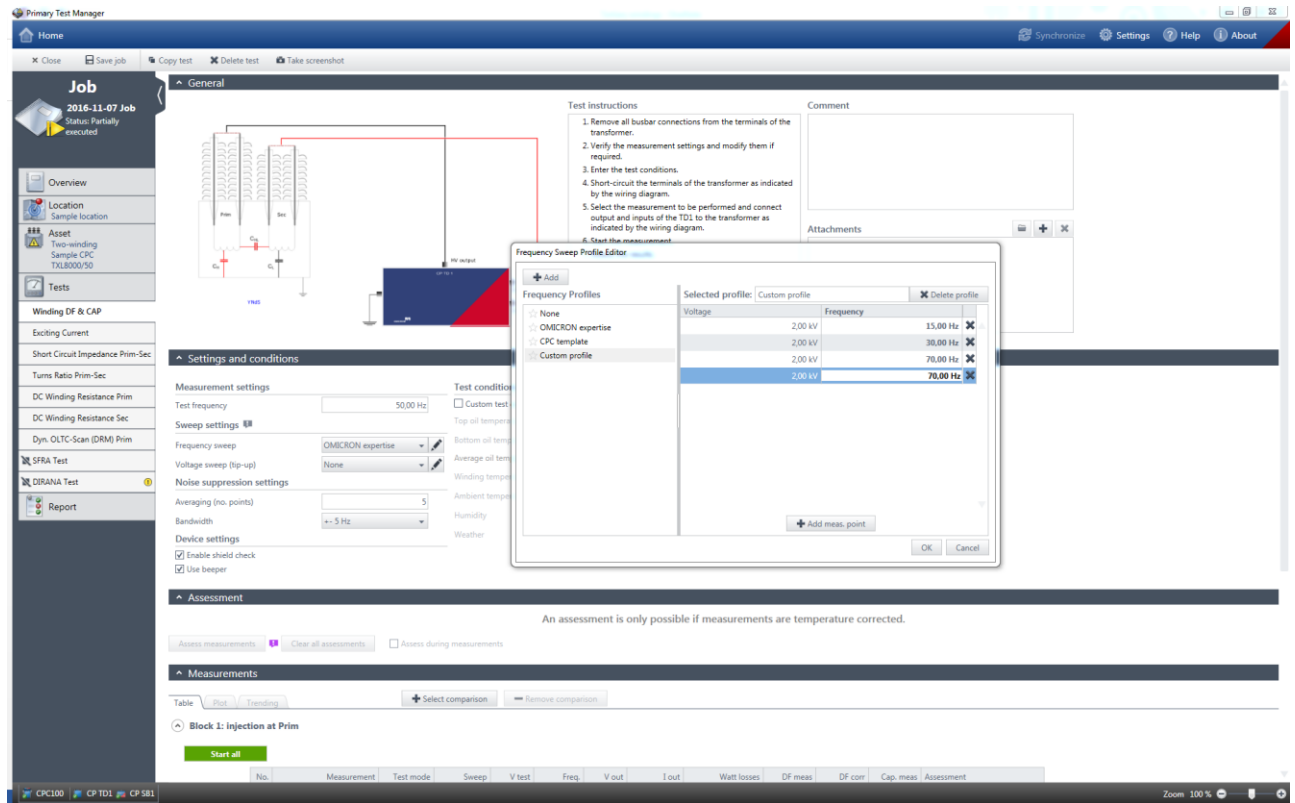
The new DIRANA PTM software can be used with all existing DIRANA devices without an additional license!



Sweep Editor for Tan Delta tests

Users are now able to create his own custom sweeps for tan delta tests:

