



DIRANA

Getting Started



DIRANA Getting Started

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The product information, specifications, and technical data embodied in this manual represent the technical status at the time of writing and are subject to change without prior notice.

We have done our best to ensure that the information given in this manual is useful, accurate and entirely reliable. However, OMICRON does not assume responsibility for any inaccuracies which may be present.

The user is responsible for every application that makes use of an OMICRON product.

OMICRON translates this manual from the source language English into a number of other languages. Any translation of this manual is done for local requirements, and in the event of a dispute between the English and a non-English version, the English version of this manual shall govern.

1 Safety instructions

1.1 Operator qualifications

Working on high-voltage assets can be extremely dangerous. Consequently, only personnel qualified, skilled and authorized in electrical engineering and trained by OMICRON are allowed to operate *DIRANA* and its accessories. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on *DIRANA* must be under constant supervision of an experienced operator while working with the equipment. The operator is responsible for the safety requirements during the whole test.

Maintenance and repair of *DIRANA* and its accessories is only permitted by qualified experts at OMICRON service centers except for hardware update options delivered with the relevant Supplementary Sheet.

1.2 Safety standards and rules

1.2.1 Safety standards

Testing with *DIRANA* must comply with the internal safety instructions and additional safety-relevant documents.

In addition, observe the following safety standards, if applicable:

- EN 50191 (VDE 0104) "Erection and Operation of Electrical Test Equipment"
- EN 50110-1 (VDE 0105 Part 100) "Operation of Electrical Installations"
- IEEE 510 "IEEE Recommended Practices for Safety in High-Voltage and High-Power Testing"

Moreover, observe all applicable regulations for accident prevention in the country and at the site of operation.

Before operating *DIRANA* and its accessories, read the safety instructions in this Getting Started carefully.

Do not turn on *DIRANA* and do not operate *DIRANA* without understanding the safety information in this manual. If you do not understand some safety instructions, contact OMICRON before proceeding.

Maintenance and repair of *DIRANA* and its accessories is only permitted by qualified experts at OMICRON service centers (see "Support" on page 16).

1.2.2 Safety rules

Always observe the five safety rules:

- ▶ Disconnect completely.
- ▶ Secure against re-connection.
- ▶ Verify that the installation is dead.
- ▶ Carry out grounding and short-circuiting.
- ▶ Provide protection against adjacent live parts.

1.3 Safe operation

When operating the *DIRANA* test system and its accessories, observe the following safety instructions.

1.3.1 Test equipment integrity

- ▶ Do not open the housing of *DIRANA*.
- ▶ Do not repair, modify, extend, or adapt *DIRANA* and its accessories.
- ▶ Use only the *DIRANA* original accessories and cables and only use the OMICRON accessories together with OMICRON devices as described in this manual.
- ▶ Operate *DIRANA* and its accessories only under ambient conditions specified in "Technical data" in the *DIRANA* User Manual.

1.3.2 DIRANA

- ▶ Use only adequately rated power cords.
- ▶ Supply *DIRANA* only from a power outlet with protective earth (PE).
- ▶ Position the measurement setup so that you can easily disconnect *DIRANA* from mains.
- ▶ Do not use extension cables on a cable reel to prevent overheating of the cord. Instead, run out the extension cord.
- ▶ Before handling *DIRANA* in any way, connect its equipotential ground terminal with a solid connection of at least 6 mm² cross-section to the ground terminal of the high-voltage asset under test.
- ▶ Do not operate *DIRANA* and its accessories in the presence of explosives, dangerous gases or vapors.
- ▶ If *DIRANA* or its accessories do not seem to function properly, stop using them and contact your regional OMICRON service center.

1.3.3 Measurement setup

- ▶ Ensure that the ground terminal of the test object is in good condition, clean, and free of oxidation.
- ▶ Do not touch any terminals and do not connect any cables to the test object without a visible connection to ground.
- ▶ Only use test leads and tools which provide full protection against direct contact.
- ▶ Always insert connectors completely and use the interlock mechanism.
- ▶ Always turn off *DIRANA* with the power switch before connecting or disconnecting any cable.
- ▶ Never remove any cables from *DIRANA* or the test object during a test.
- ▶ Do not insert objects (for example, screwdrivers) into any input/output socket.

