

portable

VLF HIPOT INSTRUMENTS



High Voltage, Inc.

The World's Source for

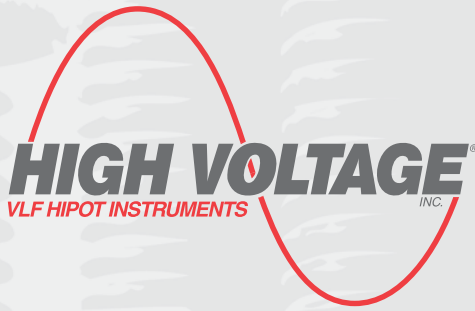
Cable Testing & Fault

Locating Technology

affordable

HIGH VOLTAGE[®]
VLF HIPOT INSTRUMENTS INC.

www.hvinc.com



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**
- **Rugged oil filled non-electronic design offers extreme reliability and ease of field service if ever necessary**

Models Available

HVI offers more models and higher voltage models than any other vendor in the world. Models range from 28kV – 200kV, offering from 0.4 μ F to 50 μ F of load capability.

VLF-28CM	0-28 kVac, 0.1 Hz, load rated to 0.4 μ F
VLF-4022CM	0-44 kVac, 0.1 Hz - 0.02 Hz, load rated to 5.5 μ F
VLF-50CM	0-50 kVac, 0.1 Hz - 0.01 Hz, load rated to 50 μ F
VLF-6022CM	0-60 kVac @ 50Hz, 0.1 Hz - 0.02 Hz, load rated to 5.5 μ F 0-62 kVac @ 60Hz
VLF-65CMF	0-65 kVac, 0.1 Hz - 0.01 Hz, load rated to 22 μ F
VLF-90CMF	0-90 kVac, 0.1 Hz - 0.02 Hz, load rated to 2.75 μ F
VLF-12011CMF	0-120 kVac, 0.1 Hz - 0.01 Hz, load rated to 5.5 μ F
VLF-200CMF	0-200 kVac, 0.1 Hz - 0.02 Hz, load rated to 3.75 μ F
VT33	VLF Thumper, 0 – 33kVac, 1 μ F @ 0.1Hz 13kV @ 760 joules discharge, TDR ready

**The HVI VLF technology is protected
under U.S. Patent # 6,169,406**

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.

SINCE 1998, HVI has produced the most rugged and reliable VLF products available. Our electro-mechanical control and our oil filled HV power supply designs are **extremely dependable**, and if necessary, more easily field serviced than the electronic designs of others. **The HVI design has a proven 12 year track record with over 900 units in service.** The HVI VLF design offers the best of everything, with manual, easy to use controls but also sophisticated data collection. Electric utilities and industrials have long recognized the benefit of our technology. HVI knows how to build long lasting field test equipment.

The HVI VLF design produces a **sine wave output** that meets all requirements of world standards, permitting it to be used as a voltage source for **Tan Delta** and **Partial Discharge** cable diagnostic testing. Non sine wave producing VLF designs are limited in this ability and may reduce the users' options in the future to use the VLF for diagnostic testing. Stick to the HVI sine wave producing VLF.

Why Buy HVI VLF Products?

The HVI Design – Portable, Affordable, Rugged, & Reliable

What is VLF?

VLF stands for Very Low Frequency. A VLF hipot is an AC output high voltage instrument. HVI VLF products provide sinusoidal AC voltage and current but at 0.1 Hz - 0.01 Hz, compared to the 50/60 Hz output of conventional AC test sets. It is still an AC voltage with sinusoidal polarity reversals every half cycle. The VLF instrument is used to provide a simple go/no-go, or pass/fail, withstand test. Also, HVI VLF instruments can be used as the voltage source for performing off-line **Partial Discharge** and **Tan Delta** cable diagnostic testing.

Why VLF?

VLF test sets are used to field test high capacitance loads like cables and motors/generators. The lower the frequency of an AC source, the lower the current and power required to apply a voltage to a capacitive load like a cable. At 0.1Hz, it requires 600 times less power to test a cable than at 60Hz. The HVI VLF instruments permit users to field test long cables and large generators with a portable and affordable test set. A 100 lb VLF instrument can do the job of a multi-ton 60Hz AC test set. Cables should be tested with AC voltage. With the HVI VLF products, it can be done with a practical, economical, and easy to use package.

