

# TANDO 700

High-precision measuring and analysis system for  
dissipation/power factor and capacitance



# High-voltage insulation testing made safe, easy and reliable

## Why dissipation/power factor and capacitance?

The condition of insulation is essential for secure and reliable operation of high-voltage (HV) electrical equipment. Measuring dissipation/power factor (Tan Delta) and capacitance helps you to determine overall insulation condition of:

- > Rotating machines (motors and generators)
- > High-voltage cables and cable accessories
- > Distribution, instrument and power transformers
- > Bushings
- > Capacitors
- > Circuit breakers

## Early loss detection improves performance

Variations in the dissipation/power factor are often signs of mechanical displacements, the ingress of moisture, partial discharge, aging and degradation in insulation.

By detecting these conditions early, corrective action can be taken to improve the performance and reliability of electrical equipment.

Our TANDO 700 system provides you with a precise and extremely safe measuring solution that makes insulation tests easier and more reliable. It can be used for insulation material tests in research labs as well as production quality checks in factory HV test fields.

## High-voltage area



TANDO 700  
Reference object



SHT1  
Optional external shunt



TANDO 700  
Test object

Typical TANDO 700 system configuration

## Complete testing and analysis with TANDO 700

TANDO 700 is a complete digital test and analysis system used to measure dissipation/power factor and capacitance in the insulation of high-voltage equipment.

### Flexible testing solution

TANDO 700 measures both ungrounded and grounded test objects, since it can be operated on HV potential. The system is compatible with any type of reference capacitor for testing a variety of HV equipment

TANDO 700 can directly measure currents in a dynamic range from 5  $\mu$ A to 1 A. The input range can be extended up to 28 A by means of optional external shunts.

### Compact, portable design

TANDO 700 includes two measuring units and a fiber optic converter, which is linked with a USB connection to any desktop PC, rack-mounted computer or laptop. This simple system design enables easy transport to various lab and field areas.

### Highly precise, reliable data

The robust TANDO 700 provides you with extremely high measurement accuracy (typical  $< 5 \times 10^{-6}$ ). It is suitable for use in environments with interference, such as in power plants, substations and unscreened test labs. The system continuously verifies signal quality through Fast Fourier Transformation (FFT) analysis.

### Long, continuous measurement

TANDO 700 measurement channels are equipped with a powerful internal battery. The system's low power consumption allows for long measuring periods without having to recharge the internal battery.

### Safe, plug-and-play operation

The easy-to-use TANDO 700 software automatically recognizes connected hardware for easy plug-and-play operation. Fiber optic connections ensure complete galvanic isolation for superior safety in HV areas.

### Additional measurements

TANDO 700 also measures power, voltage, current, impedance and frequency. All measurement data is displayed and analyzed in real time. The modular system can also be used with our MPD 600 for simultaneous measurement and analysis of partial discharges.

## Safe area



**MCU1**  
USB connection to PC

**TANDO 700**  
PC software

## TANDO 700

- > Very high measurement accuracy in environments with interference
- > Galvanic isolation for optimum safety
- > Large input measurement range for a wide variety of HV test objects
- > Compact design for easy transport to various testing areas
- > Plug-and-play operation for quick system setup

 [www.omicron.at/tando700](http://www.omicron.at/tando700)

