



# HVZI<sup>®</sup>

**HIGH VOLTAGE, INC.**  
PRODUCT CATALOG





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For further information and to see our complete product line,  
please visit [www.hvinc.com](http://www.hvinc.com)

# HISTORY OF HVI

**HIGH VOLTAGE, INC.** designs and manufactures high voltage test equipment for testing utility substation apparatus, aerial lifts, MV & HV power cable, and cable fault locating products. While HVI is the leader in producing portable field test equipment, we also offer a line of higher power AC and DC high voltage test sets for the industrial market. We are a worldwide company with representatives in over 100 countries and more than half of our sales are foreign.

High Voltage, Inc. was started in 1997 by Stanley G. Peschel, who also founded Hipotronics in 1962 and later sold to Hubbell in 1992. Prior to Hipotronics, Stan worked for his father's high voltage equipment company, Peschel Instruments, starting in the late '50s. Stan was perhaps the leading high voltage design engineer in the world and pioneered much of the HV test equipment and methods now used, including AC Series Resonant technology. He held nearly 20 patents and built Hipotronics into the world's leading HV test equipment producer, prior to its sale. Stan passed away in 2002. Steve and Mike Peschel, President and Chairman respectively, continue this tradition as the third generation of Peschels in the high voltage business, joined by Jim Grayson, VP Operations, and Jonathan Warren in Engineering, all part of the founding group.

HVI was started with a lofty goal: to design and produce the best high voltage test equipment in the world. Starting with decades of design and manufacturing knowledge and experience, ample money for funding research, and years of development time, Stan and his team of engineers and manufacturing people succeeded in producing the next generation of high voltage test equipment. Nearly all of the products produced by HVI are superior to any similar products found elsewhere; the reason why HVI is the leading supplier of high voltage utility field test equipment worldwide, with more than half our business occurring outside the U.S. HVI now produces approximately 1300 instruments a year for the worldwide utility and industrial industry.

One of our greatest design accomplishments was the Very Low Frequency (VLF) technology developed and patented by HVI. HVI produces the top line of VLF AC Hipots, with models ranging from 28kV – 200kV and models designed for short run 15kV cable testing to 138kV cable and a voltage source for Tan Delta and Partial Discharge testing cables rated up to 230kV. HVI is the VLF company in this country and around the world, with over 2000 units already delivered to nearly 100 countries.

We at HVI are committed to delivering the best test equipment possible and just as important, the absolute best after sales and customer service support in the industry. There is no better alternative than High Voltage, Inc.



# VLF AC Technology

Delivering Seamless  
Cable Testing Efficiency

## VLF Series

- ⚡ VLF-30CM
- ⚡ VLF-30CMF
- ⚡ VLF-4022CM
- ⚡ VLF-4022CMF
- ⚡ VLF-50CMF
- ⚡ VLF-6022CM
- ⚡ VLF-6022CMF
- ⚡ VLF-65CMF
- ⚡ VLF-90CMF
- ⚡ VLF-12011CMF
- ⚡ VLF-200CMF

## VLF E Series

- ⚡ VLF-34E
- ⚡ VLF-65E
- ⚡ E-Link Software

## Cable Diagnostic Tools

- ⚡ Tan Delta
- ⚡ Partial Discharge
- ⚡ TD-34E
- ⚡ TD-65E
- ⚡ OCK-30

### Options Available

- Safety ground sticks (Included with all VLF Hipot Test Sets)
- Hand Safety Interlock Switch
- Foot Safety Interlock Switch
- Hand Cart (VLF-4022CM, VLF-6022CM, VLF-90CMF)
- Reusable Shipping Case

## HVI – The World’s VLF Source Made in the US

- 90 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
- Latest solid state, computer controlled wireless designs offered

HVI offers more models and higher voltage models than any other vendor in the world. Models range from 30 kVac – 200 kVac peak, offering from 0.4  $\mu$ F to 50  $\mu$ F of load capability. Load ratings shown are at the lowest frequency.

### Original Patented Transformer Based Design

<b>VLf-30CM</b>	0-30 kVac, 0.1 Hz, load rated to 0.4 $\mu$ F
<b>VLf-4022CM</b>	0-44 kVac, 0.1 Hz - 0.02 Hz, load rated to 5.5 $\mu$ F
<b>VLf-50CM</b>	0-50 kVac, 0.1 Hz - 0.01 Hz, load rated to 50 $\mu$ F
<b>VLf-6022CM</b>	0-62 kVac, 0.1 Hz - 0.02 Hz, load rated to 5.5 $\mu$ F
<b>VLf-65CMF</b>	0-65 kVac, 0.1 Hz - 0.01 Hz, load rated to 22 $\mu$ F
<b>VLf-90CMF</b>	0-90 kVac, 0.1 Hz - 0.02 Hz, load rated to 2.75 $\mu$ F
<b>VLf-1201CMF</b>	0-120 kVac, 0.1 Hz - 0.01 Hz, load rated to 5.5 $\mu$ F
<b>VLf-200CMF</b>	0-200 kVac, 0.1 Hz - 0.02 Hz, load rated to 3.75 $\mu$ F
<b>VT33</b>	VLF: 0-33kVac, 1.0 uF @ 0.1 Hz

