MIDAS 2881 & 2881G

Mobile Insulation Diagnosis & Analysing System

Datasheet



HAEFELY

Current and voltage – our passion

Designed by Tettex

General Description

Measurement of insulation losses is performed during periodic maintenance and inspection of high voltage equipment like power transformers, bushings, motors, generators, etc.

The MIDAS is a valuable tool for such measurements especially in the harsh electrical environments experienced in substations and other field locations.

Designed for testing at local power-line frequency (50 Hz or 60 Hz), MIDAS automatically measures and records dissipation factor (tan δ), power factor (cos φ) and all other relevant values of impedances (capacitive, inductive and resistive). Damage to or changes in the insulation material are detected rapidly and reliably.

The rugged construction and large pneumatic wheels make transportation and access to remote locations easy.

Predefined test sequences linked with limiting values (e.g. previous measurements) guide the user automatically through the test sequence and make possible a first assessment on-site. Communication with laptop trough standard interfaces (Ethernet) enable easy data exchange with a host computer for data collecting, reporting, printouts, statistics and advanced analysis.

Features	Advantages
▪ **Measures Dissipation Factor** (tan δ) and **Power Factor** (cos φ) with built-in high voltage supply up to **15 kV, 4 kVA, 15 … 1000 Hz** including manual and **automatic** (sequencer) test operation.	☑ **Shortest Measuring Time**: Shortest equipment set-up and measuring time by an “all in one” unit. ☑ **Rotating machines testing**: The up to 15 kV (MIDAS 2881G) and 4 kVA embedded power supply allows measurement of rotating machines of up to 24 kV at nominal voltage (13.85 kV). The optional resonating inductors increase the measuring load up to 1.41 µF.
▪ **Accurate, reliable, rugged, and safe construction** with built-in, long-term stable nominal capacitor.	☑ **Highest Accuracy:** The Highest accuracy in field-testing instruments has been achieved by using latest measuring techniques. High long-term stability of system accuracy has been ensured by utilization of a gas-insulated standard capacitor as internal reference arm and self-calibrating measurement sensors. ☑ **Advanced interference suppression**: allows measurement in extremely noisy environments
▪ **Low PD level** Due to the state of the art high voltage power supply with filters.	☑ **Simultaneous partial discharge and tan □ (Dissipation factor) test:** The MIDAS 2881/2881G inherent Low Partial discharge level in combination with a DDX 9121b (optional) allows both tan δ (Dissipation factor) and partial discharge tests to be made simultaneously, for example on rotating machines.
▪ **Easy to operate** including advance measurements like **Swap Frequency on Bushings**, **Short Circuit Impedance** and **Excitation Current**.	☑ **Self-explanatory user interface.** Manual and Automatic test operation. Software assisted test planning, preparation, execution and trending analysis function to get a quick graphical assessment.
▪ **Stand alone Bridge option with additional measuring capabilities** like Quality Factor, Power, Losses, Impedance, Inductance, Reactance, Spectrum Analyzer, Digital Scope and Data Logger.	☑ Can be used for other applications or with external power supplys and external nominal capacitors for **higher voltages measurements in the laboratory**

Applications

- Power Transformers
- Distribution Transformers
- Instrument Transformers
- Rotating Machines
- Liquid Insulation
- Bushings
- Cables
- Capacitors
- Circuit Breakers
- Surge Arrestorst
- Instrument Transformers
- Rotating Machines

Handy mechanical design

Rugged construction and large pneumatic wheels are an advantage for transportation in the back of a van and when measurements must be made in remote, hard-to-access locations.



Test system packed in the back of a station wagon

Easy, one-man transportation-and–loading is possible thanks to the integrated handles. Another great feature of this all-in-one-piece design is the shortest measuring set-up time you can get on the market.

Latest Technology

The development is based on the latest measurement and electronics technologies.

- Conventional techniques like mechanical driven compensation are replaced by real-time electronic compensation. This is realized by using advanced high-speed data bus technology and powerful software algorithms.
- Predefined test sequences for transformers, bushings, generators, cables, etc. together with two measuring inputs reduce set-up and test time and minimize wiring and re-wiring errors.
- Operated through a laptop with **Windows 7™** makes it a powerful tool in the field to make sure maintenance jobs get done fast and accurately.