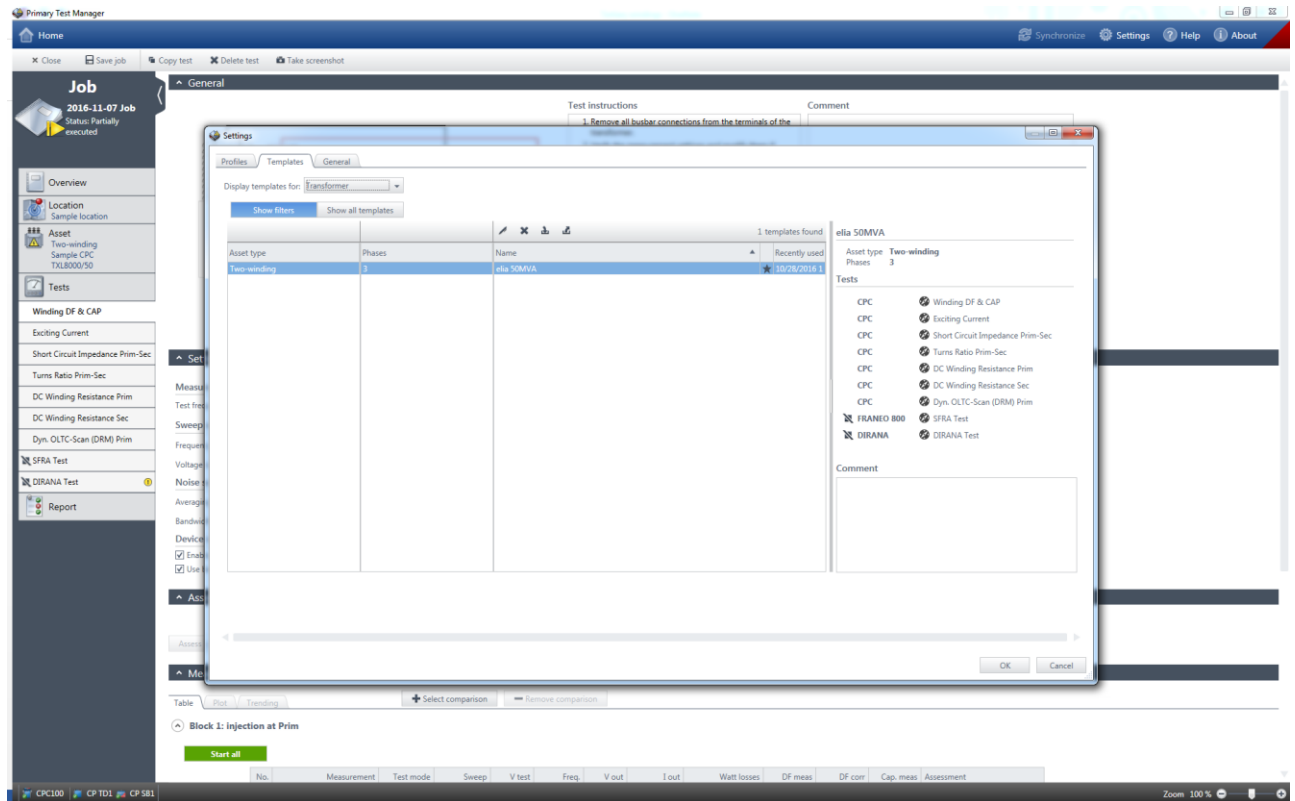
- Voltage sweep
- Frequency sweep



Templating for power transformer testing

Users are now available to create their own test list templates:

- Sorted after Asset type/Phases
- Can be applied to all kind of power transformers with automatic adaption to asset



Support of CP SB1 with single-phase transformers

Better comparison of TTR test results

- Comparison of two tests without exact same test settings is now possible

New vector groups

- YND3/YD3
- DYN3/DY3
- YND9/YD9
- DYN9/DY9

3 PTM 4.00 Features & Improvements for Switch Gear Testing

Automatic assessment for Motor Current test results

The Motor Current test now offers an automatic assessment of its new numerical results Inrush Current and Charging Time. The assessment limits (absolute or relative) can be entered directly in the asset definition ("Assessment limits" tab) or in the Motor Current test ("Assessment" section).

Automatic assessment for auxiliary contact timings

The assessment of CIBANO 500 Timing and Dynamic Contact Resistance tests now allows also the automatic assessment of auxiliary contact timings ("Switching time", "Diff. to main" and "Duration"). The assessment limits can be defined in the asset definition ("Assessment limits" tab) or directly in the test ("Assessment" section).

Automated stop of motor supply when charging is finished

The Motor Current test is now automatically stopped when the motor finished the charging process. The CIBANO device monitors the current drawn by the motor during the charging process and automatically stops the operation when no current is drawn anymore. The same applies for the "Supply motor" option executed from any other CIBANO 500 test in PTM.

Permanent power supply on channel B3

The CIBANO 500 now offers to enable the channel B3 as permanent power supply. This power supply can be switched on even if no test is currently running and it is not interrupted while executing a test. The voltage level can be in the range of -300V...300V DC or 0 ... 240V AC. Since the CIBANO device can only put out one voltage level at a time, the permanent power supply and other voltage outputs have to have the same voltage level.