1.4 Orderly measures

The DIRANA Getting Started or alternatively the e-book has always to be available on the site where *DIRANA* is operated.

The users of *DIRANA* must read this manual before operating *DIRANA* and observe the safety, installation, and operation instructions therein.

DIRANA and its accessories may be used only as described in this Getting Started. Any other use is not in accordance with the regulations. The manufacturer and the distributor are not liable for damage resulting from improper usage. The user alone assumes all responsibility and risk.

Following the instructions provided in this Getting Started is also considered part of being in accordance with the regulations.

Opening *DIRANA* or its accessories invalidates all warranty claims.

1.5 Disclaimer

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.6 Compliance statement

Declaration of conformity (EU)

The equipment adheres to the guidelines of the council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) directive, the low voltage directive (LVD) and the RoHS directive.

FCC compliance (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Declaration of compliance (Canada)

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

1.7 Recycling



This test set (including all accessories) is not intended for household use. At the end of its service life, do not dispose of the test set with household waste!

For customers in EU countries (incl. European Economic Area)

OMICRON test sets are subject to the EU Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE directive). As part of our legal obligations under this legislation, OMICRON offers to take back the test set and ensure that it is disposed of by authorized recycling agents.

For customers outside the European Economic Area

Please contact the authorities in charge for the relevant environmental regulations in your country and dispose the OMICRON test set only in accordance with your local legal requirements.

2 System requirements

Table 2-1: *Primary Test Manager* system requirements

Characteristic	Requirement (*recommended)
Operating system	Windows 10 64-bit* Windows 8.1 64-bit* , Windows 8 64-bit* , Windows 7 SP1 64-bit* and 32-bit
CPU	Multicore system with 2 GHz or faster* , single-core system with 2 GHz or faster
RAM	min. 2 GB (4 GB*)
Hard disk	min. 4 GB of available space
Storage device	DVD-ROM drive
Graphics adapter	Super VGA (1280×768) or higher-resolution video adapter and monitor ¹
Interface	Ethernet NIC ² , USB 2.0 ³
Installed software required for the optional Microsoft Office interface functions	Microsoft Office 2016* , Office 2013, Office 2010, Office 2007

1. We recommend graphics adapter supporting Microsoft DirectX 9.0 or later.

2. For testing with *TESTRANO 600*, *CPC 100* and *CIBANO 500*. NIC = Network Interface Card. *TESTRANO 600*, *CPC 100* and *CIBANO 500* can be connected with RJ-45 connectors either directly to the computer or to the local network, for example, by using an Ethernet hub.

3. For testing with *FRANEO 800*

3 Introduction

Water in oil-paper insulated assets such as power transformers or instrument transformers is accelerating the aging of the paper insulation and thus reducing the life expectancy of the asset. Knowing the water content therefore allows to assess the aging status of assets. By measuring the dielectric response of the equipment in a wide frequency range, *DIRANA* determines the moisture content. To save time, *DIRANA* combines frequency domain spectroscopy (FDS) and advanced time domain spectroscopy (PDC+).

DIRANA can also be used as an universal dielectric analyzer for all kind of asset insulations, for example, for bushings and rotating machines.

3.1 Frequency domain spectroscopy

By using the frequency domain spectroscopy (FDS), the dissipation factor of the insulation system under test is measured by frequency sweep. The FDS allows fast measurements at high frequencies but requires long measurement times at lower frequencies.

3.2 Advanced time domain spectroscopy (PDC+)

The advanced time domain spectroscopy (PDC+) uses the principles of the PDC measurement which applies a DC voltage to the insulation and measures the response current. The result (current over time) is mathematically transferred to the frequency domain so that the result can be presented, for example, as power factor/dissipation factor over frequency. PDC+ is applicable for frequencies lower than 0.1 Hz and is significantly faster than frequency domain measurements.

