

# FRANEO 800

The next generation for a reliable core and winding diagnosis of power transformers





# The next generation of power transform

Mechanical or electrical problems in power transformer windings, contacts or cores are the result of:

- > extraordinarily high mechanical forces,
- > shocks due to transportation and seismic activities, or
- > mains power failures such as high short-circuit currents.

Problems such as these will not necessarily lead to a breakdown, but a power transformer's ability to withstand further mechanical loads will be drastically reduced.

These problems can be identified with our new FRANEO 800, the successor to the well-established FRAnalyzer, by using the Sweep Frequency Response Analysis (SFRA) principle.

## Worldwide proven measurement method

Since the IEC 60076-18 standard was introduced, the method has become one of the common electrical tests and its acceptance on the market has increased accordingly.

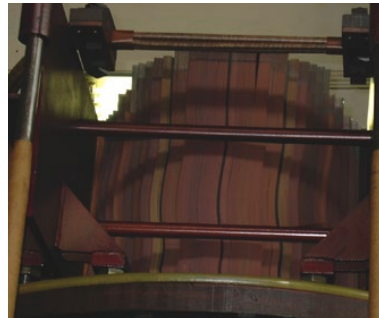
SFRA performs measurements in a frequency domain. It is robust against broadband and narrowband noise and thus, it is able to achieve a high signal-to-noise ratio. SFRA is a non-invasive measurement method and based on a comparison of actual and reference measurements.

# mer core and winding diagnosis

With FRANEO 800 and the SFRA being used you can detect defects as well as faults in the magnetic core, the winding assembly, and the clamping structures of power transformers, such as:

- > Axial and radial winding deformation
- > Displacements between high- and low-voltage windings
- > Partial winding collapse
- > Shorted or open turns
- > Faulty grounding of core or screens
- > Core movement
- > Broken clamping structures
- > Problematic internal connections

As a result you can improve the reliability of your transformers, reduce maintenance costs and, most of all, avoid unexpected and expensive outages.



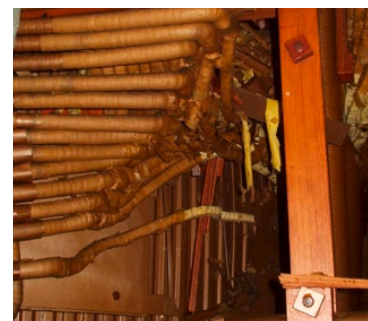
Deformed core



Collapsed tap winding



Buckling of winding



Displaced internal connections



## Your benefits

- > Wide dynamic measuring range (> 150 dB)
- > Reproducible results thanks to innovative connection technique, based on IEC 60076-18, Method 1
- > Guided workflow for test set-up, execution and assessment for easy analysis without expert knowledge
- > Fast measurement times due to intelligent sweep algorithm
- > Small and light-weight equipment guarantees optimum usability