### Solid State Computer Controlled Models

<b>VLf-34E</b>	0-34 kVac, 0.1 Hz - 0.01 Hz, load rated to 5.0 $\mu$ F
<b>VLf-65E</b>	0-65 kVac, 0.1 Hz - 0.01 Hz load rated to 10.0 $\mu$ F

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

## AC testing of Cables, Motors & Generators 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 highly capacitive loads, particularly cables and rotating machinery. High Voltage, Inc. offers a full line of VLF AC Hipots from 30 kVac to 200 kVac with models that can test up to 50  $\mu$ F of load, cables over 50 miles in length and the largest of generators or motors. Use VLF for **AC Withstand** stress tests and/or as a voltage source for **Tan Delta** and **Partial Discharge Diagnostic Testing**.

HVI offers both its original, patented long proven oil filled power supply models with analog controls and its all new solid state, computer and micro-controlled wireless design. Both have diagnostic accessories available.

**SINCE 1998**, HVI has produced the most economical, 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. **The HVI design has a proven record with well over 2000 units in service worldwide.**

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. HVI now also offers the latest in solid state design VLF units that offer many benefits, like automatic programmable control and wireless communications.

All HVI VLF designs produce a sine wave output that meets the requirements of world standards, permitting it to be used as a voltage source for Tan Delta and Partial Discharge diagnostic testing.

A sine wave producing VLF is required to perform these tests. Keep all options open by choosing a sine wave design, like the HVI VLF.

## Why Buy HVI VLF Products?

- HVI Design - Portable, Affordable, Rugged, Reliable, & Long Proven
- HVI Support & Service – Best Customer Support, Ship from Stock, Instant Factory Help, Quick Service Turn Around, Repair & Cal. Locations Worldwide, Reps in over 90 countries

## 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 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, VLF instruments can be used as the voltage source for performing off-line Partial Discharge and Tan Delta cable diagnostic testing, both from HVI.

## 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 0.1 Hz, it requires 600 times less power to test a cable than at 60 Hz. 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 60 Hz 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 cables ability to withstand several times normal AC voltage. IEEE 400, 400.2, & 433, VDE 0276, CENELEC HD 620/621, SANA 10198, NEN 3620 and IEC 60502-2 standards all define VLF 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 433-2009 standard.

### **Partial Discharge & Tan Delta VLF Cable Diagnostic Testing**

The VLF hipot alone 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 and generator testing better than any other. Contact HVI for additional information on other cable testing methods and products available.

For more information on VLF testing, visit [www.hvinc.com](http://www.hvinc.com)

### **Benefits of HVI VLF AC Hipots**

- Portable and affordable
- All models feature a true sinewave output
- Waveform is independent of load capacitance between 0.01  $\mu$ 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
- BNC scope output for waveform viewing
- Rugged and reliable design less prone to failure from transients

### **Two Design Choices**

Patented original, electro-mechanical, transformer designs and the latest solid state computer controlled designs available from HVI.

# VLF AC WITHSTAND TESTING OF CABLES

## VOLTAGE LEVELS & TIME DURATIONS OF TEST

### Testing Methodology

When VLF Withstand testing cable, the proper test voltage and time duration are critical for the success of the test. A defect that is big enough to be excited by the applied voltage will grow to failure during the test. Lesser defects are not affected. They remain dormant and are not aggravated by the test voltage. The information and data that follows is taken directly from the IEEE 400.2-2013 Standard.

### IEEE Std. 400.2-2013

IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF) (less than 1 Hz)

**Table 3 - VLF withstand test voltages for sinusoidal and cosine-rectangular waveforms (see note 1)**

WAVEFORM	Cable system rating (phase to phase) [kV]	Installation (phase to ground)		Acceptance (phase to ground)		Maintenance <sup>2</sup> (phase to ground) (see Note 2)	
		[kV RMS]	[kV PEAK]	[kV RMS]	[kV PEAK]	[kV RMS]	[kV PEAK]
Sinusoidal	5	9	13	10	14	7	10
	8	11	16	13	18	10	14
	15	19	27	21	30	16	22
	20	24 (Note 3)	34 (Note 3)	26	37	20	28
	25	29 (Note 3)	41 (Note 3)	32	45	24 (Note 3)	34 (Note 3)
	28	32	45	36 (Note 3)	51 (Note 3)	27	38
	30	34	48	38	54	29 (Note 3)	41
	35	39	55	44	62	33	47
	46	51	72	57	81	43	61
	69	75	106	84	119	63	89

VLF ac voltage testing methods utilize ac signals at frequencies in the range of 0.01 Hz to 1 Hz. The most commonly used, commercially available VLF ac voltage test frequency is 0.1 Hz. VLF ac test voltages with cosine-rectangular and the sinusoidal wave shapes are most commonly used. While other wave shapes are available for testing of cable systems, recommended test voltage levels have not been established.

