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DIRANA

The fastest way of moisture determination of power- and instrument transformers and condition assessment of rotating machines



DIRANA – the fastest way of dielectric

Moisture reduces the lifetime of transformers

For power transformers, the moisture content is one of the most important parameters determining the remaining lifetime. Moisture in oil-paper insulated power and instrument transformers is caused by paper aging or enters the transformer via leaky seals or breathing. It leads to a reduced breakdown strength and an accelerated aging of the insulation.

Knowing the moisture content enables you to perform condition based maintenance which reduces failures and avoids unnecessary replacements. Additionally, it also allows you to verify if a new transformer is really dry.

Automatic and easy moisture analysis

DIRANA determines the water content in paper without the need of oil sampling. It combines Frequency Domain Spectroscopy (FDS) and Polarization Depolarization Current (PDC+). In combination with the automated frequency range setting, DIRANA ensures the shortest measurement time on all assets at any temperature. The easy to use software provides automatic analysis and requires no expert knowledge.



moisture analysis

Applications

With DIRANA you can analyze the water content in different kind of cellulose insulation. You can test assets filled with mineral oil, natural and synthetic ester as well as air or vacuum. Commonly tested assets are:

- > Power transformers
- > Instrument transformers
- > Bushings

Additionally, dielectric measurement is available for diagnosis of other types of assets, such as:

- > Rotating machines
- > RBP, RIP and RIS bushings
- > Cables

One measurement – many valuable results

A single DIRANA measurement does not only provide you with the water content and oil conductivity of the asset, but also delivers many more valuable parameters such as:

- > Power/dissipation factor at line frequency
- > Capacitance
- > Insulation resistance
- > Polarization index (PI), DAR...

One box for easy and comfortable testing

With DIRANA you get all the required components in just one box. This makes testing quite comfortable and the system easy to transport. Its simple wiring and concept clamps with integrated guard connections make setting up tests easy and fast.



Your benefits

- > Non-invasive moisture determination in the paper insulation
- > Automated software for easy analysis without expert knowledge
- > Shortest measurement time by combination of revolutionary FDS and PDC+ and automatic frequency range determination
- > Applicable to all oil-paper or ester-paper insulated assets
- > Compact all-in-one test set

Dielectric frequency response (DFR) analysis

How does DFR work?

The main amount of cellulose insulation in the active part of a transformer is located between the primary and secondary winding. To measure this insulation, the output is connected to the high-voltage winding and the input to the low-voltage winding. Unwanted capacitive and resistive currents are bypassed by the guard connection which is applied to the tank.

The power dissipation factor of the insulation is measured over a wide frequency ranging from the μHz to the kHz region. The resulting curve contains information about the insulation condition.

The very low frequencies contain information on moisture in the solid insulation, while the position of the slope in the mid-range frequencies indicates the conductivity of the liquid insulation. This curve is automatically compared to model curves and the moisture content of the cellulose insulation is calculated.

The method is scientifically approved by CIGRÉ. There are no other non-invasive ways to assess moisture in a transformer which provide comparable accuracy.



DIRANA determines the moisture content of oil-paper insulated power and instrument transformers and also assesses the condition of bushings by using dielectric response analysis.

Result analysis and assessment

A DFR measurement doesn't only provide you with a power/dissipation factor value at line frequency with comparable accuracy to a high-voltage test set. It also enables you to determine if a high value is caused by water, bad oil and the bushings or if further factors such as soot, corrosive sulphur or localized carbonized spots may be the cause.

The assessment is performed in accordance with IEC 60422 which provides categories for moisture levels.