When and Where is VLF Used – Cable & Rotating Machinery

The principal use of VLF is testing medium and high voltage shielded power cables. A long cable may have many microfarads of capacitance. To AC high voltage test this cable requires the use of VLF technology. An AC voltage test is the best way to verify the AC integrity of a cable. If a cable can't hold 2 – 3 times normal voltage, it is not healthy and an in-service failure is likely. Use the VLF to cause defects to fail during the test. Find the fault, make the repair or replacement, and be left with a better cable. It is especially valuable for verifying a cable after installation or repair: far better than using a DC hipot, 5kV megohmmeter, hot stick adaptor,

or soak test, none of which provide meaningful information about a cable's ability to withstand several times normal AC voltage. IEEE 400, IEEE 400.2, VDE 0276, CENELEC HD 620/621, and IEC 60060-3 standards define VLF cable testing.

VLF is also very useful for testing large rotating machinery, since it provides a portable and affordable method of field testing coils and is sanctioned by the IEEE 433 standard.

Partial Discharge & Tan Delta VLF Cable Diagnostic Testing

The VLF hipot by itself provides a withstand, or proof test. It can also be used as the voltage source for off-line partial discharge and tan delta cable diagnostic testing. HVI can serve the needs of the industry for cable testing better than any other. Contact HVI for additional information on other cable testing methods and products available.

Benefits of HVI VLF AC Hipots

For more information on VLF testing, download our VLF FAQ from our website: www.hvinc.com

- Portable and affordable
- All models feature a true sinewave output
- Waveform is independent of load capacitance between 0.01 μ F and maximum load
- Highest load ratings available
- Highest voltage models available
- Simple and easy operation
- AC testing does not degrade good cable insulation
- Harmful space charges are not injected into the cable insulation
- No traveling waves are generated during testing
- BNC scope output for waveform viewing
- Rugged and reliable design less prone to failure from transients
- Much easier to service compared to units with solid state design

POS

NEG

VLF-28CM(F)

Our smallest VLF model, the VLF-28CM approaches the size and cost of a DC hipot and is designed for quick & easy short-run cable testing. It can test up to 0.4 μ F of load, or up to 4000 feet (1200 m) of a typical 15 kV class cable. Small, light, inexpensive. Now there is no reason not to use VLF.



- Input:** 120 volts, 60 Hz, 5 A peak, 2.5 A average
or 230 volts, 50/60 Hz, 3A peak, 2A average (F suffix)
- Output:** 0 – 28 kVac peak, 0.1 Hz, sinusoidal
- Duty:** Continuous
- Load Rating:** 0.4 μ F
- Metering:** Voltmeter: -30 – 0 – +30kVac
Charging Current meter: 0 – 50 mA peak
- HV Cable Output:** Shielded EPR output cable - 20 ft. (6 m)
- Size & Weight:** 15" w x 11.5" d x 22" h, 75 lbs.
381 mm w x 292 mm d x 559 mm h, 34 kg



VLF-4022CM(F)

This model, with its 44 kVac peak output, is suitable for testing cables rated up to 25 kV. Its high load capacity enables it to test up to approximately 10 miles of cable, depending on type. This model includes a charging current and load capacitance meter, and a center zero peak kilovolt output meter.



Two-piece easy portability

- Input:** 120 volts, 60 Hz, 10 A peak, 5 A average
or 230 volts, 50/60 Hz, 6 A peak, 2.5 A average (F suffix)
- Output:** 0 – 44 kVac peak, 0.1/0.05/0.02 Hz sinusoidal
- Duty:** Continuous
- Load Rating:** 1.1 μ F @ 0.1 Hz, 2.2 μ F @ 0.05 Hz, & 5.5 μ F @ 0.02 Hz
- Metering:** Voltmeter: Center Zero -40 – 0 – +40 kVac peak
Charging Current meter: 0 – 100 mA peak
Load capacitance meter: 0 – 6 Microfarads
- Cable Lengths:** Shielded RG/8U output cable - 20 ft. (6 m)
Interconnect cable - 10 ft. (3 m)
- Size & Weight:** Controls: 22" w x 11.25" d x 15.25" h, 50 lbs.
559 mm w x 286 mm d x 387 mm h, 23 kg
HV Tank: 14.5" w x 10.5" d x 19" h, 72 lbs.
368 mm w x 267 mm d x 483 mm h, 33 kg



VLF-6022CM(F)

This model, with its 60 kVac peak output, is suitable for testing cables rated up to 35 kV. Its high load capacity enables it to test up to approximately 10 miles of cable, depending on type. This model includes an enhanced features package: a charging current and load capacitance meter, test dwell timer, and polarity indicating lights.