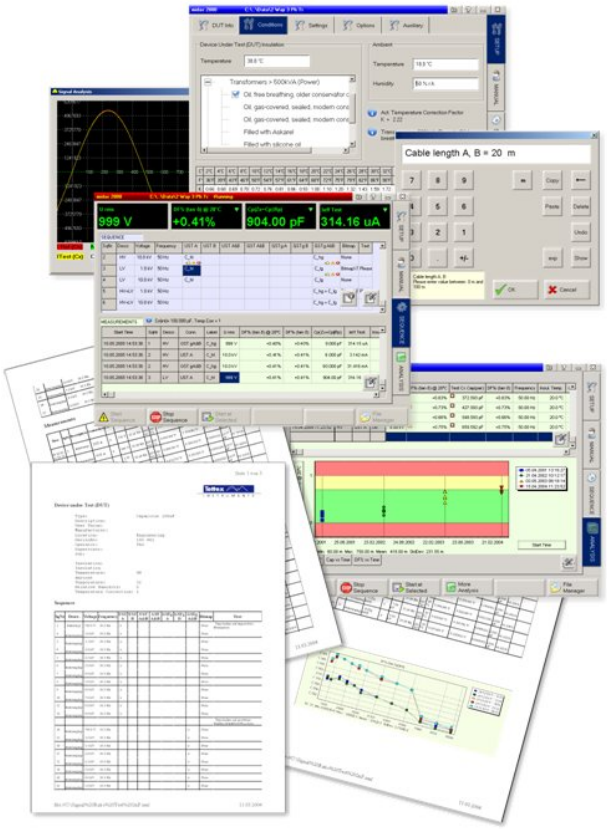
Easy to operate

MIDAS software incorporates much of our and our customers' experiences in the test business. We designed a very easy to operate and understand, self-explanatory graphical user interface. It allows test planning, preparation, execution and first assessment with just a mouse click. It also means the test equipment is sealed against environmental influences.



Manual and automatic

The manual test mode provides quick measurements without lots of definitions or pre-settings while the automatic tests in "Sequence mode" provide complete automated test sequences. This powerful software efficiently performs for field-testing from set-up to sequence definition to automatic operation to a first on-site assessment to the final report.



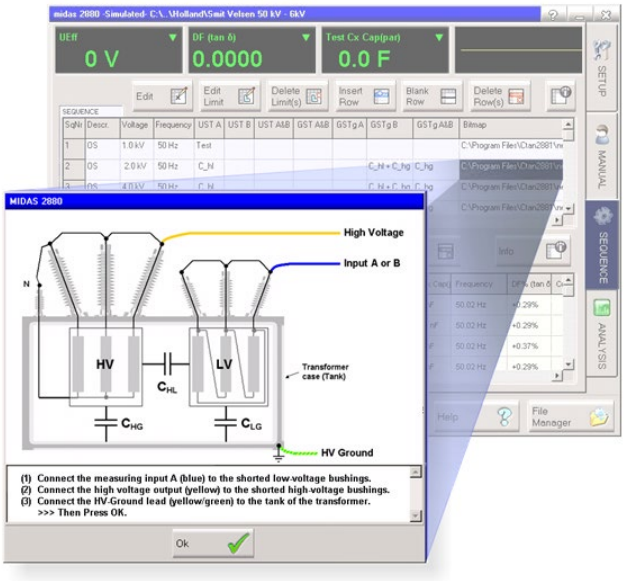
Sequence mode

Executable test sequences (step macros) can be defined with

- **Set-ups**: Set all configuration values, type of DUT, insulation type, temperature correction function, limits, work order, serial numbers, test personal, location, etc.
- **Test levels**: Set the desired different test levels (voltage and frequency).
- **Connections**: Set the different connections (DUT wiring) e.g. GSTg A+B.
- **Measuring values**: Define the different values to be recorded. E.g. Voltage, Frequency, PF, Current, Insulation Temperature, PF@20 °C, etc.
- **Test instructions**: In every step that requires a rewiring of the test object an instruction box with text and pictures can be defined to provide the test personnel with a step by step guide on how to perform the connection, wiring and the test.
- **Pass/fail levels**: Absolute or relative Limits can be set (based on reference measurements) that will be compared with the measured values and shown in the analysis diagram.