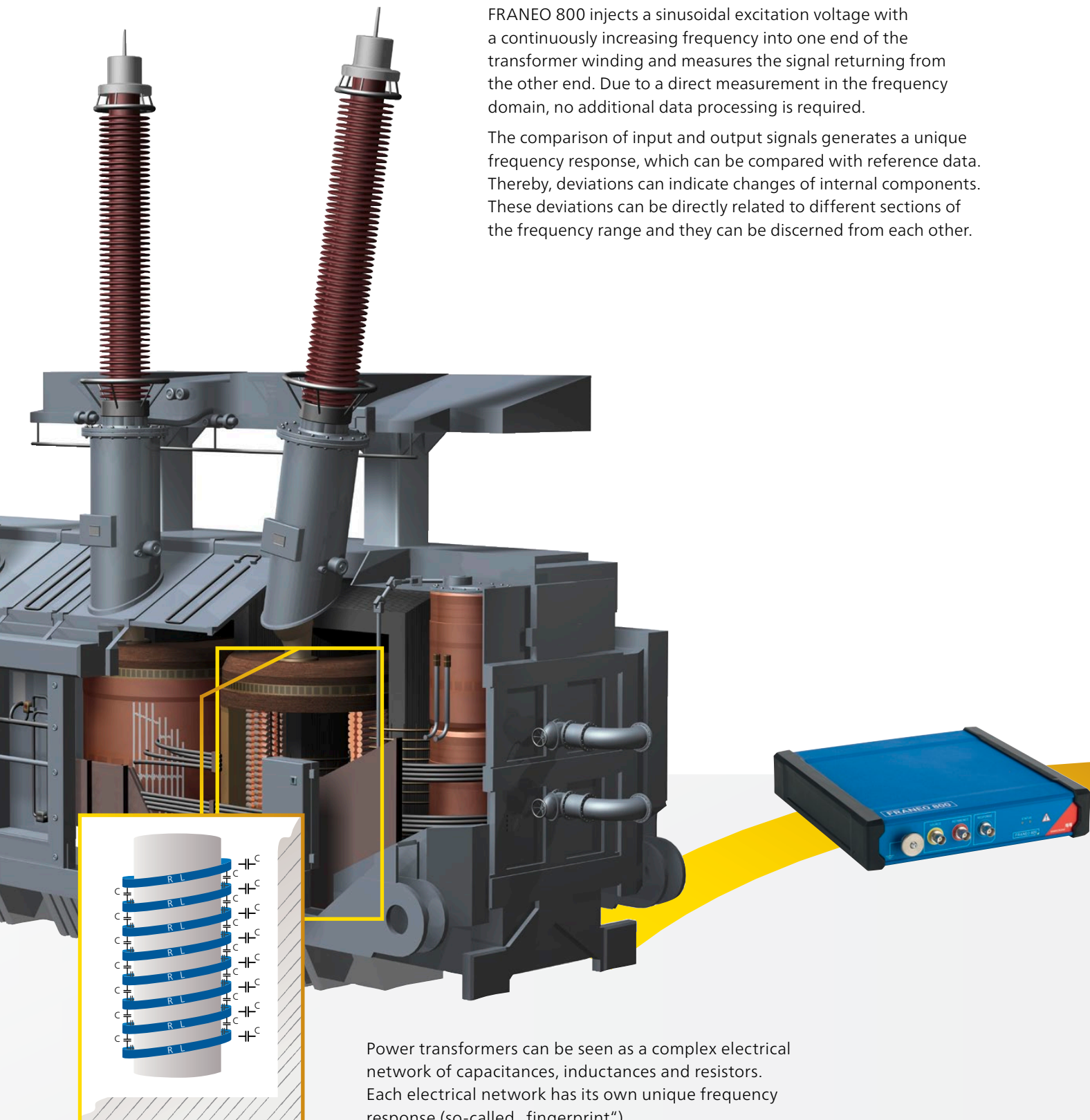
 [www.omicronenergy.com/FRANEO-800](http://www.omicronenergy.com/FRANEO-800)

# Sweep Frequency Response Analysis (SFRA)

## Measuring principle

FRANEO 800 injects a sinusoidal excitation voltage with a continuously increasing frequency into one end of the transformer winding and measures the signal returning from the other end. Due to a direct measurement in the frequency domain, no additional data processing is required.

The comparison of input and output signals generates a unique frequency response, which can be compared with reference data. Thereby, deviations can indicate changes of internal components. These deviations can be directly related to different sections of the frequency range and they can be discerned from each other.



Power transformers can be seen as a complex electrical network of capacitances, inductances and resistors. Each electrical network has its own unique frequency response (so-called „fingerprint“).

