

HVI Does WIND

HIGH VOLTAGE[®]
VLF HIPOT INSTRUMENTS INC.

THE VLF AND THUMPER PRODUCTS

from HVI are best suited for VLF testing, VLF Tan Delta testing, and fault locating cable rated up to the typical 35 kV cables found on wind farms. Many VLF and Thumper models exist to serve all applications.

Buy discreet products or the whole package ready to drop into your truck or van.



This VLF
[VLF-6022CM for testing
up to 35kV cables]

and/or



This Thumper & accessories
[Powerful design for long 35 kV cables]

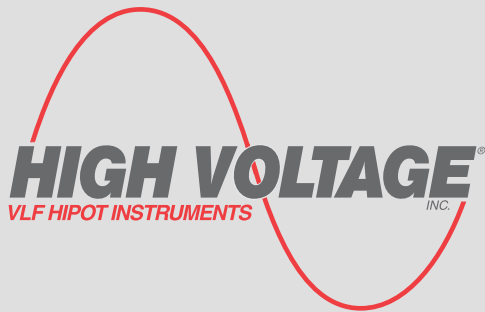
equals



**Complete VLF, VLF Tan Delta,
Thumper, TDR/radar,
fault pinpointer, and
cable reels package.**

*High Voltage, Inc.
The World's Source for
Cable Testing & Fault
Locating Technology*

www.hvinc.com



VLF-6022CM

HVI – The World's VLF Source

Nearly 70 countries served since 1998

- Greatest Model Selection
- Highest Voltages Available
- Highest Power Ratings Delivered
- Only VLF Thumper Produced
- Most Rugged Design

The HVI VLF Advantages:

- Smallest
- Lightest
- Easiest to use
- Most economical
- True sine wave output
- Highest load ratings
- Variable frequency
0.1 — 0.01 Hz

Very Low Frequency AC Hipots

AC testing of cables and electrical apparatus is now easier than ever.

Since the introduction of the High Voltage, Inc. line of portable and affordable VLF hipots, there is a practical method of AC field-testing various loads, particularly cables and rotating machinery. High Voltage, Inc. offers a full line of VLF AC Hipots from 28 kVac to 200 kVac with models that can test up to 50 μ F of load; cables over 50 miles in length and the largest of generators/motors. Use VLF for AC stress tests and/or as a voltage source for **Tan Delta** and **Partial Discharge** cable diagnostic testing.



Wind Farm Cable Testing

What to do?

QUESTION: You just installed miles of cables with hundreds of splices and terminations. What do you do to make sure the workmanship is good? You assume the components were sound from the manufacturers but want to test the quality of the installation work by the contractors. What to do, what to use, how to do it, etc?

As with any testing program, you must ask yourself what you intend to gain by the test and what will you do with the test data. If all you want to do is to verify the installation integrity of new work, then you want to perform a simple, inexpensive AC withstand test. If it's old, water treed cable and you want to test many lengths to compare and prioritize replacement or injection, then maybe a Tan Delta test or Off-Line PD test is best, although the TD test is simpler and less expensive than PD if the test will be used simply for comparison purposes. If it's old and you need to verify if certain lengths are good, an Off-Line PD test may be the best approach. Below are the possible approaches.