- NOTE 1** If the operating voltage is a voltage class lower than the rated voltage of the cable, it is recommended that the maintenance test voltages should be those corresponding to the operating voltage class.
- NOTE 2** The maintenance voltage is about 75% of the acceptance test voltage magnitude.
- NOTE 3** Some existing test sets have a maximum voltage that is up to 5% below the values listed in the table. These test sets are acceptable to be used. However, there is a risk that the cable may be “undertested” due to a combination of lower test voltage and allowed uncertainty of the measuring circuit.

## 5.1 General VLF ac Withstand Voltage Testing

### 5.1.1 VLF ac withstand voltage test parameters

The purpose of a withstand test is to verify the integrity of the cable under test. If the test cable has a defect severe enough at the withstand test voltage, an electrical tree will initiate and grow in the insulation. Inception of an electrical tree and channel growth time are functions of several factors including test voltage, source frequency and amplitude, and the geometry of the defect. For an

electrical tree from the tip of a needle in PE insulation in laboratory conditions to completely penetrate the insulation during the test duration, VLF ac voltage test levels and testing time durations have been established for the two most commonly used test voltage sources, the cosine-rectangular and the sinusoidal wave shapes. However, the time to failure will vary according to the type of insulation such as PE, paper, and rubber. Thus the electrical tree growth rate is not the same for all materials and defects.

The voltage levels (installation and acceptance) are based on the most used, worldwide practices of from less than 2 U<sub>0</sub> to 3U<sub>0</sub>, where U<sub>0</sub> is the rated rms phase to ground voltage, for cables rated between 5 kV and 69 kV. The maintenance test level is about 75% of the acceptance test level.

One can reduce the test voltage by another 20% if the voltage is applied for longer times (Bach [B2]; Baur, Mohaupt, and Schlick, [B6]; Krefter [B27]). Evidence (Hernandez-Mejía, et al. [B21]) indicates that increasing the voltage above 3U<sub>0</sub> to compensate for reduced test cycles (time) does not replicate performance either on test or in service as compared to the lower voltage, longer time tests.

Table 3 lists voltage levels for VLF withstand testing of shielded power cable systems using cosine-rectangular and sinusoidal waveforms (Bach [B2]; Eager, et al. [B9]; Krefter [B27]; Moh [B28]). For a sinusoidal waveform the rms is 0.707 of the peak value, assuming the harmonic distortion is less than 5%. The rms and peak values of the cosine-rectangular waveform are assumed to be equal.

It should be noted that terminations may need to be added to avoid flashover for installation tests on cables rated above 35 kV.

### Regarding the test times:

- The recommended minimum testing time for a simple withstand test on aged cable circuits is 30 min at 0.1 Hz (Goodwin, Oetjen, and Peschel [B13]). If a circuit is considered as important, e.g., feeder circuits, then consideration should be given to extending the testing time to 60 min at 0.1 Hz (Hampton, et al. [B19]).
- The recommended minimum testing time for an installation and/or acceptance withstand test on new cable circuits is 60 min at 0.1 Hz.
- A test time within the range 15–30 min may be considered if the monitored characteristic remains stable for at least 15 min and no failure occurs. It should be noted that the recommended test time for a withstand test is 30 min.

**Summary:** The intent of VLF Withstand Testing is to apply a sufficient test voltage for a long enough time to permit any defect big enough to be excited by the voltage applied to fail within the test duration. If a cable can't withstand the test voltage, let it fail and make the repair or replacement. If the cable passes, there is a high assurance that the cable should not fail in service for many years.

**Diagnostic Testing:** If a pass/fail AC Withstand test is not desired, there are several Diagnostic Tests available. Using the VLF as the voltage source, Tangent Delta ( $\delta$ ) measurements and Partial Discharge detection can be performed with accessories available from HVI.

## Model VLF-30CM / VLF-30CMF **Best for testing 5 kV - 15 kV cables**

Our smallest VLF model, the **VLF-30CM / VLF-30CMF** 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  $\mu\text{F}$  of load, about 4000 feet (1200 m) of a typical 15 kV class cable. Small, light, inexpensive, and easy to use. Now there's no reason not to use VLF.

CE



<b>Input:</b>	(VLF-30CM) 120 volts, 60 Hz, 5 A, 2.5 A average (VLF-30CMF) 230 volts, 50/60 Hz, 3 A, 2 A average
<b>Output:</b>	0 – 30 kVac peak, 0.1 Hz, sinusoidal
<b>Duty:</b>	Continuous
<b>Load Rating:</b>	0.4 $\mu\text{F}$
<b>Metering:</b>	Voltmeter: -30 kVac – 0 – +30 kVac Charging Current meter: 0 – 50 mA peak
<b>Output Termination:</b>	Shielded EPR output cable - 20 ft. (6 m)
<b>Size &amp; Weight:</b>	15" w x 11.5" d x 22" h, 82 lbs. (88 lbs. - F version) 381 mm w x 292 mm d x 559 mm h, 39 kg (42 kg - F version)

## Model VLF-4022CM / VLF-4022CMF **Two piece portability for field testing 25 kV & 30 kV cables**

The High Voltage, Inc. **VLF-4022CM** with its 44 kVac peak output, is suitable for all testing of 25 kV cable and maintenance testing on 30 kV cable. Its high load capacity enables it to test up to approximately 10 miles of cable (at .02 Hz), 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.