## SFRA as basis for further measurements

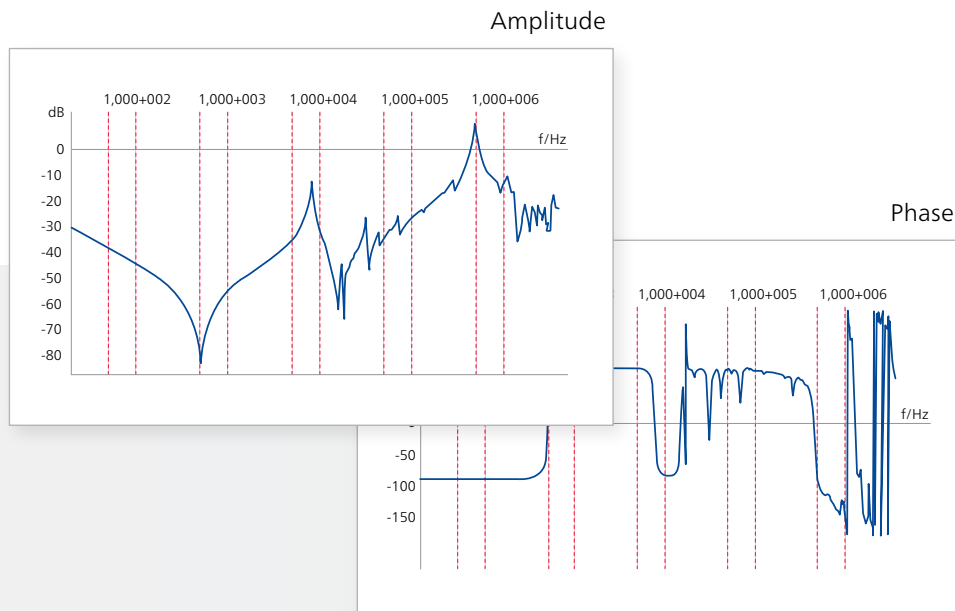
The SFRA measurement technique is the most sensitive diagnostic method for the detection of mechanical deformations. As the SFRA covers a wide frequency range, electrical defects and faults can also be indicated.

Based on the SFRA results you can reliably assess the integrity of your power transformer and, if required, derive further diagnostic measurement techniques, such as leakage reactance, exciting current, or winding resistance measurements. These measurements can be performed with our multifunctional CPC 100 + CP TD1.

FRANEO 800 is a very reliable and efficient test set for the classical core and winding diagnosis of power transformers. At the same time, it supports you in the best possible way during the diagnosis of complex defects within the active part of your power transformer.

SFRA combines different advantages:

- > Most sensitive method for detecting mechanical and electrical changes within the active part of power transformers.
- > Non-invasive measurement method, which allows the assessment of power transformers' integrity without applying high-voltages.
- > Comprehensive method, providing additional information to facilitate the condition assessment of the power transformer.



Geometrical changes within and between the elements of the network cause deviations of a transformer's frequency response. FRANEO 800 compares such measurement results with the original fingerprint.

# FRANEO 800 – our new solution for a reliable frequency response

Since SFRA is a comparative method, it is vital that measurements become reproducible. This is the only way to guarantee that deviations between an actual measurement and its fingerprint can be related to defects within the observed transformer.

The connections between the measuring device and the transformer terminals, as well as the grounding technique, all have an influence on the reproducibility of your measurement.

## Innovative connection technique for the highest level of reproducibility

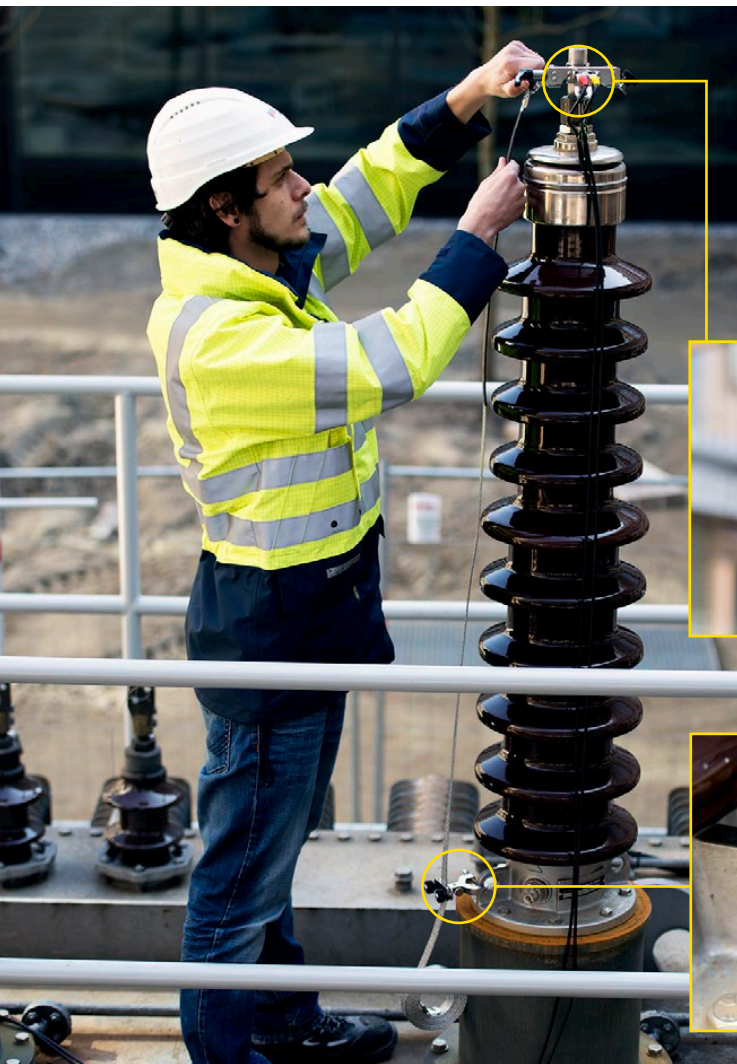
The improved bushing clamps can easily be mounted to transformer bushings, achieving a reliable electrical contact. They provide a high level of cable relief, which increases the longevity of the required accessories.