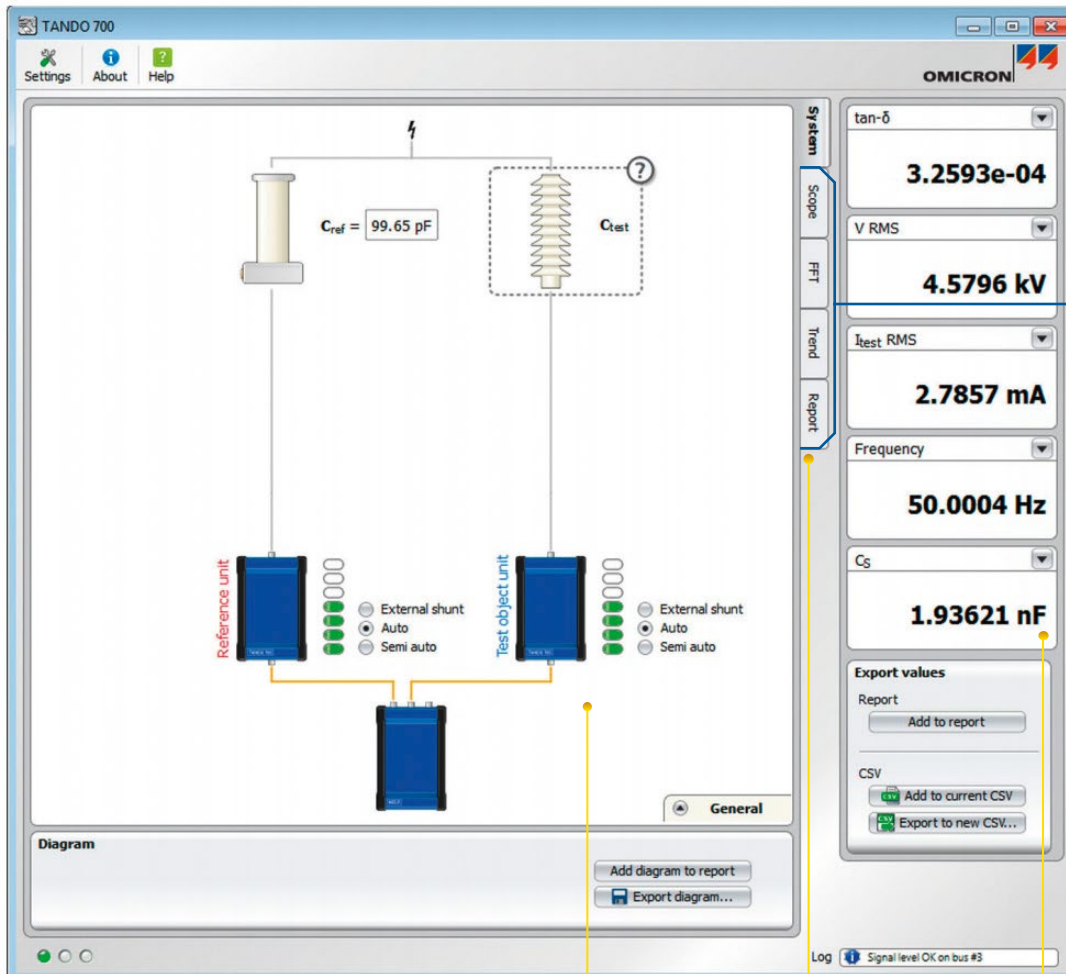
# Customizable data display and reporting

## All essential information at a glance

TANDO 700 includes easy-to-use software for system management as well as comprehensive data analysis, display and customized reporting. All essential information is available to you in real time.

The tab-based navigation lets you choose from a variety of display possibilities for viewing measurement values. You can also select which measurement parameters and trends are captured, saved and included in reports.

TANDO 700 software dashboard – System view

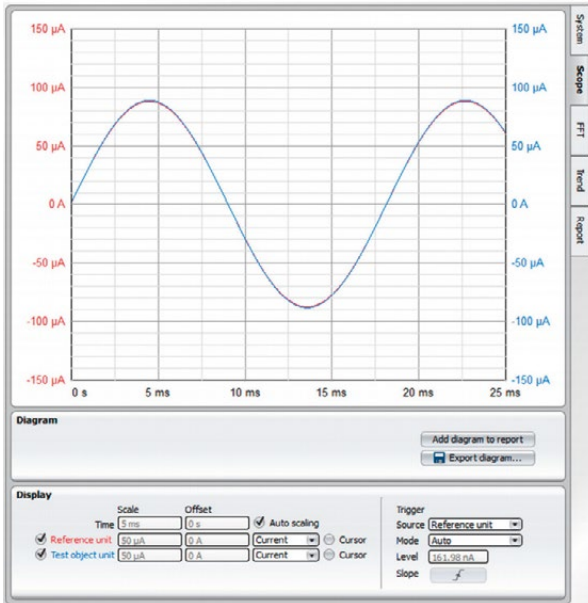


Schematic representation of test system verifies actual setup and connection status

Tab-based navigation lets you view measurement data and trends, and create custom reports