All this can be done on the MIDAS laptop or with the office software package on a separate PC or laptop.

A predefined test sequence then can be performed by junior field personnel. It reduces the set up time in the field and also reduces failures due to lack of knowledge, wrong connections or misinterpretation of measuring values.

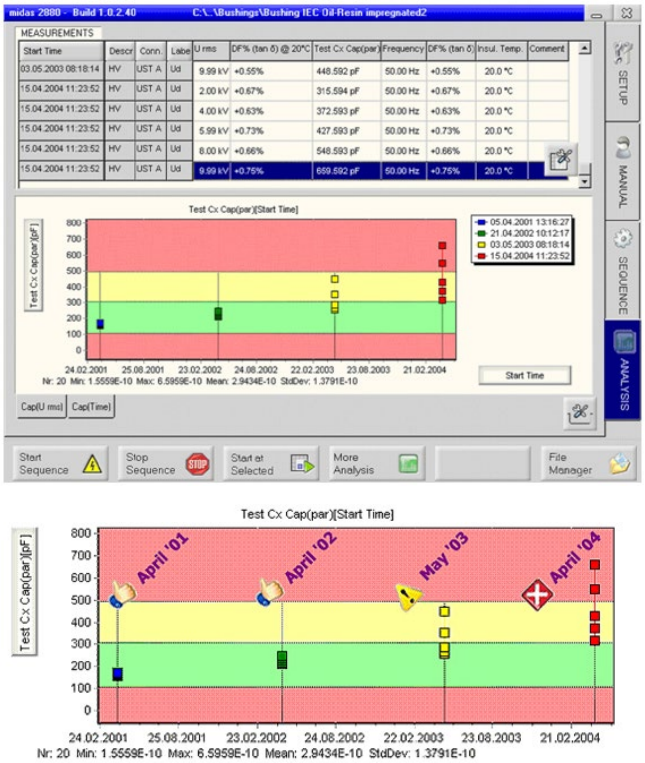


The pop-up test instruction window with a connection diagram picture and below the corresponding instruction text

The Sequence mode is the perfect tool to repeat maintenance measurements. If you have already done one complete measurement you can reload it, perform an identical test, collect the additional measurements and display the new trending. As easy as that!

Analysis function

As an immediate on-site assessment one can compare the latest measurements with stored data sets and see how the insulation values have changed over time (trending), using the analysis diagram. Also comparison of measurements captured at different voltages and different frequencies can be observed.



The ANALYSIS window with the list of stored measurements (top) and the corresponding diagram window (bottom)

Both axis of the analysis diagram are freely definable and the collected sets of different measuring data can be sorted as selected. So almost any dependency can be shown and displayed.

If the Pass/Fail criteria are set they are shown in the diagram as a green “Pass” band, a yellow “Attention” band and a red “Failed” section. So one can immediately identify a possible problem in the insulation.

Highest accuracy

Due to the technology used for this advanced test equipment we reached the highest accuracy in the market. **The built-in reference is a standard gas capacitor**, developed in-house, proven over 60 years, used as a calibration standard for high voltage laboratories and metrology national institutes. This guarantees the highest long-term stability unbeaten by any other reference standard. Because of the design of our standard capacitor, the stability and the accuracy is independent of temperature, air pressure and humidity of the environment so there is no need for additional verification. It’s all built-in already and all calibrations are done automatically as part of the self-test at boot-up. That’s “accuracy by design”.

advanced interference suppression

The built-in ***A***daptive ***D***ynamic ***N***oise ***S***uppression (ADNS) eliminates the external interferences from the measuring signal.

With ADNS we have successfully developed an advanced interference suppression method (patented) that allows measurements at the real power-line frequency!

For environments polluted with high noise the system switches into an Extended Noise-Suppression mode to measure stable and accurate values even in the most difficult locations.

wide range of applications

The built-in 15 kV and 4 kVA high voltage- high power source is unique. The 15 kV output voltage (MIDAS 2881G) together with the mobile resonating inductor 5289 allows testing of generators up to 26 kV ($U_N/\sqrt{3}$) according to IEC 60034 or IEEE 286 recommendation.