CE



<b>Input:</b>	(VLF-4022CM) 120 volts, 60 Hz, 10 A, 5 A average (VLF-4022CMF) 230 volts, 50/60 Hz, 6 A peak, 2.5 A average
<b>Output:</b>	0 – 44 kVac peak, 0.1/0.05/0.02 Hz sinusoidal
<b>Duty:</b>	Continuous
<b>Load Rating:</b>	1.1 $\mu\text{F}$ @ 0.1 Hz, 2.2 $\mu\text{F}$ @ 0.05 Hz, & 5.5 $\mu\text{F}$ @ 0.02 Hz
<b>Metering:</b>	Voltmeter: Center Zero -45 – 0 – +45 kVac peak Charging Current meter: 0 – 100 mA peak Load capacitance meter: 0 – 6 Microfarads
<b>Output Termination:</b>	Shielded RG/8U output cable - 20 ft. (6 m)
<b>Size &amp; Weight:</b>	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

All HVI VLF models are labeled and metered for peak voltage, not rms. When testing, use the peak voltage values given in your specification.

## Model VLF-50CMF Highest $\mu\text{F}$ rating available: 5 $\mu\text{F}$ - 50 $\mu\text{F}$ @ 0.1 Hz - 0.01 Hz

The **VLF-50CMF** is the highest power VLF unit we offer. It is rated for 5  $\mu\text{F}$  at 0.1 Hz and can increase its output to 50  $\mu\text{F}$  at 0.01 Hz, capable of testing up to 50 miles of 15 kV and 25 kV cable. It is ideal for long cable spans like feeders, submarine cables, wind and solar farms. It comes as pictured, including cable reels with 100' of high voltage and ground cable.



<b>Input:</b>	230V +/-10%, 50/60 Hz, single phase, 30 A peak, 25 A avg.								
<b>Output:</b>	Sinusoidal 0 – 50 kVac peak, 0.1, .05, .02 and .01 Hz frequency								
<b>Duty:</b>	Continuous								
<b>Load Rating:</b>	5.0 $\mu\text{F}$ @ .1 Hz, 10.0 $\mu\text{F}$ @ .05 Hz, 25.0 $\mu\text{F}$ @ .02 Hz, 50.0 $\mu\text{F}$ @.01 Hz								
<b>Metering:</b>	Kilovoltmeter: 3.5 in., 0 – 60 kVac peak 2% FS Accuracy Current Load: 3.5 in., 0 – 200 mAac peak 5% FS Accurac Load capacitance meter: 0 – 6 $\mu\text{F}$ with x1 & x10 ranges User programmable test duration timer								
<b>Sizes:</b>	<table> <tr> <td>Controls:</td> <td>17" w x 11" d x 9.5" h, 20 lbs. 432 mm w x 280 mm d x 241 mm h, 9 kg</td> </tr> <tr> <td>Power Section:</td> <td>20" w x 14" d x 27" h, 160 lbs. 508 mm w x 356 mm d x 686 mm h, 73 kg</td> </tr> <tr> <td>HV Tank size:</td> <td>13.5" w x 19" d x 23" h, 310 lbs. 343 mm w x 483 mm d x 584 mm h, 141 kg</td> </tr> <tr> <td>Complete Trolley:</td> <td>28" w x 60" d x 51" h, 775lbs 711 mm w x 1524 mm d x 1295 mm h, 352 kg</td> </tr> </table>	Controls:	17" w x 11" d x 9.5" h, 20 lbs. 432 mm w x 280 mm d x 241 mm h, 9 kg	Power Section:	20" w x 14" d x 27" h, 160 lbs. 508 mm w x 356 mm d x 686 mm h, 73 kg	HV Tank size:	13.5" w x 19" d x 23" h, 310 lbs. 343 mm w x 483 mm d x 584 mm h, 141 kg	Complete Trolley:	28" w x 60" d x 51" h, 775lbs 711 mm w x 1524 mm d x 1295 mm h, 352 kg
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<b>Output Termination:</b>	Shielded X-Ray/Ground on reels - 100 ft. (30 m)								

## Model VLF-6022CM / VLF-6022CMF Two piece portability for testing up to 35 kV cable systems - Wind Farms

The High Voltage, Inc. VLF-6022CM with its 62 kVac peak output, is suitable for all testing of 35 kV cable per IEEE 400.2-2013. Its high load capacity enables it to test up to approximately 15 miles of cable (at .02 Hz), depending on type. This model includes an enhanced features package: a charging current and load capacitance meter, test dwell timer, and polarity indicating lights.