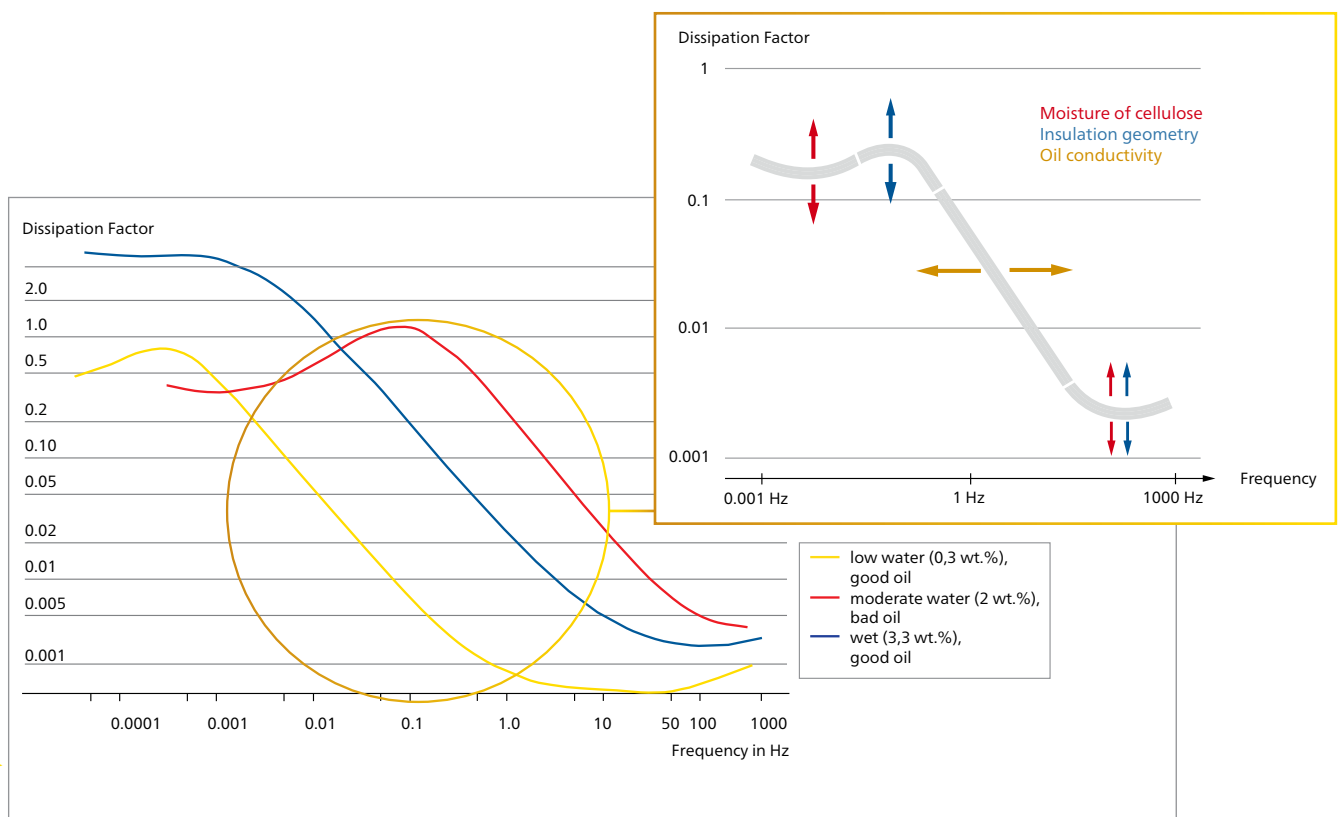
DIRANA is the only device which compensates the influence of aging byproducts. Otherwise this would lead to an overestimation of the water content in aged transformers.

Combining advantages

DIRANA uses the two measurement methods FDS and PDC+ and combines their advantages:

Frequency Domain Spectroscopy (FDS) is fast and accurate in the high frequency range up to 0.1 Hz but slow at low frequencies.

Time domain spectroscopy via Polarization Depolarization Current (PDC) measurement uses a DC step to measure all frequencies at once but can only be used for rather low frequencies. PDC+ is an advanced version of the PDC measurement which provides much shorter measurement times and offers improved noise immunity. DIRANA uses FDS to cover the high frequency spectrum and PDC+ for a test measurement of frequencies below 0.1 Hz.



The dielectric response curve allows conclusions to be drawn about the different factors that influence the measurement result.

Innovative measurements with DIRANA

The shortest measurement time – always

The patented principle of combining FDS for high frequencies and PDC+ for low frequencies enables testing over a wide frequency range in an extremely short time.