Two-piece easy portability

- Input:** 120 volts, 60 Hz, 15 A peak, 7.5 A average
or 230 volts, 50/60 Hz, 8 A peak, 4 A average (F suffix)
- Output:** 0-60 kVac peak @ 50Hz, 0.1 Hz - 0.02 Hz,
load rated to 5.5 μ F
0-62 kVac peak @ 60Hz
- Duty:** Continuous
- Load Rating:** 1.1 μ F @ 0.1 Hz, 2.2 μ F @ 0.05 Hz, & 5.5 μ F @ 0.02 Hz
- Metering:** Voltmeter: 0-60 kVac peak
Charging Current meter: 0 – 100 mA peak
Load capacitance meter: 0 – 6 Microfarads
Settable test duration timer
- Cable Lengths:** Shielded EPR output cable - 20 ft. (6 m)
Interconnect cable - 10 ft. (3 m)
- Size & Weight:** Controls: 26" w x 13" d x 16" h, 75 lbs.
660 mm w x 330 mm d x 406 mm h, 34 kg
HV Tank: 15" w x 10.25" d x 21.5" h, 120 lbs.
381 mm w x 260 mm d x 546 mm h, 54 kg



VLF-65CMF

The **VLF-65CMF** is a higher power model designed to test very long cables rated up to 35kV. It offers the complete controls package including Cable Burn mode. Its cable reels provide 100' (30m) of HV and ground cable.

Input:	230 V, 50/60 Hz, 30A peak, 25A average
Output:	0-65 kVac peak, 0.1/0.05/0.02/0.01 Hz sinusoidal
Duty:	Continuous
Load Rating:	2.2 μF @ 0.1 Hz, 4.4 μF @ 0.05 Hz 11 μF @ 0.02 Hz & 22 μF @ 0.01 Hz
Metering:	Voltmeter: 0-75 kVac peak Charging Current Meter: 0 – 200 mA peak Load capacitance meter: 0 – 6 microfarads User programmable test duration timer
Cable Lengths:	Shielded EPR output cable - 100 ft. (30m) Ground cable 100 ft. (30m)
Sizes & Weight:	Controls: 17" w x 11" d x 9.5" h, 20 lbs. 432mm w x 280mm d x 241mm h, 9 kg Regulator: 20" w x 14" d x 27" h, 160 lbs. 508mm w x 356mm d x 686mm h, 73 kg HV Tank: 15" w x 18" d x 22" h, 215 lbs. 381mm w x 457mm d x 559mm h, 98 kg Overall: 30" w x 60" d x 51" h, 704 lbs. 762mm w x 1524mm d x 1295mm h, 320 kg



VLF-90CMF

The **VLF-90CMF** offers 90kVac peak output voltage, suitable for testing cables rated 45 – 50kV. It is load rated for 0.55 μF @ 0.1Hz, capable of testing up to 2 miles of cable, five times that at 0.02Hz. Pictured with optional hand truck.

Input:	230 V, 50/60 Hz, 20A peak, 15A average
Output:	0-90 kVac peak, 0.1/0.05/0.02 Hz sinusoidal
Duty:	Continuous
Load:	.55 μF @ 0.1 Hz 1.1 μF @ 0.05 Hz 2.75 μF @ 0.02 Hz
Metering:	Voltmeter: 0-100 kVac peak Current Meter: 0 – 100 mA peak Load capacitance: 0 – 6 microfarads User programmable test duration timer
Cable Lengths:	Shielded EPR output cable – 20 ft. (6m) Interconnect cable - 10 ft. (3m)
Sizes & Weights:	Control: 26" w x 13" d x 16" h, 75 lbs. 660 mm w x 330 mm d x 406 mm h, 34 kg HV Tank: 15" w x 21" d x 29" h, 293 lbs.



VLF-12011CMF

The **VLF-12011CMF** provides a 120kVac peak output voltage, suitable for VLF hipot testing 69kV cable and as a voltage source for partial discharge and tan delta testing of 115kV cable. In addition to the standard controls described, this model also contains a Cable Burn mode. Cable reels provide 100' (30m) of HV and ground cable.

Input:	230 volts, 50/60 Hz, 30A peak, 25A average
Output:	0-120 kVac peak, 0.1/0.05/0.02/0.01 Hz sinusoidal
Duty:	Continuous
Load Rating:	.55 μF @ 0.1 Hz, 1.1 μF @ 0.05 Hz 2.75 μF @ 0.02 Hz, 5.5 μF @ 0.01 Hz
Metering:	Voltmeter: 0-120 kVac peak Charging Current Meter: 0 – 100 mA peak Load capacitance meter: 0 – 6 microfarads User programmable test duration timer
Cable Lengths:	Shielded EPR output cable 100 ft. (30m) Ground cable 100 ft. (30m)
Sizes & Weight:	Controls: 17" w x 11" d x 9.5" h, 20 lbs. 432mm w x 280mm d x 241mm h, 9 kg Regulator: 20" w x 14" d x 27" h, 160 lbs. 508mm w x 356mm d x 686mm h, 73 kg HV Tank: 26" w x 20" d x 22" h, 390 lbs. 660mm w x 508mm d x 559mm h, 177 kg Overall: 30" w x 60" d x 51" h, 853 lbs. 762mm w x 1524mm d x 1295mm h, 388 kg