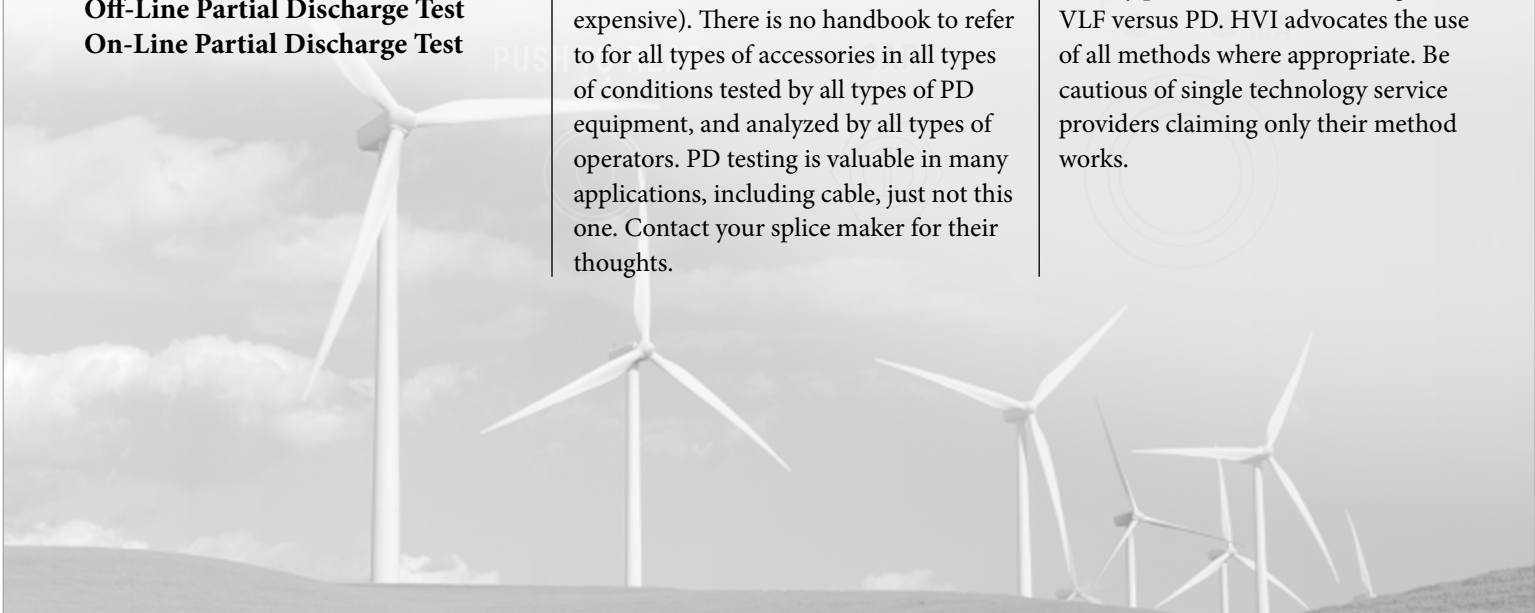
- DC Overvoltage Test
- VLF AC Withstand Test
- VLF Tan Delta Test
- Off-Line Partial Discharge Test
- On-Line Partial Discharge Test

Let's take a look: DC is out, since most no longer use it due to the problems associated with DC voltage and polarizing water trees and the fact that DC leakage current testing misses too much. On-Line PD testing is mostly out since it does nothing to test the insulation or accessories at voltages above operating, even 5% above operating, missing too much to be a worthy diagnostic test. Tan Delta is used effectively to measure the level of insulation degradation of old cables, but not for new situations. We are testing new cables, which are 99% good, while looking for defects due to installation. What's left: VLF and Off-Line PD, two very different approaches.

Generally, if both are considered for a job, one or the other is probably wrong for it. For instance, you would never use PD to verify the integrity of new accessories and cables. The test is very expensive, difficult to perform, and often ambiguous at best and inconclusive at worst. Example: you measured a pd level in a splice. OK, is it acceptable or not? Splices can live with high levels of PD for decades (not insulation – this test is valuable for that, albeit expensive). There is no handbook to refer to for all types of accessories in all types of conditions tested by all types of PD equipment, and analyzed by all types of operators. PD testing is valuable in many applications, including cable, just not this one. Contact your splice maker for their thoughts.