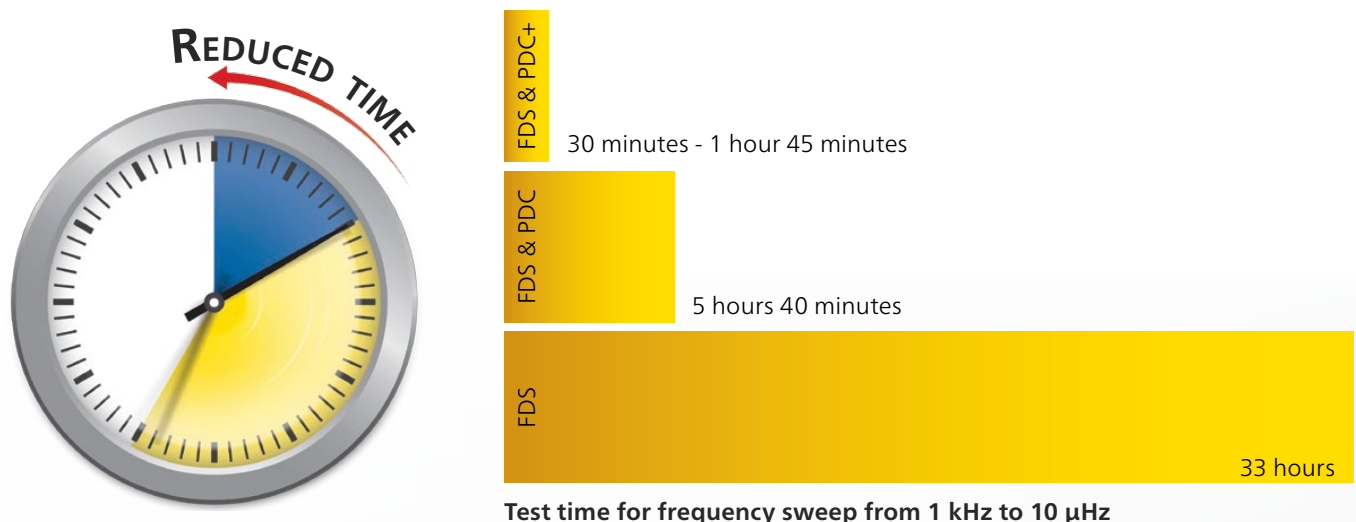
Thereby, DIRANA's unique technique ensures that exactly the required frequency range is measured, not more and not less. DIRANA determines all test parameters automatically and individually for each measurement so you don't need special expert knowledge to work with DIRANA.

Once the parameters are known, the required measurement time is updated automatically.

Where conventional FDS measurements take more than a day to measure from 1 kHz to 10 μ Hz, DIRANA can achieve this in 30 minutes to 1 hour 45 minutes.

Lowest testing frequency in the market

Due to DIRANA's innovative measurement concept you can perform high precision measurements down to 10 μ Hz which is the lowest frequency range available for transformer analysis. This ensures accurate measurements for all assets, even new transformers with very low oil conductivity or an empty tank.