Megger import

PTM is now able to import numerical measurement data from Megger's CABAWin format. In the Manage view, choose "Import from Megger CABAWin" from the "Import" menu in the job column and select the root folder of the CABAWin job to import. PTM will then read available asset information and measurement data. The data is imported in the PTM database.

Use conversion tables for contact travel measurements

The former "Contact factor" setting for contact travel measurements is extended to also load "Conversion tables" that translate an angular transducer movement to a linear main contact movement (degree to millimetres). PTM supports a generic CSV format (User Manual includes details) and Megger's TBL-format for conversion tables. The conversion tables are added to the circuit breaker asset and can then be used in the corresponding tests. It is still possible to use a linear factor which is then again the Contact Factor.

CIBANO 500 hardware self-test

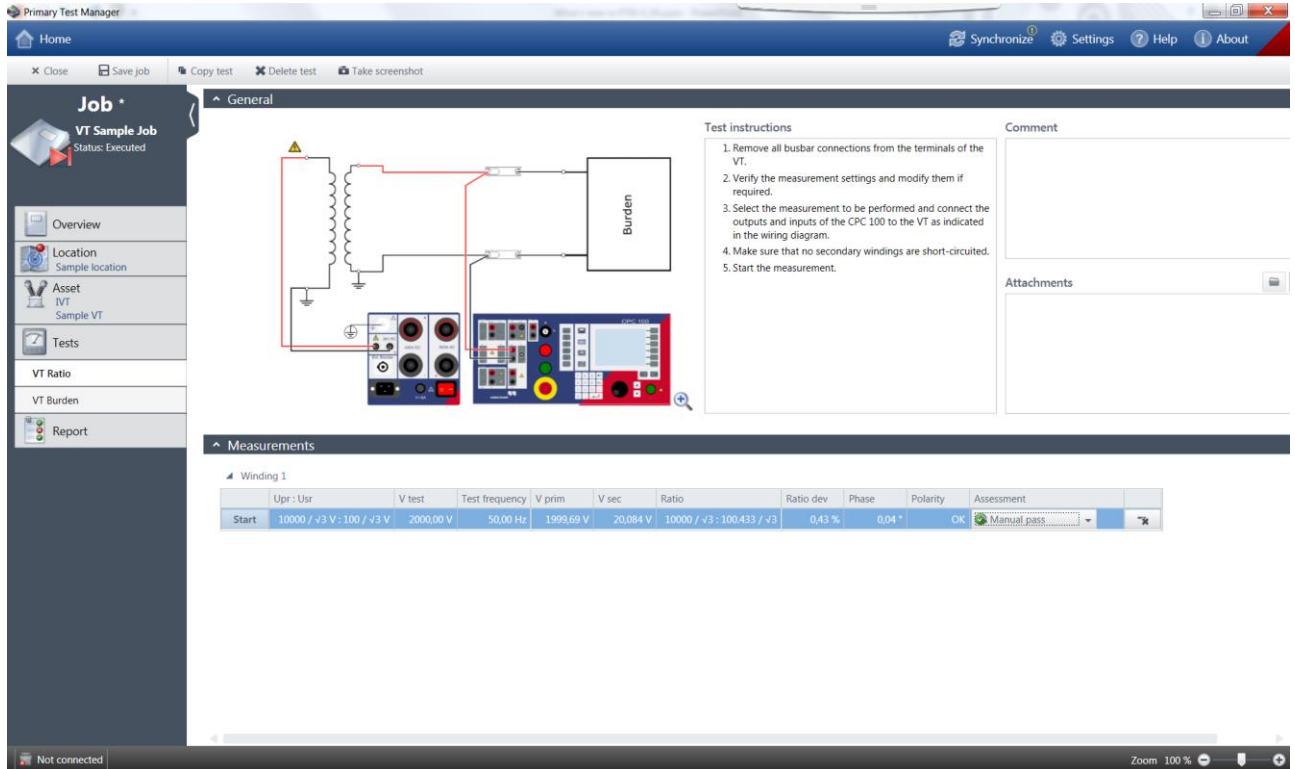
The CIBANO 500 system is safer now. The device software performs a "hardware self-test" before executing the first test after booting the device. The CIBANO 500 will automatically check vital components like the switch-matrix output relays and report back if the test was passed or not. If not, PTM shows an information with further instructions. The test will prevent the CIBANO system from executing tests with malicious hardware.

4 PTM 4.00 Features & Improvements for Instrument Transformer Testing

VT asset added

New tests for voltage transformers added

- VT Ratio
- VT Burden
- VT PF & Cap.