<b>Input:</b>	(VLF-6022CM) 120 volts, 60 Hz, 15 A, 7.5 A average (VLF-6022CMF) 230 volts, 50/60 Hz, 8 A, 4 A average				
<b>Output:</b>	0-62 kVac peak, 0.1 Hz - 0.02 Hz				
<b>Duty:</b>	Continuous				
<b>Load Rating:</b>	1.1 $\mu\text{F}$ @ 0.1 Hz, 2.2 $\mu\text{F}$ @ 0.05 Hz, & 5.5 $\mu\text{F}$ @ 0.02 Hz				
<b>Metering:</b>	Voltmeter: 0 – 65 kVac peak Charging Current meter: 0 – 100 mA peak Load capacitance meter: 0 – 6 Microfarads Settable test duration timer				
<b>Output Termination:</b>	Shielded EPR output cable - 20 ft. (6 m)				
<b>Size &amp; Weight:</b>	<table> <tr> <td>Controls:</td> <td>26" w x 13" d x 16" h, 75 lbs. 660 mm w x 330 mm d x 406 mm h, 34 kg</td> </tr> <tr> <td>HV Tank:</td> <td>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</td> </tr> </table>	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
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## Model VLF-65CMF Ideal for long 35 kV cable runs at Wind Farms

The High Voltage, Inc. **VLF-65CMF** is a higher power design for withstand testing of 35kV cable systems per IEEE 400.2-2013. With output frequency options of 0.1Hz, 0.05Hz, 0.02Hz, and 0.01Hz the VLF-65CMF can test approximately 40 miles of cable making it the right choice for long cable spans such as feeders, submarine cables, and windfarm applications. It offers the complete controls package including Cable Burn mode. Its cable reels provide 100' (30m) of HV and ground cable. Remove wheels for van mounting.



<b>Input:</b>	230 V, 50/60 Hz, 30A peak, 25A average										
<b>Output:</b>	0 – 65 kVac peak, 0.1/0.05/0.02/0.01 Hz sinusoidal										
<b>Duty:</b>	Continuous										
<b>Load Rating:</b>	2.2 $\mu$ F @ 0.1 Hz, 4.4 $\mu$ F @ 0.05 Hz 11 $\mu$ F @ 0.02 Hz & 22 $\mu$ F @ 0.01 Hz										
<b>Metering:</b>	Voltmeter: 0-75 kVac peak Charging Current Meter: 0 – 200 mA peak Load capacitance meter: 0 – 6 microfarads User programmable test duration timer										
<b>Output Termination:</b>	Shielded X-Ray/Ground on reels - 100 ft. (30 m)										
<b>Size &amp; Weight:</b>	<table> <tr> <td>Controls:</td> <td>17" w x 11" d x 9.5" h, 20 lbs. 432 mm w x 280 mm d x 241 mm h, 9 kg</td> </tr> <tr> <td>Regulator:</td> <td>20" w x 14" d x 27" h, 160 lbs. 508 mm w x 356 mm d x 686 mm h, 73 kg</td> </tr> <tr> <td>HV Tank:</td> <td>15" w x 18" d x 22" h, 215 lbs. 381 mm w x 457 mm d x 559 mm h, 98 kg</td> </tr> <tr> <td>Overall:</td> <td>30" w x 60" d x 51" h, 704 lbs.</td> </tr> <tr> <td>On skid:</td> <td>762 mm w x 1524 mm d x 1295 mm h, 320 kg</td> </tr> </table>	Controls:	17" w x 11" d x 9.5" h, 20 lbs. 432 mm w x 280 mm d x 241 mm h, 9 kg	Regulator:	20" w x 14" d x 27" h, 160 lbs. 508 mm w x 356 mm d x 686 mm h, 73 kg	HV Tank:	15" w x 18" d x 22" h, 215 lbs. 381 mm w x 457 mm d x 559 mm h, 98 kg	Overall:	30" w x 60" d x 51" h, 704 lbs.	On skid:	762 mm w x 1524 mm d x 1295 mm h, 320 kg
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On skid:	762 mm w x 1524 mm d x 1295 mm h, 320 kg										

## Model VLF-90CMF 90 kVac voltage output yet still portable

The **VLF-90CMF** offers 90kVac peak output voltage, suitable for testing cables rated 45 – 69kV. With output frequency options of 0.1Hz, 0.05Hz, and 0.02Hz the VLF-90CMF can test cables up to 25,000 feet long. Pictured with optional hand truck. Only portable unit at 90 kV



<b>Input:</b>	230 V, 50/60 Hz, 20A peak, 15A average				
<b>Output:</b>	0 - 90 kVac peak, 0.1/0.05/0.02 Hz sinusoidal				
<b>Duty:</b>	Continuous				
<b>Load Rating:</b>	.55 $\mu$ F @ 0.1 Hz, 1.1 $\mu$ F @ 0.05 Hz, 2.75 $\mu$ F @ 0.02 Hz				
<b>Metering:</b>	Voltmeter: 0 – 100 kVac peak Current Meter: 0 – 100 mA peak Load capacitance: 0 – 6 microfarads User programmable test duration timer				
<b>Output Termination:</b>	Shielded EPR output cable – 20 ft. (6m)				
<b>Size &amp; Weight:</b>	<table> <tr> <td>Controls:</td> <td>26" w x 13" d x 16" h, 75 lbs. 660 mm w x 330 mm d x 406 mm h, 34 kg</td> </tr> <tr> <td>HV Tank:</td> <td>15" w x 21" d x 29" h, 293 lbs. 381 mm w x 533 mm d x 737 mm h, 133 kg</td> </tr> </table>	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 21" d x 29" h, 293 lbs. 381 mm w x 533 mm d x 737 mm h, 133 kg
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 21" d x 29" h, 293 lbs. 381 mm w x 533 mm d x 737 mm h, 133 kg				