Ensuring the highest available signal-to-noise ratio, several double shield coax cables are used, which have to be grounded by an additional connection following certain conventions.

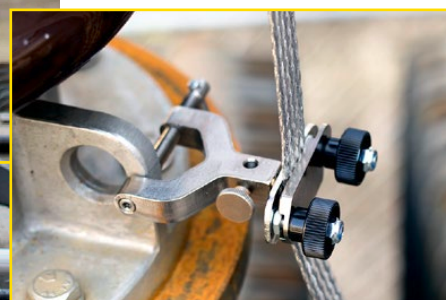
## Optimum measurement setup with shortest braid concept

Wide flat braids are dedicated for this. They provide a large surface area, the lowest inductance and are less sensitive to interference. This makes the measurement independent from the cable position and significantly increases the level of reproducibility especially in the high-frequency range area.

In order to eliminate any influence of the grounding system on your measurement results, the grounding braids should always run tightly along the body of the bushings. This is ensured by the specially designed flange-screw clamps and the flexible length of the grounding braids being used.



Due to the special design of the bushing clamps a reliable contact is achieved.



Flange-screw clamps with spikes function as reliable contacts even through layers of paint or dirt.

# analysis

## Powerful features that give you the best measurement support possible

### Highest dynamic range and accuracy

Due to the innovative measurement concept, high precision measurements can be performed with an accuracy of  $\pm 0.5$  dB down to -100 dB.

The low noise floor ensures that even strong attenuated measurement traces can be measured with high accuracy. Thereby, FRANEO 800 is able to achieve the best dynamic range (> 150 dB) in the SFRA testing industry.

### Variable output voltage

FRANEO 800 now offers you a freely adjustable output voltage from  $0.1 V_{pp}$  to  $10 V_{pp}$  (at  $50 \Omega$ ). Thus, results of previous measurements with other FRA test devices can easily be compared with new measurements. Making use of the extraordinary dynamic range, the signal-to-noise ratio can be enhanced and the influence of interference reduced by using a higher output voltage.

### Intelligent sweep settings

The intelligent sweep settings shorten the measurement duration significantly. The implemented algorithm first performs a broadband measurement and then focusses on the critical frequency areas, achieving more precise measurement results.

In order to be able to support future comparisons of new FRANEO 800 results with previous results, different sweep setting profiles can be selected.

### Ground Loop Check

The integrated 'Ground Loop Check' verifies the test set-up and makes sure that the grounding braids are properly connected. It gives you a "Pass/Fail" assessment and either allows or prevents you from continuing with your measurement. This internal check guarantees reproducible measurement results.



## One solution in one box for easy and comfortable testing

With FRANEO 800 you get all the required components in just one box. This makes testing quite comfortable and the system easy to transport. Its newly developed, extremely robust housing is ideal for on-site testing. With the powerful integrated battery, you can also perform tests in environments without a power supply.

# Step by step through the test procedure with Primary Test Manager™

The Primary Test Manager™ (PTM) is the ideal software tool for the diagnostic testing and condition assessment of your power transformers.

Operating FRANEO 800 with PTM means being compliant with applicable international IEC and IEEE standards and guidelines (IEC 60076-18 and IEEE C57.149-2012), while keeping your testing time to a minimum.