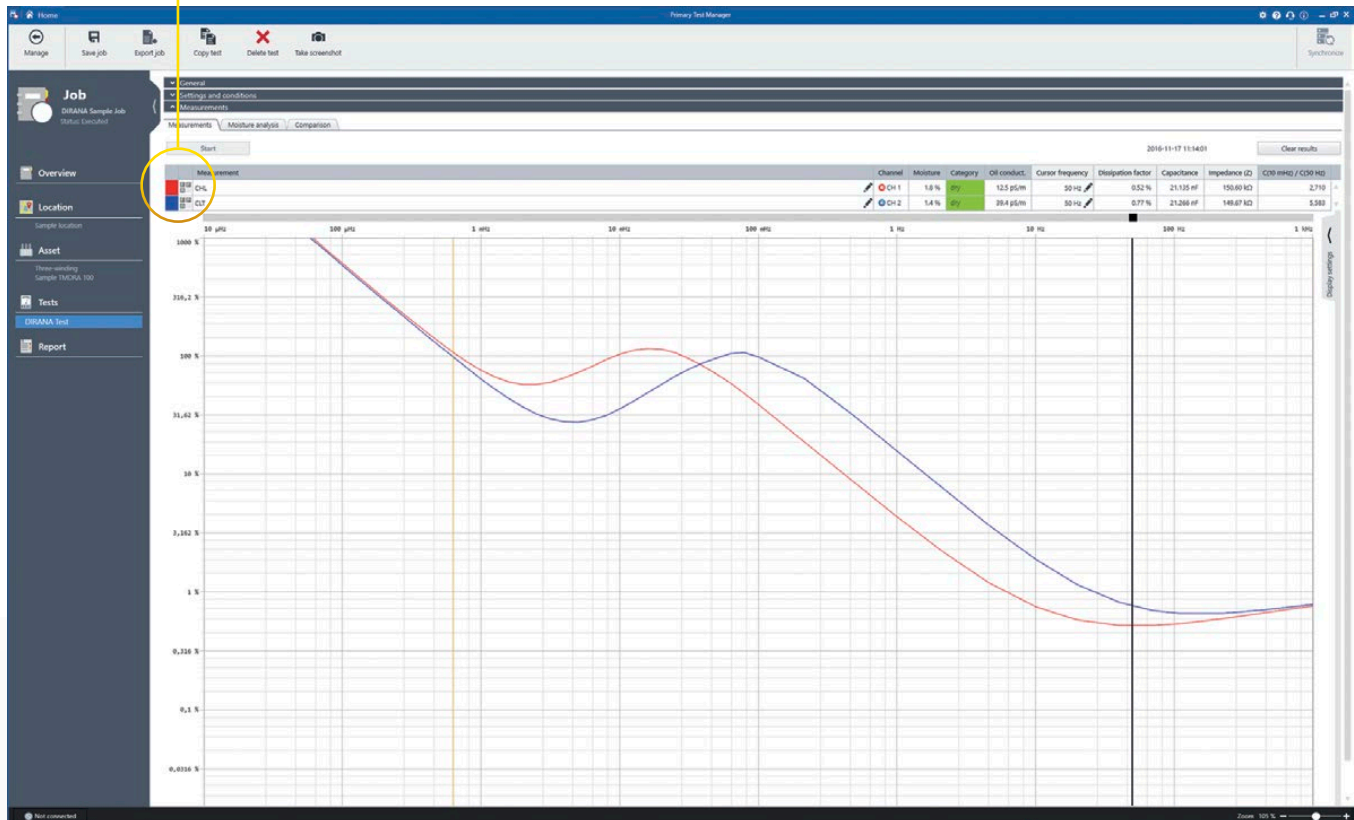
Reliable assessment

DIRANA uses a scientifically proven method to determine the moisture content. The comparison of the measurement to a built in database is performed completely automatically by the software, you only need to enter the oil temperature value.

The automated assessment function compensates for influences such as temperature, insulation geometry, oil conductivity and aging byproducts.

Thus, DIRANA reliably detects moisture even in aged oil-paper insulation. The automatic evaluation is conducted according to national, international or user defined standards.

Measurement	Channel	Moisture	Category	Oil conduct.	Cursor frequency	Dissipation factor	Capacitance	Impedance (Z)	C(10 mHz) / C(50 Hz)
CHL	CH 1	1.8 %	dry	12.5 pS/m	50 Hz	0.52 %	21.135 nF	150.60 kΩ	2,710
CLT	CH 2	1.4 %	dry	39.4 pS/m	50 Hz	0.77 %	21.266 nF	149.67 kΩ	5,583



DIRANA measurement of a power transformer including automatic assessment of moisture content and oil conductivity.

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

DIRANA is operated by the Primary Test Manager™ (PTM). It is the ideal software tool for the diagnostic testing and condition assessment of your power and instrument transformers.

Management of location, asset and test data

PTM provides a well-structured database for managing not only DIRANA data but all electrical and chemical 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. All electrical transformer tests can be configured, executed and managed within PTM.