## Model VLF-12011CMF

## Two piece portability for testing up to 35 kV cable systems - Wind Farms

The High Voltage, Inc. **VLF-12011CMF** was designed for withstand testing of 69kV cable systems per IEEE 400.2-2013 and insulation testing of large rotating machines per IEEE 433-2009. With output frequency options of 0.1Hz, 0.05Hz, 0.02Hz, and 0.01Hz the VLF-12011CMF can test cables up to 50,000 feet long. When coupled with optional equipment the VLF-12011CMF is the voltage source for diagnostic tests such as Tan Delta and Partial Discharge for 115kV class cables. Mounted to a pushcart with caster that acts as a truck mounting block or skid. Also available as separate components.



**Input:** 230 volts, 50/60 Hz, 30 A peak, 25 A average

**Output:** 0 – 120 kVac peak, 0.1/0.05/0.02/0.01 Hz sinusoidal

**Duty:** Continuous

**Load Rating:** .55  $\mu$ F @ 0.1 Hz, 1.1  $\mu$ F @ 0.05 Hz  
2.75  $\mu$ F @ 0.02 Hz, 5.5  $\mu$ F @ 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

**Output Termination:** Shielded X-Ray/Ground on reels - 100 ft. (30 m)

**Size & Weight:**

Controls:	17" w x 11" d x 9.5" h, 20 lbs. 432 mm w x 280 mm d x 241 mm h, 9 kg
Regulator:	20" w x 14" d x 27" h, 160 lbs. 508 mm w x 356 mm d x 686 mm h, 73 kg
HV Tank:	26" w x 20" d x 22" h, 390 lbs. 660 mm w x 508 mm d x 559 mm h, 177 kg
Overall:	30" w x 60" d x 51" h, 853 lbs. 762 mm w x 1524 mm d x 1295 mm h, 388 kg

## Model VLF-200CMF VLF Cable Testing for Transmission Cables

The High Voltage, Inc. **VLF-200CMF** was designed for withstand and diagnostic testing of cable systems up to 150kV. Smaller and more affordable than a power frequency AC resonant test set, the VLF-200CMF is capable of testing approximately 60,000 feet (18km) of cable and can be used with optional Tan Delta or Partial Discharge equipment. HVI introduced Sinewave output VLF technology in 1997 and the VLF-200CMF has been manufactured since 2004. The multi-piece design allows many transportation configurations, cargo trailer, flatbed, custom designs. HVI also offers the VLF-200CMF for rent installed in our custom roll top pod. Contact HVI for more information.



- Input:** 230V, 80A peak, 50/60 Hz (Single phase)
- Output:** Sinusoidal 0-200kVac peak, 100mA Bushing Output
- Load Rating:** .75  $\mu$ F @ 0.1 Hz, up to 3.75  $\mu$ F @ 0.02 Hz
- Duty:** Continuous
- Metering and Control:**
  - Voltmeter: 0-200kVac peak, Analog (3.5 in. display)
  - Current meter: 0-200 mA ac, Analog (3.5 in. display)
  - Capacitance meter: 0-6microfarads
  - On/Off Controls with zero start interlock
  - Fixed Primary overload, 120% of primary rating
  - Three Fixed Operating Frequencies: 0.1/.05/.02 Hz
  - Burn/Hipot Operation Mode Switch
  - Digital Dwell Timer
  - Automatic return to zero
  - External interlock
- Output Termination:** High Voltage Bushing Output
- Sizes:**
  - Control: 24"w x 30"d x 62"h (610mm x 762mm x 1575mm)
  - HV Tank: 60"w x 37"d x 87"h (1514mm x 958mm x 2210mm)
- Weights:**
  - Control: Approx. 750 lbs. (341 kg)
  - HV Tank: Approx. 3300 lbs. (1497kg)

Tan Delta & Partial Discharge Test							Max. k factor tested with 200 kV peak
URMS (kV)	UO RMS (kV)	UO PEAK (kV)	1/2-UO PEAK (kV)	1-UO PEAK (kV)	1.5-UO PEAK (kV)		
69	40	56.5	28.2	56.5	84.7	<b>3.5</b>	
110	64	90.5	45.2	90.5	135.7	<b>2.2</b>	
132	76	107.5	53.7	107.5	161.22	<b>1.8</b>	
150	87	123	61.5	123	184.5	<b>1.6</b>	



## Model VLF-34E 34 kV VLF Tester

The **VLF-34E** Test Set is from the newest generation of VLF AC Hipots from HVI that use a dry-type, air cooled, solid state design with microprocessor control. Its test programming, numerous output functions, wireless communications, and data retrieval are intuitive and easy to learn, as well as its E-Link PC software. It is portable, affordable, and built for the rigors of field use, like all HVI products. Its 0 - 34 kVac peak output voltage meets world standards for Acceptance testing up to 15 kV class cable. Its sine wave output is suitable for using optional Tan Delta and Partial Discharge measurement systems, like the HVI TD-34E Tan Delta System and is everything you need for fully testing cables rated up to 25 kV.