The screenshot displays the PTM 4.00 software interface. The top menu bar includes 'Home', 'Synchronize', 'Settings', 'Help', and 'About'. Below the menu bar, there are tabs for 'Close', 'Save job', 'Copy test', 'Delete test', and 'Take screenshot'. The main window is divided into several sections:

- Job * VT Sample Job** (Status: Executed) - A sidebar on the left contains a tree view with 'Overview', 'Location', 'Asset', 'Tests', 'VT Ratio', 'VT Burden', and 'Report'.
- General** - The main area shows a wiring diagram of a voltage transformer connected to a burden and a test instrument. To the right of the diagram are 'Test instructions' and a 'Comment' field.
- Measurements** - A table below the diagram shows test results for 'Winding 1'.

Test instructions:

1. Remove all busbar connections from the terminals of the VT.
2. Verify the measurement settings and modify them if required.
3. Select the measurement to be performed and connect the outputs and inputs of the CPC 100 to the VT as indicated in the wiring diagram.
4. Make sure that no secondary windings are short-circuited.
5. Start the measurement.

Measurements Table:

| | Upr : Ustr | V test | Test frequency | V prim | V sec | Ratio | Ratio dev | Phase | Polarity | Assessment |
|-------|---------------------------|-----------|----------------|-----------|----------|---------------------------|-----------|--------|----------|-------------|
| Start | 10000 / √3 V : 100 / √3 V | 2000,00 V | 50,00 Hz | 1999,69 V | 20,084 V | 10000 / √3 : 100,433 / √3 | 0,43 % | 0,04 ° | OK | Manual pass |

The bottom status bar indicates 'Not connected' and 'Zoom 100 %'.

PTM

What's New Version 3.50



1 PTM 3.50 – General New Features & Improvements

1.1 Automatic upgrade of CPC 100/80 embedded software

- PTM automatically detects if an embedded software upgrade for CPC 100/80 is required and provides an option to initiate the upgrade process.

1.2 Customer Experience Improvement Program (CEIP)

- The Customer Experience Improvement Program (CEIP) collects information about how you use Primary Test Manager without interrupting you. This helps OMICRON identify which features to improve. No information collected is used to identify or contact you. We encourage you to join the program to help improve Primary Test Manager.

2 PTM 3.50 Features & Improvements for Testing Transformers

2.1 Improvement of DC Winding Resistance Test

- When using the CP SB1, the user can select any tap position and automatically measure the winding resistance of all three windings. With this option, selective three-phase measurements on individual tap positions (e.g. mid, high, low) can be easily performed.
- When testing windings with a DETC, automatic measurements on all three phases can be performed using the CP SB1.
- When testing windings without a tap changer, automatic measurements on all three phases can be performed using the CP SB1.
- When testing one-phase transformers, automatic tap control of the CP SB1 can be used to perform automatic measurements on all tap positions.

2.2 Selective nameplate locking

- After a test has been executed, only the nameplate parameters which affect this specific test will be locked for editing. In contrast to previous versions, users will be able to change other nameplate values (e.g. bushing data) if the tests linked to those parameters have not been executed.

2.3 Assessment status overview

- In the assessment status overview, the user is able to differentiate if an assessment has been done for every executed measurement and if an assessment has been manually corrected by the user.
- Bug fix of representation of aggregated assessment status.

3 PTM 3.50 Features & Improvements for Testing Circuit Breakers

- **Automated suggestion of default Contact Factor.** If not otherwise specified, the idealized Contact Factor is automatically calculated from the measurement data and the nominal total travel in the circuit breaker nameplate.
- **Auxiliary contact timing.** Primary Test Manager now automatically detects the type of measured auxiliary contacts and calculates their switching time, duration and time difference to the corresponding main contact. These values are also part of the test report.
- **Motor current numerical results.** Primary Test Manager now automatically calculates, displays and reports the inrush current and charging time when doing a Motor Current test.
- **Auto-update also available for CIBANO 500 device software.** The auto-update of the Primary Test Manager now supports to update the CIBANO 500 device software independently from PTM.

- **Closing time calculation in O-CO sequence.** Primary Test Manager now calculates the main contact closing time when executing an O-CO operation sequence.
- **Check hardware modules to restore configuration.** Primary Test Manager automatically checks if the connected hardware modules fit the prepared Hardware Configuration in the test. In case of a mismatch it provides information to resolve it.

4 PTM 3.50 Features & Improvements for Testing Current Transformers

4.1 New tests for Current Transformers

- CT Excitation
- CT Winding Resistance
- CT Ratio (Voltage Method)
- CT Burden

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