## Management of location, asset and test data

PTM provides a well-structured database for managing SFRA and additional transformer test results to get a comprehensive overview of your asset's condition. You can define and manage locations, assets, jobs and reports in an easy and fast way.

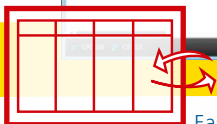
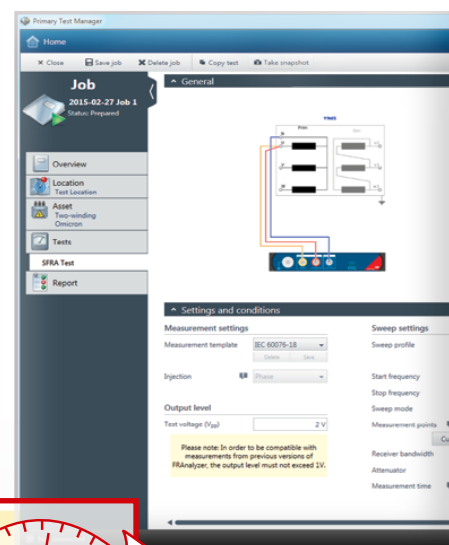
## Import and export functionality

Measurements performed and stored with the old FRAnalyzer database, can easily be imported in the new PTM database, using the migration assistant wizard that is included. In addition, data can be filtered or exported in common formats (XML, PDF, Microsoft® Word, Microsoft® Excel).

## Data synchronization and back-up

With the 'PTM DataSync' module, you can synchronize your local database with a PTM server database. The server database collects the test data from every user connected to the server. Thus, data synchronization and storage are safer and more convenient than they have ever been before.

Location				Asset				Job				Report			
Name	Address	City	Postal	Serial no.	Asset type	Name/WO	Tested by	Creation date	File	Name	Client	Creation date	File		
All				All		All				All					
642				0200022	Running	With test tag	10	2013-06-12	MW-8ra	19-29-2013	10	10-30-2013			
Rayson 38				0200022	Running	With test tag	10	2013-07-17	MW-5m	19-29-2013	10	16-09-2013			
Carr & Duff				0200022	Running	With test tag	10	2013-08-09	Motion	19-29-2013	10	11-04-2012			
CircuitBreakerLoco				0200022	Running	With test tag	10	2013-08-13	Beta2.5	19-29-2013	10	11-02-2012			
Dewbank				02-200702	Running	With test tag	10	2013-10-13	Wd4m	19-29-2013	10	10-08-2012			
Dave				02-200702	Running	With test tag	10	2013-10-13	Toung	19-29-2013	10	9-20-2011			
Genie Location				02-200702	Running	With test tag	10	2013-10-13	Wd4m	19-29-2013	10	9-20-2011			
Fish River				0200022	Running	With test tag	10	02-28-2011	ENASAC ADISTENCA LAR 1 C	9-22-2011	12	9-22-2011			
Indy				200000387	Running	With test tag	10	03-23-2011	1	9-22-2011	3C	16-03-2012			
Interpark				000000088	Running	With test tag	10	04-14-2011	1	9-22-2011	4C	11-01-2011			
Interpark Focus				100000088	Running	With test tag	10	04-14-2011	2nd Dem. Typ Tester	9-22-2011	4C	1-01-2011			
Location 2.0	Adress 2.0	Stadt 2.0	PLZ	1000000739	Running	With test tag	10	04-27-2012	1	4-27-2012	4C	10-03-2012			
Novel				100000008	Running	With test tag	10	05-24-2012	1	9-22-2011	5C	11-02-2012			
ODC				100000020	Running	With test tag	10	05-25-2012	1	9-22-2011	5C	11-02-2012			
OSTERENBERG				000000108	Running	With test tag	10	05-01-2011	10M	9-22-2011	7C	10-01-2012			
Reinhardt				110000000A	Running	With test tag	10	10-20-2011	Job 1	10-20-2011	10	9-22-2011			
Ristra - 3PT Fenc	Interpark Focus 1	Notris	6833	133	Running	With test tag	10	10-28-2013	Job 2	10-28-2013	10	9-22-2011			
Sample Location				217822	Running	Without tag	02	10-06-2012	Sample 1	11-01-2011	10	9-22-2011			
Spire location				217873	Running	Without tag	02	10-16-2012	2nd wire	11-01-2012	10	9-22-2011			
Station Shop				217874	Running	Without tag	02	10-16-2012	3rd wire	11-01-2012	10	9-22-2011			
T-2 ST BARRAC				217876	Running	Without tag	02	10-16-2012	Autocore	10-01-2011	10	9-22-2011			
				217878	Running	Without tag	02	10-18-2012	1	10-15-2012	10	9-22-2011			
				217877	Running	Without tag	02	10-20-2012	1	10-15-2012	10	9-22-2011			
				217882	Running	Without tag	02	10-24-2012	Autocore	10-24-2012	10	9-22-2011			
				189798	Transformer	Two-winding	10	12-10-2013	1	9-22-2011	12	10-03-2012			
				18982	Running	With test tag	10	2013-10-21	1st-Test	10-20-2013	10	9-22-2011			
				220AR0242488502	Running	With test tag	10	27-02-2012	Autopark 2	2-27-2012	2C	9-22-2011			
				220AR0242488503	Running	With test tag	10	27-02-2012	Autopark 1	2-27-2012	2C	9-22-2011			
				220AR0242488504	Running	With test tag	10	28-02-2012	Autopark 2	2-28-2012	3C	9-22-2011			
				220AR0242488505	Running	With test tag	10	29-02-2012	Autopark 1	2-29-2012	3C	9-22-2011			
				220AR0242488506	Running	With test tag	10	29-02-2012	Autopark 2	2-29-2012	3C	9-22-2011			
				220AR0242488507	Running	With test tag	10	3-02-2013	Job 1	3-02-2013	3C	16-08-2013			
				220AR0242488508	Running	With test tag	10	3-02-2013	Job 2	3-02-2013	3C	16-08-2013			
				220AR0242488509	Running	With test tag	10	3-02-2013	Job 3	3-02-2013	3C	16-08-2013			
				220AR0242488510	Running	With test tag	10	3-02-2013	Job 4	3-02-2013	3C	16-08-2013			