3.3 Designated use

DIRANA is a dielectric response analyzer for the insulation diagnosis. The underlying concept – combined FDS and PDC+ methods – makes *DIRANA* an intelligent, fast, and powerful solution for the insulation diagnosis of high-voltage assets in the power industry such as power transformers, rotating machines, and cables.

DIRANA combines the FDS and PDC+ measurements to get the advantages of both methods. At high frequencies, the dielectric response is measured with the FDS while at low frequencies, the results obtained by measuring the polarization current are transformed into the frequency domain and the dielectric response is calculated. This unique concept facilitates the dielectric response measurements within a wide frequency range. By comparing the dielectric response with model curves, *DIRANA* provides an indication of the insulation condition such as:

- Moisture content in the oil/paper insulation
- Condition of OIP, RBP, and RIP high-voltage bushings
- Condition of the generator, motor, and cable insulation

DIRANA is controlled by *Primary Test Manager* running on a computer connected to *DIRANA* by USB interface. *Primary Test Manager* combines seamlessly the FDS and PDC+ methods and merges the results, allowing you to work only in the frequency domain. *DIRANA* provides two measurement channels for faster measurements. *Primary Test Manager* provides an automatic procedure for the moisture content analysis of the power transformer insulation based on fitting the measurement results with a collection of model curves which are adapted to fit the measured asset.

3.4 Connections and operating controls

This section describes the connections and operating controls of *DIRANA*.

3.4.1 Front panel



WARNING

Death or severe injury caused by high voltage or current possible

- ▶ Do not touch the **OUTPUT** connector or any parts of the test setup when the red LED lights continuously or flashes.
- ▶ Always ensure that the device is safely switched off and the sample is discharged before touching any parts of the test setup.
- ▶ Before connecting *DIRANA* to the test object, observe the five safety rules (see 1.2.2 "Safety rules" on page 3) and all additional relevant laws and internal safety standards.