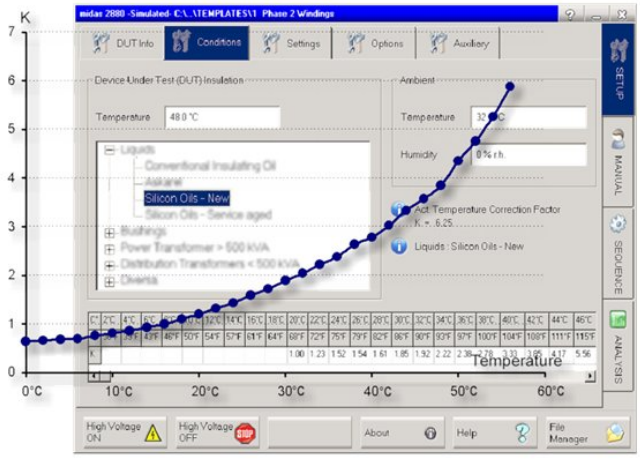
The powerful supply and measuring capabilities make sure that one can test even the biggest class of power transformers in very short time.

Measurements can be carried out on solid insulation such as cables, distribution-, voltage & current- transformers, motors, bushings, capacitors, etc.

With the optional test cell 6835 all kinds of liquid insulation samples can be tested as well.

temperature correction

Built-in temperature correction curves for different insulation materials are used to recalculate the measured results to reference conditions (20°C, 68°F). The method of correction depends on the type of insulation and the relevant standard, and the predefined set of curves can be easily expanded or changed by the user.



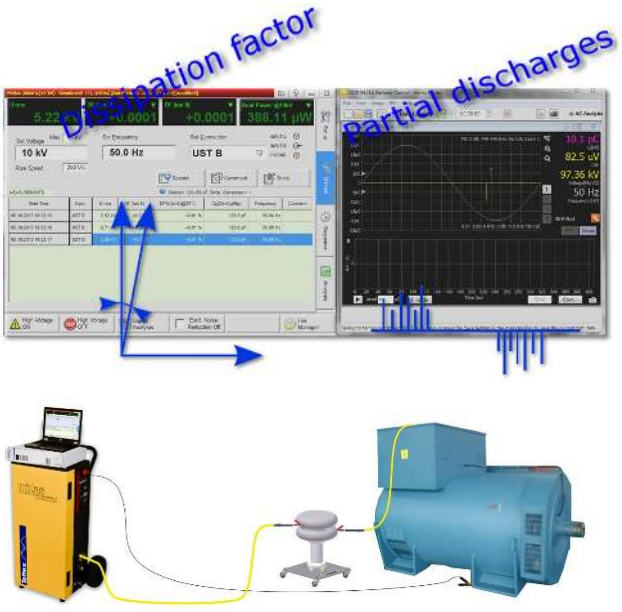
eporting and data handling

All measurement results and test object data are saved in XML and CSV, which allow an easy transfer to database applications, MS Word™, MS Excel™, MS Access™, MS PowerPoint™ or even a simple text editor. Printing of the test reports can be done after transferring the data to a PC using the Ethernet interface or a USB memory stick.



Simultaneous Partial discharges & tan δ

The combination of the high power and low PD level MIDAS 2881/2881G with a PD detector type DDX 9121b allows **simultaneous partial discharge and dissipation factor testing** on rotating machines, reducing the measurement time drastically



Scope of Supply

Device



MIDAS 2881 System with laptop as system controller. Max. output voltage 12 kV

MIDAS 2881G System with laptop as system controller. Max. output voltage 15 kV

Cable Set





Rugged cable case including:

- HV supply cable double shielded 20 m or 30 m with clamp and hook
- ground cable 20 m with clamp
- 3 shielded Measuring cables 20 m or 30 m with clamps,
- 2 Mini clamps,
- Safety switch with cable 10 m,
- USB memory stick,
- Instruction manual and Test Certificate.