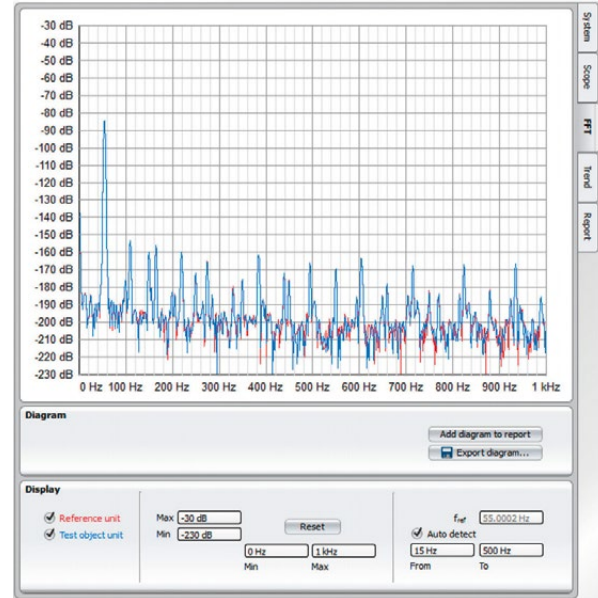
Real-time data display of up to five user-selectable measurement parameters for quick reference

### Scope view



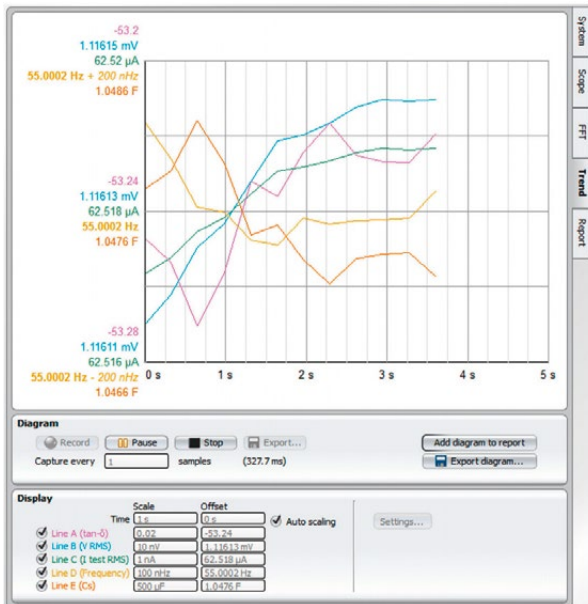
- Graph of real-time input signals from the measuring units
- > Visualizes quality of incoming input signals
  - > Data export for reports in BMP, PNG or JPG formats

### FFT view



- Fast Fourier Transformation (FFT) detects interference
- > FFT graph displays signal-to-noise ratio of input signals
  - > Signal status is updated continuously

### Trend view



- Visual historic summary of measurement values
- > Display of up to five user-selected values
  - > Recordings made at user-specified time intervals

### Report view

- Easy creation of customized reports
- > Add your logo and individualize input fields
  - > Select measurement values, diagrams and graphs

# Ordering information

## TANDO 700 packages

Description	Item no.
<b>TANDO 700 Standard Package</b>	P0000660
Precision measurement solution for the following high-voltage (HV) assets:	
> Rotating machines (motors and generators)	
> Bushings	
> Capacitors	
> Distribution, instrument and power transformers	
<b>TANDO 700 Advanced Package</b>	P0000662
High-precision measurement solution for all HV assets, particularly:	
> Power cables / cable accessories	
> Research and development	
> Metrology institutes	

## Package components

TANDO 700 standard and advanced packages both include the following components:

### Hardware

- 1 x TANDO 700 reference unit
- 1 x TANDO 700 test object unit
- 2 x 24W standard battery charger
- 1 x MCU1 fiber optic controller with USB cable

### Software

- 1 x TANDO 700 software and documentation CD  
(Computer not included)

### Cables and accessories

	Item no.
2 x Duplex fiber optic cables (20m or 50m)	
1 x Connection cable kit, including:	P0006451
1 x Reference capacitor connection cable	B1097700
1 x Connection cable for devices with TNC plug	B1097800
2 x Coax adapter BNC female to 2x4 mm male 180°	E0914000
1 x Coax adapter BNC female to TNC male 180°	E0954400
2 x 4 mm banana connection cable, 0.5 mm, red	E0362800
2 x 4 mm banana connection cable, 0.5 mm, black	E0918100
2 x Banana clamp red and black	P0006304