<b>Input Voltage:</b>	90 Vac – 265 Vac, 50 Hz/60 Hz, 5A max.
<b>HV Output:</b>	0-34 kVac peak/0-24 kVac rms - Sinusoidal DC: +/- 34 kV Square wave: 34 kV Sheath Tester
<b>Duty:</b>	Continuous
<b>Frequency:</b>	0.1 Hz to 0.01 Hz
<b>Load Rating:</b>	0.5 $\mu$ F @ 0.1 Hz @ 34 kV 1.0 $\mu$ F @ 0.05 Hz @ 34 kV 5.0 $\mu$ F @ 0.01 Hz @ 34 kV $\mu$ F rating increases at lower voltages Ex: 0.77 $\mu$ F @ 0.1 Hz @ 22 kV peak
<b>Metering:</b>	Voltage kV peak or RMS Current mA peak or RMS
<b>Calculated:</b>	Capacitance, Resistance, Flashover voltage, Time to Failure
<b>Size/Weight:</b>	19.7" x 12.0" x 18", 45 lbs. 500mm x 305mm 458mm, 21 kg.
<b>Case:</b>	Hard "Pelican" type case with extendable handle and wheels
<b>Output Termination:</b>	Shielded EPR output cable - 20 ft. (6 m)
<b>Fault:</b>	Smart Fault Management or shutdown on Fault
<b>Reports:</b>	Test Records stored in non-volatile memory or via USB memory stick
<b>PC Interface:</b>	USB, XBee® wireless, RS-232/422
<b>PC Software:</b>	Remote Control & Test Reports

## Model VLF-65E 65 kV VLF Tester

The **VLF-65E** Test Set is the latest addition to the new generation of VLF AC Hipots from HVI that use a dry-type, air cooled, solid state design with microprocessor control. Its test programming, numerous output functions, wireless communications, and data retrieval are intuitive and easy to learn, as well as its E-Link PC software. It is portable, affordable, and built for the rigors of field use, like all HVI products. Its 0 - 65 kVac output voltage meets world standards for Acceptance testing up to 35 kV class cable. Its sine wave output is suitable for using optional Tan Delta and Partial Discharge measurement systems, like the HVI TD-65E Tan Delta System and is everything you need for fully testing cables rated up to 46 kV.



<b>Input:</b>	100 Vac – 265 Vac, 50 Hz/60 Hz, 20A max
<b>Output:</b>	VLF Sinewave: 0 - 65 kVac peak/46 kVac rms @ 26 mA VLF Square wave: 0 - 65 kVac peak @ 45 mA DC: 0 - ± 65 kV @ 45 mA Sheath Test – User Programmable
<b>Duty:</b>	Continuous
<b>Frequency:</b>	0.1 Hz to 0.01 Hz in steps of 0.01 Hz
<b>Load Rating:</b>	1.0 $\mu$ F @ 0.10 Hz @ 65 kV 2.0 $\mu$ F @ 0.05 Hz @ 65 kV 5.0 $\mu$ F @ 0.02 Hz @ 65 kV 10.0 $\mu$ F @ 0.01 Hz @ 65 kV $\mu$ F rating increases at lower voltages Ex: 1.4 $\mu$ F @ 0.1 Hz @ 47 kV peak
<b>Metering:</b>	Voltage kV peak or rms, +/-1% accuracy Current mA peak or rms, +/-1% accuracy
<b>Calculated:</b>	Capacitance, Resistance, Tan Delta, Flashover voltage, Time to Failure
<b>Fault Response:</b>	Smart Fault Management – Fault “Burning” or Shutdown on Fault
<b>Reports/Data:</b>	Up to 50 test records can be stored in non-volatile memory or removable USB memory stick
<b>PC Interface:</b>	USB and XBee wireless
<b>PC Software:</b>	Remote Control & Test Data Reporting
<b>Size/Weight:</b>	22” w x 14 1/2” d x 26” h, 150 lbs 559 mm x 369 mm x 660 mm, 68 kg
<b>Output Termination:</b>	Shielded EPR output cable - 20 ft. (6 m)

HVI customers are providing a lot of positive feedback about E-Link, the new software that makes local and remote control of HVI’s VLF and TD cable test system easier than ever before.

## Local Mode

The local mode of operation logs test data to the internal memory of the VLF unit or to a removable USB flash drive. The logged data can be transferred from the VLF unit to the included PC application software for evaluation and reporting with a USB drive or an XBee wireless connection.