Technical Data

HV Power Supply

	MIDAS 2881	MIDAS 2881G
Output Voltage	Up to 12 kV	Up to 15 kV
Output Voltage Regulation	± 1 % rdg ± 1 V	± 1 % rdg ± 1 V
Output Frequency @ Nom Volt	45 Hz … 70 Hz	45 Hz … 70 Hz
Output Frequency @ 5 kV	15 Hz … 1000 Hz	15 Hz … 1000 Hz
Output Current [1] @ Nom Volt	115 mA continuous , > 275 mA max 1 min.	115 mA continuous , > 275 mA max 1 min.
Output Current @ 10 kV	165 mA continuous , > 400 mA max 1min.	165 mA continuous , > 400 mA max 1 min.
Output Power[1] max	> 4000 VA	> 4000 VA
Output PD level[2] max	≤ 500 pC	≤ 500 pC
Duty cycle	≤ 1650 VA	1650 ... 2000 VA

1 Can be expanded with optional Resonating Inductor
2 Can be reduced with additional filters on coupling capacitor

Measuring Unit

	Range	Resolution	Accuracy
Test Voltage	< 1 MV	1 V	± 0.2 % rdg ± 1 V
Dissipation Factor (tan δ)	0 … 10'000 %	0.001 %	± 0.5 % rdg ±0.01 %
Power Factor (cos φ)	0 ... 100 %	0.001 %	± 0.5 % rdg ±0.01 %
Quality Factor	0.01 ... 10000	0.0001	± 0.5 % rdg ± 0.0001
Capacitance		0.01 pF	± 0.2 % rdg ± 0.2 pF
Inductance		0.1 mH	± 0.5 % rdg ± 0.5 mH
Test Current Input A, B & HVGND	20 uA … 15 A	0.1 µA	± 0.1 % rdg ± 1 µA
Ref Current Input Cn ext	20 uA … 300 mA	0,1 µA	± 0.1 % rdg ± 1 µA
Test Frequency	15 Hz … 1000 Hz	0.01 Hz	± 0.1 % rdg ± 0.1 Hz
Apparent Power S	≤ 1 MVA	0.1 mVA	± 0.8 % rdg ± 1 mVA
Real Power P	≤ 1 MW	0.1 mW	± 0.8 % rdg ± 1 mW
Reactive Power Q	≤ 1 Mvar	0.1 mvar	± 0.8 % rdg ± 1 mvar

Accuracy @ frequency 15 Hz…100 Hz ; In & Ix > 20 µA ; Ix/In: 0.01 .. 10'000 ; With Internal Cn

Internal reference capacitor

Capacitance	100 pF
tan δ	< 0.00002
Capacitance constancy	< 0.01 % / year
Temperature coefficient	< 0.01 % / K

Environmental, Mechanical and Power Supply

Operating temperature	-10 … 50 °C
Storage temperature	-20 … 70 °C
Humidity	5 ... 95 % r.h.
Dimensions (W x D x H)	Instrument (128 lbs) 34 x 47 x 104 cm (13.5" x 18.5" x 41") Trolley (25 lbs) 33 x 68 x 112 cm (13" x 26.8" x 44")
Weight	Instrument 58 kg Trolley 11 kg
Power supply Spec.	90 VAC … 264 VAC / 50 … 60 Hz (1 kW)

Control unit

Type	Laptop Intel Core i3® or better, 4 GB RAM, Ethernet / USB 2.0
Operation system	Windows 10™
Interfaces	Ethernet connection to external laptop

Applicable Standards

Protection classes	IP22, IEC 61010, CE mark, general IEC 61326-1, IEC 61000-4-X, 61000-3-X, EN 55011, ANSI/IEEE C37.90
Safety Specification	VDE 0411/part 1a , IEC/EN 61010-1:2002
CE conformity	Yes

Global Presence

Europe

HAEFELY AG

Birsstrasse 300

4052 Basel

Switzerland

☎ + 41 61 373 4111

sales@haefely.com

China

HAEFELY AG Representative Office

8-1-602, Fortune Street, No. 67

Chaoyang Road, Beijing 100025

China

☎ + 86 10 8578 8099

sales@haefely.com.cn

This document has been drawn up with the utmost care. We cannot, however, guarantee that it is entirely complete, correct or up to date.
©Copyright HAEFELY/ Subject to change without notice

V2020.07

HAEFELY

Current and voltage – our passion

H HIGH VOLTAGE

I INSTRUMENTS

E EMC

precision. swiss made.