### Documentation

- 1 x TANDO 700 calibration report
- 1 x TANDO 700 getting started guide

## Optional accessories

Description	Item no.
<b>External shunts (4 A, 15 A, 28 A)</b>	
1 x SHT1 Version A: 4 A with connection cable	P0006452
1 x SHT1 Version B: 15 A with connection cable	P0006453
1 x SHT1 Version C: 28 A with connection cable	P0006454
<b>Battery charger</b>	
Standard 24W battery charger (spare or replacement)	B1116300
<b>Transport case</b>	
Provides space for all package components and up to three shunts	B1229900
<b>Software option</b>	
<b>Integration module</b> Includes Microsoft COM® and LabVIEW library	P0006848
<b>TANDO 700 upgrade</b>	
Upgrade from the TANDO 700 Standard Package to the Advanced Package	P0006214
<b>Calibration</b>	
ISO 9001 Calibration and Adjustment of TANDO 700 System	P0006013
ISO 9001 Calibration and Inspection SHT1	P0006014
<b>Repair</b>	
TANDO 700 system repair	P0006126
SHT1 Repair, Inspection and Calibration	P0006127



# Technical specifications

## Standard System

Value	Accuracy <sup>1</sup>	Condition <sup>2</sup>
Dissipation/ power factor	0.1 % rdg. + 1 x 10 <sup>-4</sup>	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Capacitance	0.1 % rdg. + 0.1 pF	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Current	0.1 % rdg. + 0.1 nA	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Voltage	0.5 % rdg. + 1 V	10 pF ≤ C <sub>Ref</sub> ≤ 10 nF

## Advanced System

Value	Accuracy <sup>1</sup>	Guaranteed	Condition <sup>2</sup>
Dissipation/ power factor	< 5 x 10 <sup>-6</sup>	0.1 % rdg. + 2 x 10 <sup>-5</sup>	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Capacitance	0.005 %	0.05 % rdg. + 0.05 pF	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Current	< 0.02 %	0.05 % rdg. + 0.05 nA	5 μA ≤ I <sub>IN</sub> ≤ 1 A
Voltage	< 0.02 %	0.2 % rdg. + 1 V	10 pF ≤ C <sub>Ref</sub> ≤ 10 nF

<sup>1</sup> The specified accuracies are valid for the frequency of the test voltage at 50/60 Hz, a temperature range of 23 °C ± 5 °C, SINAD of the power source < 12 dB and without errors depending on C<sub>REF</sub>, input combination and parasitic capacitances.

<sup>2</sup> Without a connected shunt and running the software in Auto Mode.

For detailed range dispersion and pre-conditions for accuracy values, please contact OMICRON Support.

## System Data

**Frequency Range** 5 Hz ... 400 Hz

### Direct and internal shunt input ranges

1.2 mA	Impedance	17 Ω
	Current	0.5 μA ... 1.2 mA
200 mA	Impedance	50 Ω
	Current	1 mA ... 200 mA
1 A	Impedance	5.4 Ω
	Current	10 mA ... 1 A

### Connection to MCU1

Fiber optic	Wave length	1300 nm
	Mode	Multimode 50 / 125 μm
	Fiber length	Up to 2 km

## Computer Requirements

Characteristic	Required
Processor	Intel Pentium 4 (≥ 2.5 GHz), Pentium M (≥ 1.5 GHz), Core, Core 2 processor or AMD Athlon 64 or Turion 64 processor
Memory	1GB RAM, USB 2.0 Hi-speed compatible
Operating system	Windows 7, Windows 8, Windows 10

## Calibration certificates

Certificate	TANDO 700 System
PTB calibration mark 20269 - 20273 PTB 14	Standard
PTB calibration mark 20269 - 20273 PTB 14	Advanced

## Power Data

Parameter	Value
Supply voltage (Power input)	9 V ... 24 V DC, 24 W
Power consumption	< 100 mW active < 1 mW standby < 15 W charging
Internal battery pack	Rechargeable lithium battery 3.7 V / 11.6 Ah
Internal battery charge period	Minimum 21 days

## Mechanical Data

Characteristic	Rating
Dimensions (W x D x H)	115 x 175 x 55 mm (4.53 x 6.88 x 2.16 in.)
System package weight	< 5 kg / 11.36 lbs (without accessories)
Connections	<b>Front:</b> 2 x Standard connectors for fiber optic network 1 x 4 pin DC input socket, LEMO FFA <b>Rear:</b> 2 x 4 mm banana red/black plug 1 x 4 pin shunt socket, LEMO FGG

## Environmental Conditions

Characteristic	Rating
Operating temperature	-10 °C ... +50 °C -14 °F ... +122 °F
Storage temperature	-20 °C ... +60 °C -4 °F ... +140 °F
Charging temperature	0 °C ... +40 °C 32 °F ... +104 °F
Humidity	-5 % ... 85 % (non-condensing)