VLF-200CMF

The **VLF-200CMF** provides a 200kVac peak output voltage, suitable for performing VLF hipot tests on 138kV cable and as a voltage source for tan delta and partial discharge testing on 230kV cable. The controls offer all the features of our other VLF models along with VLF Cable Burning. Trailer mount optional.

- Input:** 230V Single phase, 80A peak, 50/60Hz
- Output:** 0 – 200kVac peak, 100mA. Bushing output with no cable provided
- Load:** .75 μ F @ 0.1Hz, 1.5 μ F @ 0.05Hz, 3.75 μ F @ 0.02Hz
- Duty:** Continuous
- Metering:** Voltage: 0 – 200kVac peak 3.5" analog display
Current: 0 – 200mAac 3.5" analog display
- Controls:** HV On/Off, Motorized Voltage Control, Zero Start Interlock, External Interlock, Digital Dwell Timer, Capacitance Measuring Circuit, Cable Burn Mode, Fixed 120% Overload, Automatic Data Logger

- Size/Weight:** Controls: 24" w x 25.5" d x 71" h, 650lbs.
61cm h x 65cm w x 180cm h, 295kg
- HV Tank: 59" w x 37" d x 87" h, 3700lbs
155cm w x 93cm d x 220cm h, 1678kg



Contact HVI about trailer mounting options



VLF Fault Locator Combination

VT33(F)

The **VT33** is the worlds only combination VLF hipot and cable fault locator, or thumper. It is the complete tool for AC testing and fault locating cables rated up to 25kV. It offers a 33kVac peak VLF output, VLF Cable Burn mode, and a 760 joule discharge output. It is fully TDR/radar ready.

- Input:** VT33: 120V, 60 Hz, 10A
VT33F: 230V, 50/60 Hz, 5A
- VLF Hipot Output:** 0 – 33 kVac peak @ 0.1 Hz
- Load Capability:** 1 μ F or more than 1 mile (1.6 km) of 15kV & 25 kV cable
- Discharge Output:** 0 – 13 kVdc @ 760 joules
- Discharge Rate:** Every 8 seconds
- VLF Burner:** Arcs cable every few seconds
- TDR Interface:** Arc Reflection & Current Impulse
- Size & Weight:** 28" w x 26" d x 44" h, 245 lbs.
711mm w x 660mm d x 1118mm h, 111kg
- Cable Outputs:** 50' (15m) shielded HV cable & ground

Simple to use,
manual controls.
No programming
necessary.



VLF-6022CM
Front Panel

Selecting a VLF Model

There are three main considerations when selecting the appropriate model : voltage, uF rating, uF rating at 0.1Hz.

Voltage: What is the voltage rating of the cables to be tested? Below is a summary of the IEEE test voltages recommended. While IEEE400.2 does not include HV cable, field experience shows the test voltage used is ~ 2 times normal line-to-ground.

Cable Rating	Installation	Acceptance	Maintenance
phase to phase	phase to ground	phase to ground	phase to ground
kVrms	kVrms (kVpk)	kVrms (kVpk)	kVrms (kVpk)
5	9 (12)	10 (14)	7 (10)
8	11 (16)	13 (18)	10 (14)
15	18 (25)	20 (28)	16 (22)
25	27 (38)	31 (44)	23 (33)
35	39 (55)	44 (62)	33 (47)

uF Rating: VLF hipots are rated by the capacitance of the loads they can test. A cable or generator is a high capacitance load, hence the need for lower frequencies to perform an AC field test. To select the appropriate VLF model, either the load capacitance must be known or the cable length if the $\mu\text{F}/\text{ft}$ or $\mu\text{F}/\text{m}$ is known.