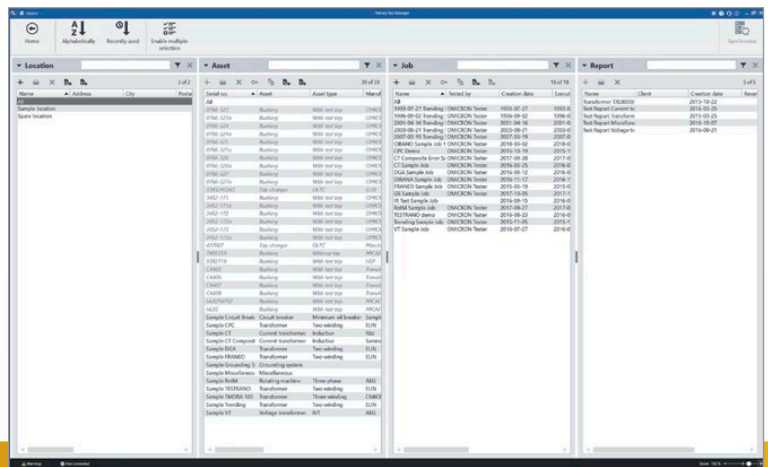
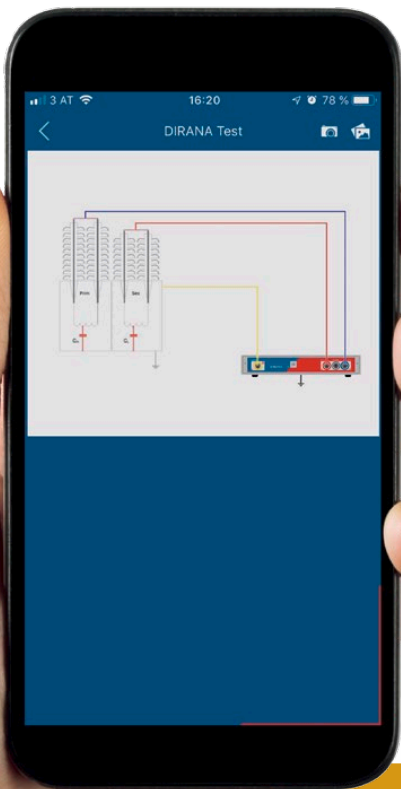
Import and export functionality

You can easily import all measurements performed and stored with the previous DIRANA software to the new PTM database. In addition, PTM data can be filtered or exported in common formats.

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.

Get the PTMate app free of charge in the App Store and Google Play Store!



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

PTM supports wiring o

(PTM)

Easy connection and operation

From the information on the asset's nameplate data, the optimal measurement setup is derived. Pre-configured wiring diagrams 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.

One button test

As DIRANA automatically sets all relevant parameters, it takes just one button to press to start the whole measurement and get the results.

PTMate app – your mobile companion

PTMate is our mobile companion for PTM. The app supports you on site and extends the PTM feature set to your smartphone, such as easy data entering, fast and safe wiring for tests as well as a stop button for ongoing measurements.

Result analysis and reporting

DIRANA automatically performs the moisture and oil analysis once the test is finished. The results are then categorized according to national or international standards or to custom settings.

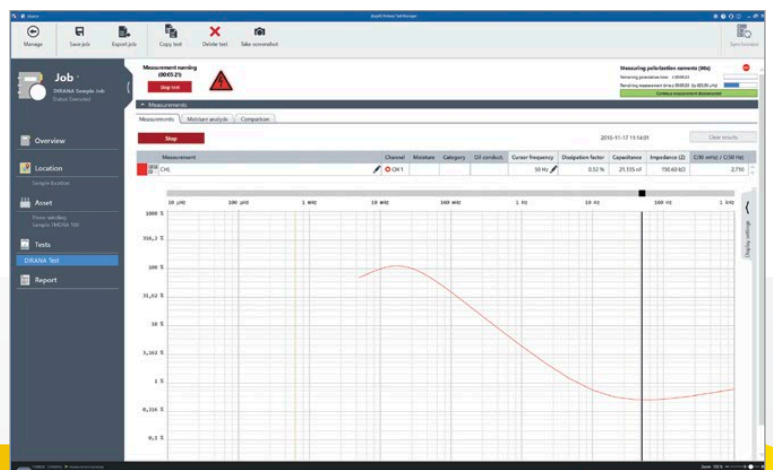
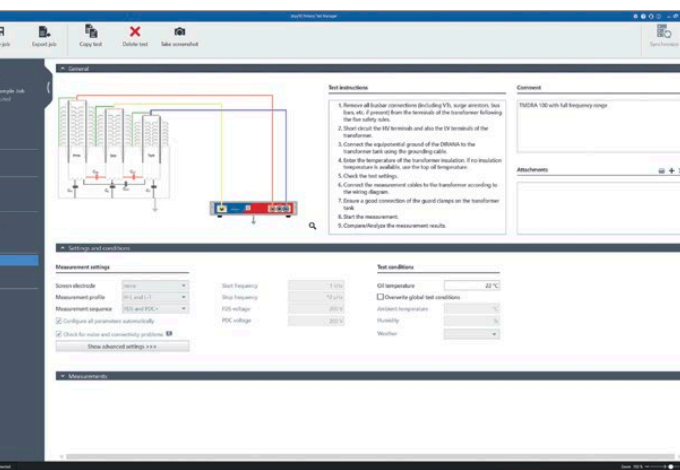
Comparison tools for detailed analysis