Everything is new; all you want to do is find bad workmanship. The easiest, least expensive, surest way to do that is to perform a simple AC withstand test. If a splice passes a "proper" VLF or 60Hz withstand test, it's good and will last for years. Who cares what the PD or Tan Delta number is. It's solid if it passed 2 – 3 times normal voltage for a 30+ minute VLF test. If you have an aged system with many defect locations, then maybe VLF is not the way to go, but for new installations that are generally good, why would you use any other more complicated and expensive approach when it does not provide any additional information, usually less? VLF will not harm good insulation nor aggravate defects that are not severe enough to be triggered into PD under the test voltage. Don't let others overcomplicate or misrepresent VLF testing. There's nothing not to work, it's just a simple AC hipot test, like we do with our vacuum bottles, rubber goods, hot sticks, breakers, etc.

If in doubt, contact your cable and accessory providers for their thoughts on VLF versus PD. HVI advocates the use of all methods where appropriate. Be cautious of single technology service providers claiming only their method works.



Wind Farm Cable Testing & Fault Locating

SCOPE

High Voltage, Inc. is a worldwide leading company for the design and production of medium and high voltage cable testing and fault locating products needed and used by the wind power industry, among others. For over 10 years HVI has been providing the Very Low Frequency (VLF) AC technology needed for performing

AC withstand tests on cable and now used as a voltage source for performing cable diagnostic testing: Tangent Delta (dissipation factor) and Partial Discharge. Our cable fault locators/surge generators have been used by utilities and others worldwide for locating cable faults in cables rated from 5 – 69 kV. We can provide

individual products for specific testing needs or fabricate a custom designed, preassembled, and integrated test van package. HVI also produces many of the leading AC and DC hipots, Oil Dielectric testers, and other instruments used for substation maintenance. *HVI – your sole source for all your cable care needs.*

VLF Cable Testing & VLF Fault Burning

Whatever the cable voltage rating and length of cable to be tested, an HVI VLF model exists for the job. Below are models designed to test up to 35 kV cable. HVI offers models rated up to 200kV if needed.

Cable Fault Locating with TDR/Radar

POS

HVI offers four models of thumpers, or surge generators. Depending on the cable voltage rating and length, there's a model ideal for the job, including the VLF/Thumper combination VT33.

NEG



5 – 25 kV Cable Testing
VLF-4022CM
0-40kV peak - sine wave
0.1 Hz – 0.02 Hz
1.1 μF – 5.5 μF



5 – 35 kV Cable Testing
VLF-6022CM
0-60kV peak - sine wave
0.1 Hz – 0.02 Hz
1.1 μF – 5.5 μF



CDS-2010U
0 – 5/10/20 kV
1000J
400 mA Burn
Current
TDR/Radar
Ready



CDS-3616U & CDS-3632U
0 - 9/18/36 kV
1600J & 3200J
280 mA Burn
Current
TDR/Radar Ready



5 – 25 kV Cable Testing
VLF-50CMF
0-50kV peak - sine wave
0.1 Hz @ 5.0 μF – 0.01 Hz @ 50 μF
5 – 35 kV Cable Testing

VLF-65CMF
0-65kV peak - sine wave
0.1 Hz @ 2.2 μF – 0.01 Hz @ 22 μF
These two models are higher in power to test cables over 10 miles (16 km) long.



VT33 VLF/Thumper
VLF: 0-33kVac @ 1μF
Discharge:
0 – 13kV @ 760J
VLF Cable Burn Mode
TDR/Radar ready



TDR/Radar

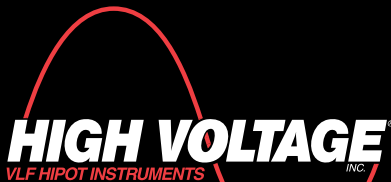


Fault
Pinpointing

Ask about our Tan Delta diagnostic testing products, now available up to 60kV. Partial Discharge detection devices are available from others, not HVI.

Why the World Prefers HVI VLF

- Easiest to use – no programming necessary
- Sine wave output ideal for diagnostics: TD & PD
- More models available, from: 28 kV – 200 kV
- Rugged & reliable non electronic design
- Data Logger available for full report generation
- Smallest – lightest – most economical
- Highest voltage models & highest power models
- Nearly 1000 units field proven in over 55 countries



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