Easy management of location, asset and test data due to a structured database, implemented search and filter functions and automatic data synchronization.



PTM supports you in the best via wiring diagrams and asset-



## Execution of diagnostic tests

You can select between several predefined test templates. These templates fully comply with current standards and guidelines and always consider the nameplate values that have already been entered. You can also create your own test templates for your individual needs.

### Easy connection due to wiring diagrams

Pre-configured wiring diagrams, that depend on the selected vector group of your power transformer, assist you with setting up the test equipment in the correct manner.

This minimizes the likelihood of measurement errors and speeds up your testing process.

## Result analysis and reporting

After the measurement a reference test of the same transformer will be selected automatically. FRANEQ 800 provides you with a mathematical solution for comparing the traces based on the Chinese standards DLT 911/2004 or NCPRI. This is a powerful tool for assessing the mechanical and electrical integrity of your power transformer.

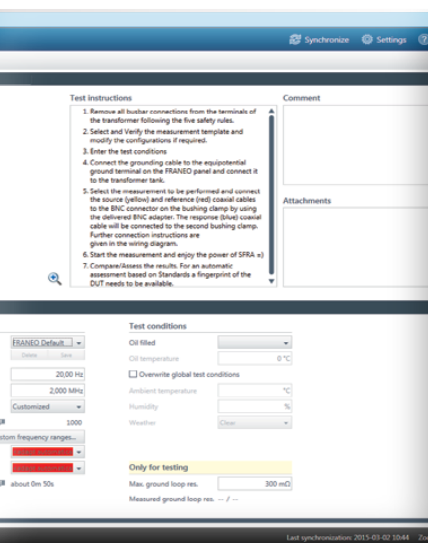
### Comparison tools for detailed analysis

For a detailed analysis you can compare different test results side-by-side in one diagram. You can choose between a time- and type-based comparison as well as a phase-based comparison.

### Customized, individual reports

PTM can automatically generate reports for SFRA and any further measurements, e.g. leakage reactance, exciting current or winding resistance. This gives you a comprehensive overview of your power transformer, its test results, and its assessment.

