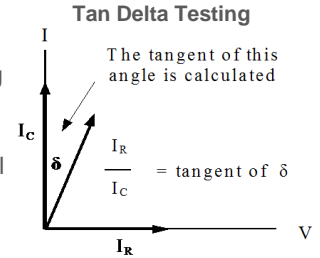




# Application: Cable Testing – VLF Diagnostic Methods

## Application Description

Diagnostic testing is a term for methods that test the health of a cable's insulation without risking its failure during the test, like an over voltage Withstand test might. Diagnostic testing intends to learn something about the cable insulation to permit the user to make a qualitative analysis of its condition to try to make a judgement as to how long the cable may last. Some diagnostic tests indicate the overall deterioration of cables insulation while some show specific locations of trouble. Which one used depends on several factors. There are two methods that are the most commonly used and both are offered by HVI.



## Diagnostic Testing Solutions

Tangent Delta measurement: A Tan Delta, or Tan  $\delta$ , test measures the degree of deterioration of cables insulation, performing a total assessment from end to end. Several test data parameters determine the cables insulation quality: the Absolute TD number, the change in the TD number as voltage is raised, the change in the TD number over time, and others. The intent is to test the cable and then grade the quality of the insulation. Usually large populations of cables are tested with the results compared to help prioritize future actions. Is the insulation **Highly, Moderately, or Slightly Degraded, or is it Good?** Another scale of measure commonly used is to list the cables tested into three categories: **No Action Required, Further Study Advised, & Action Required.** These cable condition levels were developed by NEETRAC \*, which has performed years of lab and field cable testing to assess VLF, TD, and PD effectiveness.

\* NEETRAC stands for National Electric Energy Testing, Research & Applications Center. It is part of Georgia Tech in Atlanta, GA. and is a testing and research facility for utility power topics and other areas, performing many years of extensive testing on the use of VLF and the diagnostic accessories discussed here. [www.neetrac.gatech.edu](http://www.neetrac.gatech.edu).

**TD testing** uses a VLF hipot to apply the voltage to the cable while measurements are recorded. It is an easy test to perform, taking less than 20 minutes, with results relatively easy to interpret. See Tan Delta Product's on this site for more detail.

**Partial Discharge** detection and measurement is another diagnostic test that is commonly performed on cables. This test attempts to locate specific places of partial discharge emission caused by defects and measures their severity. It too uses a VLF hipot to apply variable and overvoltage to the cable. Important measurements and factors in the insulation health are PDIV (partial discharge inception voltage), PDEV (partial discharge extinction voltage), the severity or level of discharge, and its location in the sine wave. PD testing requires more equipment than TD testing and a high level of knowledge of the concepts of PD and how to interpret the results.

## HVI Product Solutions

Either the **VLF Series** or the **VLF E Series** of VLF AC hipots can be used to perform Withstand testing and the TD and PD Diagnostic testing. For **Tan Delta testing**, HVI offers its **TD-65E**, a **65 kVac** peak transducer designed to interface to the **VLF E Series** and controlled with the custom designed **HVI E-Link Application software**. All functions of programming, control, data logging and reporting, and wireless communication are included. Also offered are TD products from other vendors. For **PD testing**, HVI provides various PD/TD systems from other vendors and perfected for use with the HVI VLF products.

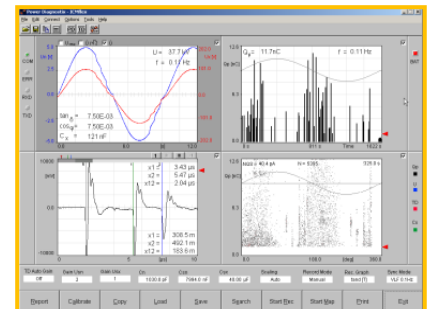


VLF Original Designs  
Since 1999 - Patented to HVI



VLF-34E VLF-65E TD-65E

VLF-200CMF w/TD & PD



VLF-6022CMF & PDIX ICMflex  
70 kV PD/TD System