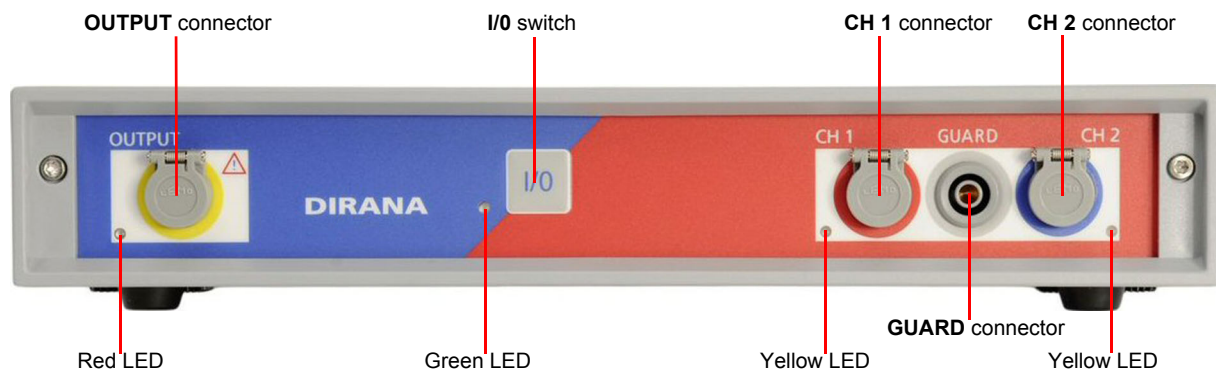


Figure 3-1: Front view of *DIRANA*

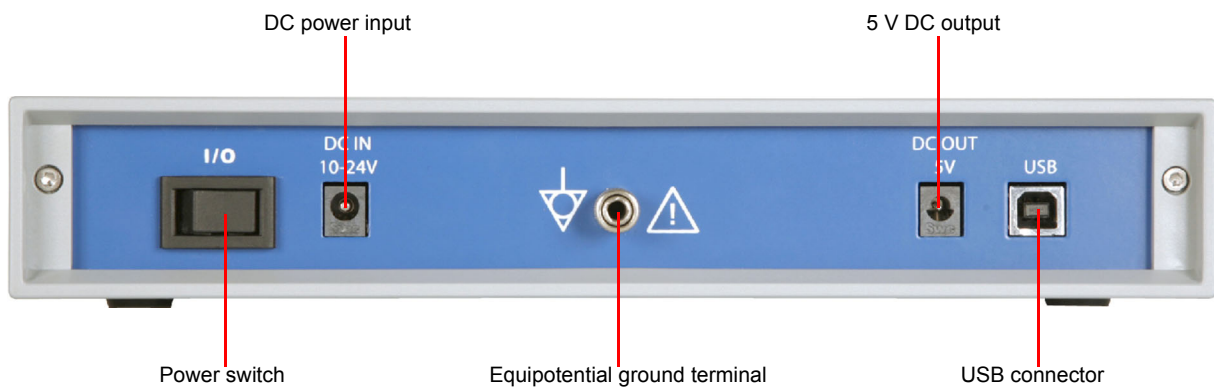
Table 3-1: Front-panel operating controls

Operating control	State	Description
OUTPUT connector	n/a	Signal source output
I/O switch	n/a	Starts and to stops measurements in the disconnected mode.
CH 1 connector	n/a	Channel 1 input
CH 2 connector	n/a	Channel 2 input
GUARD connector	n/a	Connector for connecting an additional guard cable
Red LED	LED is flashing	Signals that a measurement is running.
	On for approx. 10 s	Signals that you the test object is depolarized after a measurement has been stopped.

Table 3-1: Front-panel operating controls (continued)

Operating control	State	Description
Green LED	On	Indicates that the power switch is on.
Yellow LEDs	The LED next to the active channel is flashing	Signals that measurement results are available in <i>DIRANA</i> for one-channel measurements.
	LEDs are flashing concurrently	Signal that measurement results are available in <i>DIRANA</i> for two-channel measurements.
	LEDs are flashing alternately	Signal an error during a measurement. In the disconnected mode, after a computer has been connected to <i>DIRANA</i> , the error information is sent to the computer and the LEDs switch over to continuous lighting.

3.4.2 Rear panel

Figure 3-2: Rear view of *DIRANA*

3.5 Delivery

The *DIRANA* delivery includes:



DIRANA



Power supply



Power cable



Grounding cable
(GR/YE) 6 m/20 ft,
6 mm² with clamp



Braid wire



USB 2.0 A/B cable
2 m/6.6 ft



50 Ω triaxial cable
18 m/60 ft (red)



50 Ω triaxial cable
18 m/60 ft (blue)



50 Ω triaxial cable
18 m/60 ft (yellow)



3 × triaxial cable
adapter with banana
plugs



3 × laboratory cable
6 m/20 ft, 2.5 mm² with
banana plugs



Crank handle



Screw clamp



3 × measuring clamp
with triaxial and guard
connections



3 × connection clamp
with banana plugs



Crocodile clamps with
banana socket



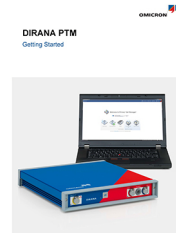
Terminal adapters with banana socket



Soft bag



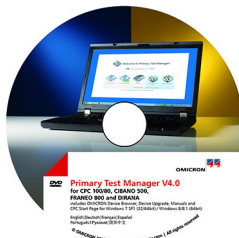
Transport case



DIRANA Getting Started



TMDRA 100



Primary Test Manager DVD

3.6 Primary Test Manager

Primary Test Manager is a control software for testing high-voltage assets with OMICRON test systems. *Primary Test Manager* provides a computer interface to the test set and assists you with the hardware configuration and performing tests.

With *Primary Test Manager*, you can create new jobs, execute prepared jobs, manage objects, create new manual tests, open existing manual tests, and perform tests. After you have performed a test, you can generate test reports. *Primary Test Manager* runs on a computer and communicates with *DIRANA* through USB interface.

For detailed information about *Primary Test Manager*, see the relevant chapters in the *DIRANA PTM User Manual*.