## SHT1 External Shunts

Parameter	Value		
Maximum current	4 A	15 A	28 A
Minimum current	100 mA	1 A	3 A
Nominal resistance	500 mΩ	50 mΩ	15 mΩ
Typical temperature coefficient	2 ppm	2 ppm	2 ppm
Initial resistance accuracy	±0.04 %		
Absolute phase deviation	tan δ < 2 x 10 <sup>-5</sup>		
Weight	0.68 kg / 1.49 lbs		

## CE Conformity

(EMC) Directive 2004/108/EC, (LVD) low-voltage directive 2006/95/EC

EMC	EN 61326-1/2013	Emission: Class A Immunity: Table 2
Safety	UN 38.3 IEC 62133:2012 (ed.2) UL 2054 (ed.2, incl. rev. 2011) TÜV certificate no. B 14 11 17955 065	
Protection	IEC 60068- /2-6 / 2-27 / 2-78 IEC 60529 § 12.2 / § 13.2	Vibration, Shock, Damp Heat IP4X

We create customer value through ...

## Quality

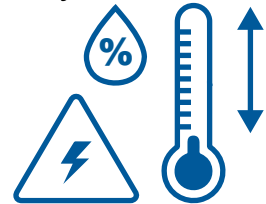
We always want you to be able to rely on our testing solutions. This is why our products have been developed with experience, passion and care and are continually setting groundbreaking standards in our industry sector.



You can rely on the highest safety and security standards

Superior reliability with up to

72



hours burn-in tests before delivery

100%

routine testing for all test set components



ISO 9001  
TÜV & EMAS  
ISO 14001  
OHSAS 18001



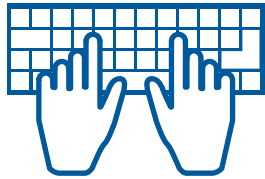
Compliance with international standards



## Innovation

Thinking and acting innovatively is something that's deeply rooted in our genes. Our comprehensive product care concept also guarantees that your investment will pay off in the long run – e.g. with free software updates.

More than

**200** 


developers keep our solutions up-to-date

 I need...



... a product portfolio tailored to my needs

Save up to

**70%** 

testing time through templates, and automation

More than

**15%** 

of our annual sales is reinvested in research and development

We create customer value through ...

## Support

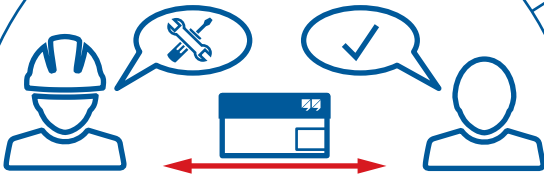
When rapid assistance is required, we're always right at your side. Our highly-qualified technicians are always reachable. Furthermore, we help you minimize downtimes by lending you testing equipment from one of our service centers.



Professional technical support  
at any time



Loaner devices help to  
reduce downtime



Cost-effective and straight-  
forward repair and calibration



offices worldwide for local  
contact and support

## Knowledge

We maintain a continuous dialogue with users and experts. Customers can benefit from our expertise with free access to application notes and professional articles. Additionally, the OMICRON Academy offers a wide spectrum of training courses and webinars.



Frequently OMICRON hosted user meetings, seminars and conferences

More than

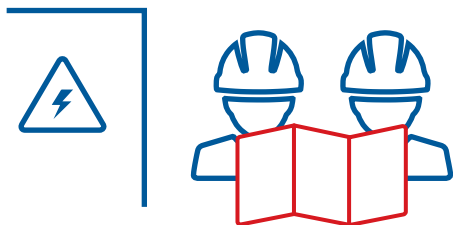
300



Academy and numerous hands-on trainings per year



to thousands of technical papers and application notes



Extensive expertise in consulting, testing and diagnostics

OMICRON is an international company that works passionately on ideas for making electric power systems safe and reliable. Our pioneering solutions are designed to meet our industry's current and future challenges. We always go the extra mile to empower our customers: we react to their needs, provide extraordinary local support, and share our expertise.

Within the OMICRON group, we research and develop innovative technologies for all fields in electric power systems. When it comes to electrical testing for medium- and high-voltage equipment, protection testing, digital substation testing solutions, and cybersecurity solutions, customers all over the world trust in the accuracy, speed, and quality of our user-friendly solutions.

Founded in 1984, OMICRON draws on their decades of profound expertise in the field of electric power engineering. A dedicated team of more than 900 employees provides solutions with 24/7 support at 25 locations worldwide and serves customers in more than 160 countries

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