For a detailed analysis you can view different test results side-by-side in one diagram. You can compare test results to previous measured data of the same asset as well as to measurement data of other assets.

Customized, individual reports

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

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



supports you in the best possible way during execution of diagnostic tests via diagrams and asset-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 DIRANA

Voltage source

Measurement voltage	200 V _{peak}
Maximum continuous output current	50 mA _{peak}

Power/dissipation factor, capacitance

Dissipation factor range	0...100
Accuracy for ¹ :	
1 MHz < f < 100 Hz	1 % + 3 × 10 ⁻⁴
f < 1 MHz and f > 100 Hz	2 % + 5 × 10 ⁻⁴
Capacitance	10 pF ... 100 μF
Accuracy	0.5 % + 1 pF

Time domain current measurement (PDC+)

Range	±10 mA
Accuracy	0.5 % ± 1 pA

Frequency Domain Spectroscopy (FDS)

Measurement voltage	200 V _{peak}
Measurement current	±50 mA _{peak}
Max. AC interference (50 Hz / 60 Hz) ¹	10 mA (SNR: 1:10)

Frequency ranges

FDS frequency range	5 kHz ... 10 μHz
FDS & PDC+ frequency range	5 kHz ... 10 μHz
PDC+ frequency range	100 mHz ... 10 μHz

Typical measuring time (FDS & PDC+)¹

1 kHz ... 1 mHz	9 minutes
1 kHz ... 100 μHz	Between 15 min and 54 min
1 kHz ... 10 μHz	Between 30 min and 1 h 44 min

Mechanical data / supply voltage

Dimensions (w × h × d):	
Device	260 × 50 × 265 mm/ 10.2 × 2 × 10.5 inch
Case	604 × 466 × 307 mm/ 24 × 18 × 12 inch
Weight:	
Device	2.3 kg / 5 lbs
Complete set	20 kg / 44 lbs
Supply voltage	85 V ... 265 V
Frequency	50 Hz ... 60 Hz

Environmental conditions

Ambient temperature	
in operation	-10 °C ... +55 °C / +14 °F ... 131 °F
for storage	-35 °C ... +65 °C / -31 °F ... 149 °F
Relative humidity	5 % ... 95 %, non-condensing
Air-pressure (storage/operation)	70 kPa ... 106 kPa
Voltage withstand of output and measurement inputs	> 2kV (1.2 μs / 50 μs lightning impulse)

¹ For capacitances > 100 μF using default settings

System requirements² for PTM

Operating system	Windows 10™, 64-bit Windows 8™ and 8.1™, 64-bit Windows 7™ SP1, 32-bit and 64-bit
CPU	Multicore system with 2 GHz or faster Single core system with 2 GHz or faster
RAM	minimum 4 GB (8 GB)
Hard disk	minimum 5 GB of available space
Storage device	DVD-ROM drive
Graphics adapter	Super VGA (1280×768) or higher-resolution video adapter and monitor ³
Interface	USB 2.0 ⁴ , Ethernet NIC ⁵
Installed software ⁶	Microsoft Office® 2016 , Office® 2013, Office® 2010 or Office® 2007

² Recommended system requirements marked in bold

³ Graphics adapter supporting Microsoft® DirectX 9.0 or later is recommended.

⁴ USB 2.0 is needed for operation with FRANEO 800 and DIRANA.