You can easily adapt the reports to your needs, e.g. compile the included parts, provide comments or incorporate your company logo.



possible way during execution of diagnostic tests specific test plans according to international standards.

For a comprehensive analysis, PTM offers automatic result assessment and comparison as well as customized reporting.

# Technical data and ordering information

## Technical data FRANEO 800

### General

Frequency range 1 Hz ... 30 MHz

### Source output

Output impedance<sup>1</sup> 50 Ω (± 2%)

Connector BNC

Amplitude 10 V<sub>pp</sub> (at 50 Ω)

Dynamic range<sup>1</sup> > 150 dB  
(+10 dB ... < -140 dB noise floor<sub>RMS</sub>)

### Attenuation/Accuracy<sup>1</sup>

Typical accuracy ± 0.1 dB (down to -50 dB) and  
± 0.3 dB (between -50 dB and -100 dB)

Guaranteed accuracy ± 0.3 dB (down to -50 dB) and  
± 0.5 dB (between -50 dB and -100 dB)

<sup>1</sup>... In the frequency range 20 Hz ... 2 MHz

### Mechanical data

Dimensions 252 x 53 x 265 mm /  
(w x h x d) 10 x 2 x 10.4 in

Weight 1.8 kg / 4 lb  
(without measuring cables)

### Environmental

Temperature Operating: -10 °C ... + 55 °C / + 14 °F ... + 131 °F  
Storage: -35 °C ... + 55 °C / + 31 °F ... + 131 °F

Relative humidity 20% ... 95%, non-condensing



## System requirements<sup>1</sup> for PTM

Operating system	<b>Windows 10™, 64-bit</b> <b>Windows 8™ and 8.1™, 64-bit</b> <b>Windows 7™ SP1, 32-bit and 64-bit</b>
CPU	<b>Multicore system with 2 GHz or faster</b> Single core system with 2GHz or faster
RAM	minimum 4 GB ( <b>8 GB</b> )
Hard disk	minimum 5 GB of available space
Storage device	DVD-ROM drive
Graphics adapter	Super VGA (1280x768) or higher-resolution video adapter and monitor <sup>2</sup>
Interface	USB 2.0 <sup>3</sup> , Ethernet NIC <sup>4</sup>
Installed software <sup>5</sup>	<b>Microsoft Office® 2016</b> , Office® 2013, Office® 2010 or Office® 2007

<sup>1</sup> Recommended system requirements marked in bold

<sup>2</sup> Graphics adapter supporting Microsoft® DirectX 9.0 or later is recommended.

<sup>3</sup> USB 2.0 is needed for operation with FRANEO 800 and DIRANA.

<sup>4</sup> The Ethernet NIC is need for operation with CPC 100 and CIBANO 500.

<sup>5</sup> Installed software required for the optional Microsoft Office® interface functions.



## FRANEO 800 package and accessories

Package	Description	Ordering No.
FRANEO 800 Package	With this package you can perform sweep frequency response analysis (SFRA) on power transformers. It comes with FRANEO 800 and Primary Test Manager™.	VE000661
<b>Accessories</b>		
Clamp set for short bushings	2 short aluminum braids (1.5 m / 5 ft) and 2 clamps in a carry bag	VEHZ0673
<b>Software</b>		
Module 'PTM DataSync'	Separate module for data synchronization and back-up: For up to 3 users For up to 10 users For up to 25 users Upgrade for 1 user	VESM0677 VESM0678 VESM0679 VESM0680



### Get your FRANEO 800 training!

OMICRON Academy offers well-known training courses to answer any individual question you might have. The training "Sweep Frequency Response Analysis (SFRA) of Power Transformers with FRANEO 800" covers:

- > Basics and theory of the SFRA measurement method
- > Operating concept of FRANEO 800 and its accessories
- > Power transformer testing using FRANEO 800 (with hardware and software)
- > Theoretical information and practical sessions

[www.omicronenergy.com/en/training](http://www.omicronenergy.com/en/training)

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

Customers in more than 150 countries rely on the company's ability to supply leading-edge technology of excellent quality. Service centers on all continents provide a broad base of knowledge and extraordinary customer support. All of this together with our strong network of sales partners is what has made our company a market leader in the electrical power industry.

For more information, additional literature, and detailed contact information of our worldwide offices please visit our website.