The length of solid dielectric cable that can be tested depends on the voltage rating and size, with higher voltage ratings and smaller cable diameters lower in capacitance. The below numbers are for when using the 0.1Hz output frequency. **At 0.05 Hz, twice the length shown can be tested. At 0.02Hz, five times the length shown can be tested.**

Model	Cable Rating	Cable Test Length @ 0.1 Hz
VLF-28CM	15kV	.4 – 1 mile or .64 – 1.6 km
VLF-4022CM	15kV	1 – 2 miles or 1.6 – 3.2 km
	25kV	1.5 – 3 miles or 2.4 – 4.8 km
VLF-6022CM	35kV	2 – 4.2 miles or 3.2 – 6.8 km
VLF-12011CMF	69kV	1.5 – 2 miles or 2.4 – 3.2 km
VLF-200CMF	138kV	2 – 3.5 miles or 3.2 – 5.6 km

uF Rating at 0.1Hz: If the VLF is to be used as a voltage source for performing Tan Delta and Partial Discharge testing, then the load rating at 0.1Hz is important, as this is the frequency that these tests are performed. If the VLF is to be used for hipoting, then any frequency from 0.1Hz - 0.01Hz can be used.

VLF Cable Burning

The VLF-50CMF, VLF-65CMF, VLF-12011CMF, & the VLF-200CMF models are equipped with a Cable Burn mode. A VLF burner is one of the most effective methods of reducing a cable fault's impedance, or arc-over voltage, in order to permit the use of lower voltage and energy rated fault locators – thumpers. For instance, the VLF-12011CM can be used to burn down faults on 138kV cable to lower the arc-over voltage to where the HVI CDS-3632U thumper can easily fault locate, with its 9/18/36 kV @ 3200 joules discharge rating.

The VLF hipot applies its voltage to the faulted cable. The voltage output raises to the arc-over level and the cable arcs. The current of the VLF and the stored energy in the cable discharges into the fault. This process continues, but now in the opposite polarity, as the sine wave output of the VLF continues. This arcing of the cable fault repeatedly in opposite polarities rapidly reduces the fault voltage.

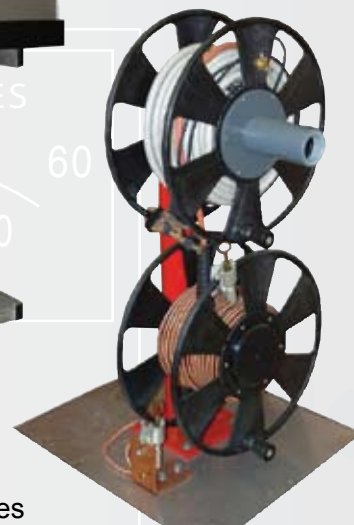
Accessories

The ADL-1 data logger is designed to monitor, record, and wirelessly download all test data from an HVI Very Low Frequency tester to a computer. Users of HVI VLF products now have the best of both worlds: economical and simple to operate VLF testers along with full test data collection. Use a laptop on-site to watch and record the test or store all results in the ADL-1 for later downloading. Windows compatible only.

Current HVI VLF units can be modified to use the ADL-1. One interface cable connects the data logger to the VLF. The ADL-1 comes equipped with 802.11g wireless communications, which is backwards compatible with 802.11a & b, and an Ethernet connection. Internal memory can record approximately 40 hours of testing.



Hand Truck for VLF-4022CM(F), VLF-6022CM(F), & VLF-90CMF

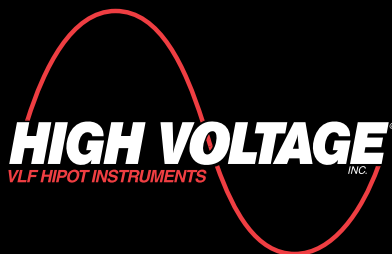


Cable Reels 100' HV & Ground Cables

Fault Locators - Surge Generators - Thumpers

HVI offers several of the top Thumpers available, all with three variable output voltages, three full energy discharge voltages, the highest burn currents, and full TDR/radar compatibility. HVI offers the complete package – don't buy less.

FEATURES	CDS-2010U	CDS-3616U	CDS-3632U
Output Voltages	0 – 5/10/20 kV	0 – 9/18/36 kV	0 – 9/18/36 kV
Joules	1000 @ 5/10/20 kV	1600 @ 9/18/36 kV	3200 @ 9/18/36 kV
Constant Energy	Yes. On all taps	Yes. On all taps	Yes. On all taps
Variable Hipot	Yes. On all taps	Yes. On all taps	Yes. On all taps
Hipot/Burn Rating	400 mA	280 mA	280 mA
Discharge Rate	6 – 10 seconds	6 – 10 seconds	6 – 10 seconds
TDR/Radar Ready	Yes. Use any TDR	Yes. Use any TDR	Yes. Use any TDR



HIGH VOLTAGE, INC.

31 County Route 7A • Copake, NY 12516 • (518) 329-3275 • Fax: (518) 329-3271

E-Mail: sales@hvinc.com • Web: www.hvinc.com

www.hvinc.com