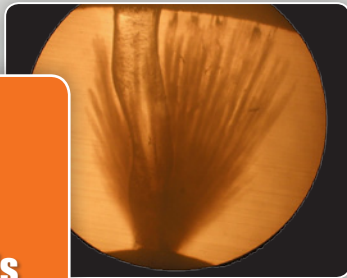


Tan Delta HV Cable Diagnostic Testing Instruments

TD SERIES



DETECT:
Bad Accessories
Degraded Insulation
Corroded Neutral Shields
Water Tree Degradation



HV Diagnostics
INC.

BACKGROUND / APPLICATION

Tan Delta, often referred to as Dissipation Factor or Power Factor, is an excellent diagnostic test that provides an indication as to the quality of the dielectric insulation used in electrical apparatus. By analyzing the dielectric losses in the insulation, the TD Series of test instruments provide the testing engineer with a versatile high voltage diagnostic system that is suitable for testing MV cables such as XLPE, EPR, PE and PILC and a variety of other electrical apparatus such as capacitors, transformers and rotating machines.

For Medium Voltage cables, Tan Delta measurements are the most effective and widely used diagnostic method for detecting water trees and water degradation, the most common aging mechanism found in extruded insulated cables. These degradation mechanisms often go undetected with other common diagnostic techniques such as Partial Discharge. Tan Delta tests are often performed at test voltages below the normal operating voltage of the device under test - minimizing the risk of a cable insulation failure that could otherwise occur during a normal "hipot" or elevated voltage test performed on a weak or aged insulation. Insulation defects can be detected before they cause the cable to ultimately fail in service.

In addition, the Tan Delta diagnostic measurement can be combined with an acceptance or maintenance VLF withstand test standard to provide an intelligent or SMART VLF test. By analyzing the Tan Delta information in real time, the test engineer can limit the testing time on cables demonstrating good characteristics while maximizing the testing time on cables demonstrating poor insulation characteristics. Likewise, the operator can avoid test failures by detecting highly degraded cables at test voltages at or below the normal operating voltage.

The test engineer gains an enhanced understanding as to the remaining life of their cable asset infrastructure, so as to better plan and prioritize their cable replacement / rejuvenation program and thereby improve their overall reliability.

PRODUCT DESIGN / DESCRIPTION

The TD series of versatile, portable tan delta measuring systems are the smallest, lightest, most accurate portable TD instruments available. They connect directly to, or integrated in the HV Diagnostics - HVA series of VLF/DC test systems. The TD diagnostic test results are measured quickly and efficiently, taking no more than a few minutes to complete a full test, providing a simple and effective means to perform routine acceptance or maintenance testing on electrical systems.

All models also utilize the widespread Bluetooth™ wireless technology to transmit test results directly in real time to a laptop, thus dramatically eliminating the number of cables, power supplies and grounding connections required for correct operation and hookup.



WIRELESS TECHNOLOGY



DETECT SHIELD CORROSION



DETECT WATER TREE DEGRADATION

TD Data Collection, Analysis and Reporting Software

The TD Control Center software is the heart of the TD test data collection, analysis and report generation. The Software is supplied free with every TD test instrument and software upgrades are also made available at **no charge** to our customers.

The TD Control Center is simple to set up and easy to use on any Windows™ compatible PC/Laptop with TD test data being available within about a minute of commencing a test - most other instruments on the market take several minutes to start recording valid TD test results.

All 3 phases are recorded and displayed in one electronic file allowing for easy comparison and evaluation. After the completion of each voltage cycle, a new TD test data point is captured and tabulated by the software. The TD test data is also displayed as a function of voltage and time in graphical format. In addition, capacitive load, charging current, applied voltage, TD standard deviation as well as the voltage and current waveform can all be displayed and recorded with the associated date and time stamp. The user also has the **ability to compare old TD test report data to a current test for trending purposes.**

Automatic Reporting

With some test instruments on the market, you spend more time generating a test report than you do performing the actual physical test. At the click of a mouse, the Tan Delta Control Center generates a report within seconds of completing a test in either a summarized single page or detailed multiple page formats. Each TD test can be saved electronically in PDF, CSV or XML Excel file format. TD Test reports can then easily be stored, emailed, printed or additional analyzed.