3.7 Cleaning

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Do not clean the *DIRANA* test set when connected to the test object.
- ▶ Before cleaning *DIRANA* and its accessories, always disconnect the test object, accessories and connection cables.

To clean *DIRANA* and its accessories, use a cloth dampened with isopropanol alcohol.

4 Installation

This section describes how to put the *DIRANA* test system into operation. The *DIRANA* operation is controlled by the *Primary Test Manager* software. Consequently, before operating *DIRANA*, you must install *Primary Test Manager* and connect *DIRANA* to a computer.

4.1 Connect *DIRANA* to the computer

DIRANA communicates with the computer through USB interface. To connect *DIRANA* to the computer:

1. Connect the USB 2.0 A/B cable to the USB connector on the *DIRANA* rear panel (see Figure 3-2: "Rear view of DIRANA" on page 11).

NOTICE

Equipment damage possible

- ▶ Do not crush the cables when closing the transport case.
- ▶ Always place the cables deliberately before closing the transport case.

2. Connect the USB cable on the front of the transport case to the USB connector of your computer by using the USB 2.0 A/B cable.

4.2 Power up *DIRANA*

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Do not power up *DIRANA* without grounding connection.
- ▶ Before powering *DIRANA* up, connect its equipotential ground terminal with a solid connection of at least 6 mm² cross-section to the ground terminal of the asset under test.

To power *DIRANA* by using the delivered AC power supply:

1. Plug the DC output connector of the AC power supply into the DC power input on the *DIRANA* rear panel (see Figure 3-2: "Rear view of DIRANA" on page 11).
2. Connect the power cable to the AC power supply.

DANGER



Death or severe injury caused by high voltage or current

- ▶ Do not use power outlets without protective ground (PE).
- ▶ Only use the delivered AC power supply to power *DIRANA*.
- ▶ Connect the *DIRANA* power supply only to a power outlet that is equipped with protective ground (PE).
- ▶ For safe operation always make sure that protective ground and equipotential ground are connected properly.

3. Plug the mains plug of the power cable into the power outlet.
4. Toggle the power switch on the *DIRANA* rear panel.

4.3 Install *Primary Test Manager*

For the minimum requirements your computer needs to run *Primary Test Manager*, see 2 "System requirements" on page 7.

- To install *Primary Test Manager*, put the delivered *Primary Test Manager* DVD in the DVD drive of your computer and follow the instructions on the screen.

4.4 Start *Primary Test Manager* and connect to *DIRANA*

- To start *Primary Test Manager*, click **Start** on the task bar, and then click **OMICRON Primary Test Manager**, or double-click the **OMICRON Primary Test Manager** icon  on the desktop.
- To connect to *DIRANA*, select the device from the list, and then click **Connect**.

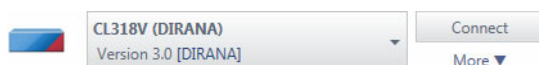


Figure 4-1: Connecting to *DIRANA*

If you could not connect to your *DIRANA* device, do one of the following:

- Ensure that *DIRANA* is switched on and connected to the computer.
- Click **More** beneath the **Connect** button, and then click **Refresh**.
- Press F5.

Note: The **Update device software**, **Open device web interface** and **Add device manually** options are not available for *DIRANA*.

Alternatively, you can manage the connection to *DIRANA* in the *Primary Test Manager* status bar (see "Status bar" in the *DIRANA* PTM User Manual).

During the connection process, *Primary Test Manager* checks the *DIRANA* firmware version and updates it, if necessary.

NOTICE

Equipment damage or loss of data possible

- Do not disconnect *DIRANA* from the computer during the firmware update process.
- Always wait until the firmware update has finished before disconnecting *DIRANA*.

Support

When you are working with our products we want to provide you with the greatest possible benefits. If you need any support, we are here to assist you!



24/7 Technical support – get support

www.omicronenergy.com/support

At our technical support hotline, you can reach well-educated technicians for all of your questions. Around the clock – competent and free of charge.

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