⁵ The Ethernet NIC is need for operation with CPC 100 and CIBANO 500.

⁶ Installed software required for the optional Microsoft Office® interface functions.

DIRANA packages

	Description	Order No.
DIRANA set	DIRANA comes in a rugged case which contains all necessary accessories such as 18 m long connection cables with clamps, drums etc. and the operating software Primary Test Manager™	VE000670



A strong and safe connection

Welcome to the team

At OMICRON you can always depend on an experienced team that actively supports you and an infrastructure that you can rely on. We always listen attentively in order to understand your needs so that we can offer you the best possible solutions.

We strive for lasting partnerships and ensure that you can continue to rely on your product long after you've purchased it. In order to do this, we focus on quality, the transfer of knowledge and unique customer support.

Charles, Wenyu and René are able to tell you about the services we have available for you and why it pays to be part of the team.



Charles Sweetser
Application Specialist

Solutions you can rely on...

... developed with experience, passion and an innovative approach that we use to continually set groundbreaking standards in our industry sector.

We invest more than 15 % of the total turnover in research and development so that we can even guarantee the reliable use of the latest technology and methods in the future.

Our comprehensive product care concept also guarantees that your investment in our solutions – like free software updates – pays off in the long term.





Wenyu Guo
OMICRON Academy



We share our knowledge...

... by maintaining a constant dialogue with users and experts. Some examples of this are our customer events and conferences that take place all over the world and our collaboration with numerous standardization committees.

We also make our knowledge available to you in the customer section of our website in the form of application reports, specialized articles and articles in the discussion forum. With the OMICRON Academy, we also provide a wide spectrum of training possibilities and assist you with Start-up training and free webinars.



René Ulmer
Technical Support

24/7 support

When rapid assistance is required...

... our excellent level of support is always appreciated. You can reach the highly-qualified and committed technicians in our customer support department 24 hours a day, seven days a week – and it's completely free. We deal with repair services and service features in a fair and non-bureaucratic manner.

We can help minimize your downtime by lending you equipment from a readily available plant at one of our service centers in your area. A comprehensive offer of services for consulting, testing and diagnostics completes our range of services.

OMICRON – Who we are

Reliable. Passionate. Different.

For over 30 years we have been developing innovative, top-quality testing and monitoring solutions for electrical power systems.

Customers in more than 150 countries rely on OMICRON's testing technology. In addition, we offer a wide array of services in the fields of consulting, testing and training.

We aim to inspire our customers with exceptional products, an interactive exchange of knowledge and extraordinary customer support. Our curiosity and passion give us the courage to approach things from different angles.

Together with our partners and customers, we are striving towards a safe and reliable energy supply.

„Create an environment with no artificial limits where a team of excellent members can reach an excellent performance and enjoy working together at the same time.“

(Rainer Aberer, company founder)

Our values

We acknowledge our social, ecological and corporate responsibility, and are committed to ensuring sustainable development and business practices. The majority of development and production work takes place at our premises in Austria. Highly specialized suppliers from the region and first-class components guarantee the reliability and durability of every OMICRON device.

Over 750 employees from 45 different countries shape our extremely diverse corporate culture today. Flat hierarchies and a high degree of individual responsibility create a motivational work environment in which our employees can realize their full potential. Actively practiced corporate values such as respect and trust lead to our unique company spirit.

Founding of
OMICRON in Austria

1984



Entering the fields of protection
and measurement technology

1990

First major OMICRON
protection testing conference

1993

OMICRON has
over 100 employees

2000



Entering the field of
primary equipment
testing

2001



The world of OMICRON

OMICRON is an international company that develops, manufactures and markets transfer systems for the automatic testing of printed and multilayer substrate electronics, including assembly systems and final inspection systems.

In continuing innovation, total customer satisfaction and environmental friendliness remain OMICRON's top priorities. OMICRON is a leader in its sector. With over 700 employees across 22 offices in Germany, France, Italy, Spain, Portugal, India and Australia, and a customer base of more than 1000 companies, OMICRON has truly established a reputation of excellence at the highest level.

Customers in over 100 countries worldwide



Entering the field of online monitoring

Over 700 employees across 22 offices worldwide



2003

2009

2015

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.