AUTOMATIC TEST REPORTING

TD Report for Phase A, X6
System used SN: GH0300.06A003

Start 8/5/2006 3:11:02 PM
Mean (13) TD 0.5 E-3, Std Dev 0.00 %, 1.9 kVrms, 0.055 mAmps, 0.1 Hz, 46 nF

#	TD [E-3]	Voltage [rms]	Current [rms]	Load Cap.	Duration
1	0.5	1.9 kV	0.055 mA	45 nF	0 min
2	0.5	1.9 kV	0.055 mA	45 nF	0 min
3	0.5	1.9 kV	0.055 mA	45 nF	0 min
4	0.5	1.9 kV	0.055 mA	45 nF	0 min
5	0.5	1.9 kV	0.055 mA	45 nF	0 min
6	0.5	1.9 kV	0.055 mA	45 nF	0 min
7	0.5	1.9 kV	0.055 mA	45 nF	1 min
8	0.5	1.9 kV	0.055 mA	45 nF	1 min
9	0.5	1.9 kV	0.055 mA	45 nF	1 min
10	0.5	1.9 kV	0.055 mA	45 nF	1 min
11	0.5	1.9 kV	0.055 mA	45 nF	1 min

Start 8/5/2006 3:13:28 PM
Mean (15) TD 0.5 E-3, Std Dev 0.00 %, 3.9 kVrms, 0.111 mAmps, 0.1 Hz, 45 nF

#	TD [E-3]	Voltage [rms]	Current [rms]	Load Cap.	Duration
1	0.5	3.9 kV	0.111 mA	45 nF	0 min
2	0.5	3.9 kV	0.111 mA	45 nF	0 min
3	0.5	3.9 kV	0.111 mA	45 nF	0 min
4	0.5	3.9 kV	0.111 mA	45 nF	0 min
5	0.5	3.9 kV	0.111 mA	45 nF	0 min
6	0.5	3.9 kV	0.111 mA	45 nF	0 min
7	0.5	3.9 kV	0.111 mA	45 nF	1 min
8	0.5	3.9 kV	0.111 mA	45 nF	1 min
9	0.5	3.9 kV	0.111 mA	45 nF	1 min
10	0.5	3.9 kV	0.111 mA	45 nF	1 min
11	0.5	3.9 kV	0.111 mA	45 nF	1 min
12	0.5	3.9 kV	0.111 mA	45 nF	1 min
13	0.5	3.9 kV	0.111 mA	45 nF	2 min
14	0.5	3.9 kV	0.111 mA	45 nF	2 min
15	0.5	3.9 kV	0.111 mA	45 nF	2 min

Start 8/5/2006 3:16:54 PM
Mean (13) TD 0.5 E-3, Std Dev 0.00 %, 5.9 kVrms, 0.168 mAmps, 0.1 Hz, 46 nF

#	TD [E-3]	Voltage [rms]	Current [rms]	Load Cap.	Duration
1	0.5	5.9 kV	0.168 mA	45 nF	0 min
2	0.5	5.9 kV	0.168 mA	45 nF	0 min
3	0.5	5.9 kV	0.168 mA	45 nF	0 min
4	0.5	5.9 kV	0.168 mA	45 nF	0 min
5	0.5	5.9 kV	0.168 mA	45 nF	0 min
6	0.5	5.9 kV	0.168 mA	45 nF	0 min
7	0.5	5.9 kV	0.168 mA	45 nF	1 min
8	0.5	5.9 kV	0.168 mA	45 nF	1 min
9	0.5	5.9 kV	0.168 mA	45 nF	1 min
10	0.5	5.9 kV	0.168 mA	45 nF	1 min
11	0.5	5.9 kV	0.168 mA	45 nF	1 min
12	0.5	5.9 kV	0.168 mA	45 nF	1 min
13	0.5	5.9 kV	0.168 mA	45 nF	2 min

HVA TD Report Summary Page 1 of 7

X6

Report Information
Cable / Line ID: X6
Station / Location: Station HVD
From: SWITCHYARD **To:** MAIN GEAR
Comment: HOT DRY
System Used: GH0300.06A003
Test Start: 4/15/2021 3:12:04 PM
End Device: SIEMENS MAIN BREAKER

Device Under Test: Cable
DUT Voltage Rating: 15.0 kV
Length: 750 FEET **Size:** 400MCM
Insulation Type: Other
Measurement Type: Maintenance
Manufacturer: Cable Co

Company: HV Diagnostics
Operator: CG
Region: ATL
Work Order: 1234

Phase A Summary: 0.1 Hz, 45.5 nF

Voltage [kVrms]	1.9	3.9	5.9	7.9
TD Value [E-3]	0.5	0.5	0.5	0.5
Std. Dev. [%]	0.00	0.00	0.00	0.00

Phase B Summary: 0.1 Hz, 40.2 nF

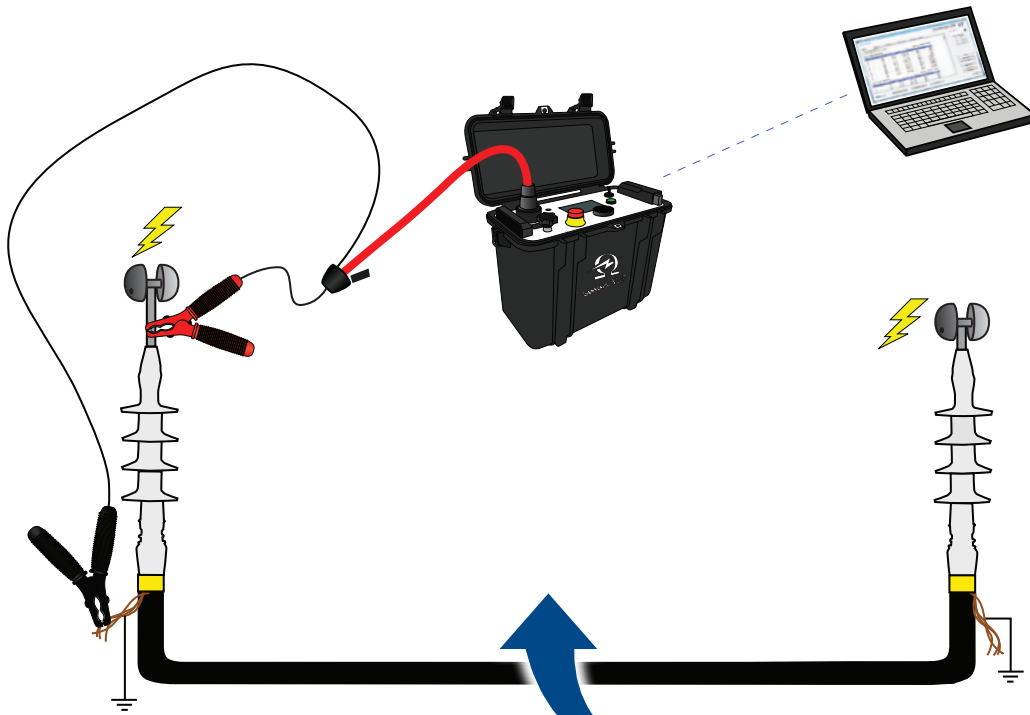
Voltage [kVrms]	1.9	3.9	5.9	7.9
TD Value [E-3]	0.6	0.6	0.6	0.6
Std. Dev. [%]	0.00	0.00	0.00	0.00

Phase C Summary: 0.1 Hz, 40.6 nF

Voltage [kVrms]	1.9	3.9	5.9	7.9
TD Value [E-3]	0.7	0.9	1.3	2.1
Std. Dev. [%]	0.00	0.00	0.00	0.01

printed with TD Control Center, HV Diagnostics

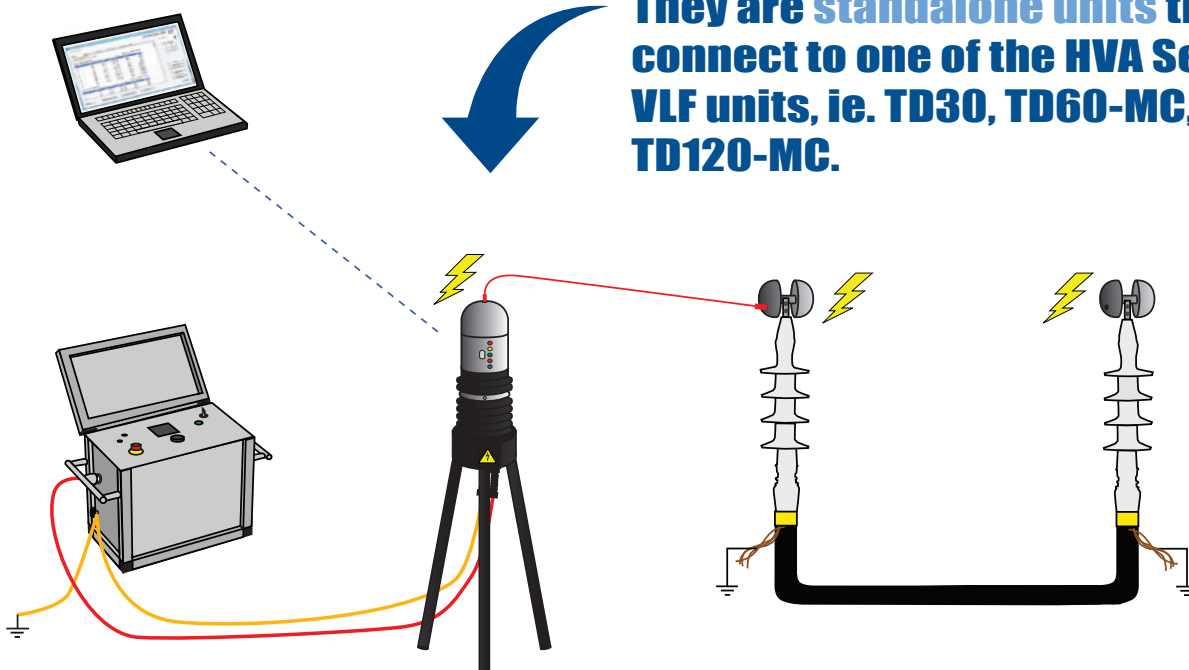
INTEGRATED or STANDALONE



TD Systems are either integrated into the HVA VLF units themselves (HVA28TD, HVA34TD, HVA45TD etc.)

-or-

They are standalone units that connect to one of the HVA Series of VLF units, ie. TD30, TD60-MC, TD90-MC, TD120-MC.



TD30 TD60-MC TD90-MC TD120-MC

Technical Data

Technical Data for Standalone Range of TD Diagnostic Testing Equipment

Model		TD30	TD60-MC	TD90-MC	TD120-MC
Ordering Information (Part #)		700 003	706 003 MC	709 003 MC	712 003 MC
Power Supply		2 "C" Type Batteries	2 "D" Type Batteries		
Rated Operating Voltage	RMS: Peak:	1-24kV 34kV	1-44kV 62kV	1-64kV 90kV	1-85kV 120kV
Voltage Measurement	Resolution: Accuracy:	0.1kV ±1% (of reading)			
Current Measurement	Resolution: Accuracy:	1µA RMS ±1% (of reading)			
Frequency Measurement	Range: Resolution:	0.01 to 0.1Hz (Nominal 0.1Hz)* 0.01Hz			
Tan Delta Measurement	Resolution: Accuracy :	0.1 x 10 ⁻⁴ >10nF: ±0.1 x 10 ⁻³ 0.5nF.. 10nF**: ±0.3 x 10 ⁻³			
Load Range		0.5nF to 10 µF			
Weight		7 lbs / 3 kgs	32 lbs / 15 kgs	36 lbs / 16 kgs	36 lbs / 16 kgs
Dimensions	(L x W x H)	9.5" x 3.5"Ø 240 x 85mm Ø	12" x 11" x 25" 300x280x640mm	12" x 11" x 31" 300x280x790mm	12" x 11" x 31" 300x280x790mm
Computer Interface	Microsoft Windows™	Bluetooth™			
HVA Interfaces		HVA30 / 34 / 30-5	HVA30 - HVA60	HVA30 - HVA90	HVA30 - HVA120
Accessories Included		Standard Connection Accessories + Cable Jumper & Grounding Cable Bluetooth USB Dongle TD Control Center Software Operating Manual Calibration Certificate Corona Protection Rugged Transport Case Set of Batteries + Battery Charger			
Standards	Shock: Vibration: EMC: Safety:	IEC68-2-27 IEC68-2-6 IEC6100-4-2, IEC6100-4-4, EN55077 EN60950, EN50191, EN61010-1			
Environmental	Storage: Operating: Humidity:	-13°F to 158°F / -25°C to 70°C 14°F to 122°F / -10°C to +50°C 80% RH non-condensing			

* Std. Calibration is only valid at the nominal frequency of 0.1Hz

** At least 3kV and 10µA

Note: Due to continuous development the information detailed in this document may change without notice.