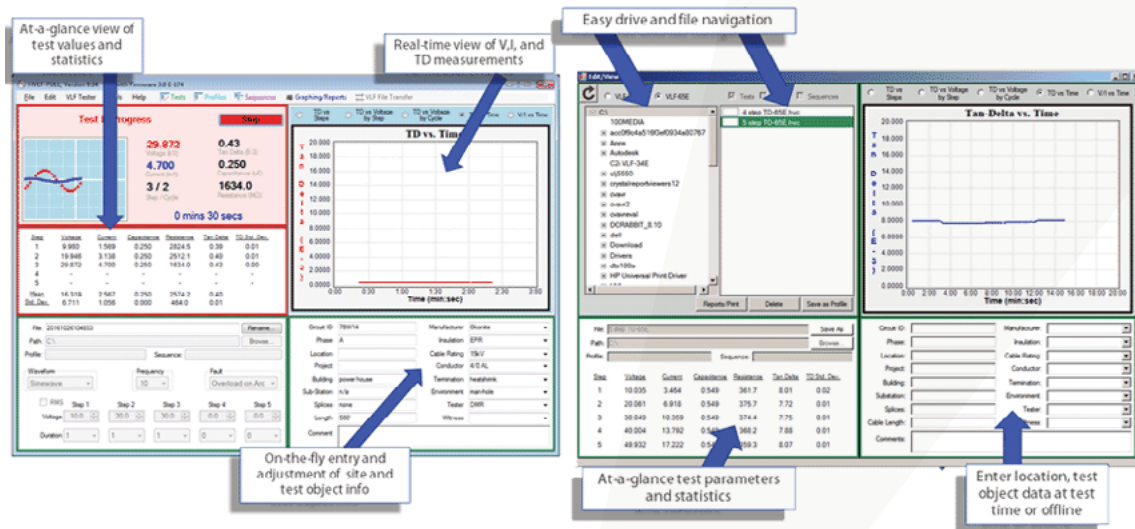
## Remote Mode

The remote mode of operation uses a laptop PC to wirelessly connect to the system. Once connected, the E-Link PC application allows the user to input or change the test parameters, view the live test data, and save the logged data directly to the PC.

E-Link’s menu-driven reports feature allows the user to quickly generate custom test reports that include header information input by the user, company logos, and graphs/tables of the logged data. E-Link can also export data in .csv or a Microsoft Access compatible format for more detailed reporting or database input.

## Features

- Easy installation—just run the setup program
- Local and remote operation
- Easy test setup via the VLF front panel or PC software
- Programmable test profiles
- XBee wireless—higher connection sustainability, longer range for remote VLF and TD testing
- Advanced data capture capabilities
- Intuitive VLF and TD report templates
- E-Link software and firmware comes standard with both the VLF-34E and the VLF-65E
- TD average and standard deviation continuously updated for easy evaluation
- PC not required for TD testing
- Data stored automatically in VLF memory with optional backups to USB and PC



# MV/HV CABLE TESTING – VLF TECHNOLOGY

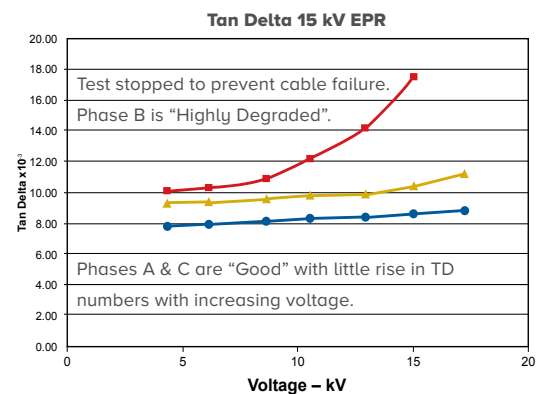
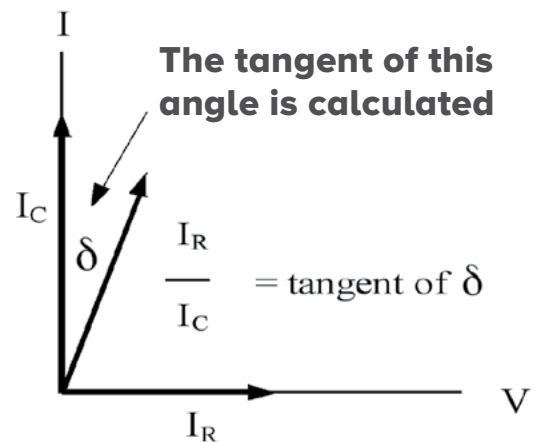
## VLF Withstand – VLF Tan Delta – VLF Partial Discharge

**Diagnostic field testing of cables is now here.** All three technologies shown above are very well proven for testing MV cables. Any VLF model from HVI can be used to perform the three tests described. Our 200 kV VLF tests HV cables.

Withstand and Diagnostic field testing of medium and high voltage cable is now practical using HVI VLF technology along with commercially available Tan Delta and Partial Discharge measuring devices. The use of multi-ton, very expensive power frequency resonant equipment is no longer necessary. VLF products from HVI are far smaller, lighter, easier to transport, and less expensive: everything needed to bring factory cable testing methods to the field. These tests are **performed off-line, providing the most information possible.** Test procedures and test specifications are within IEEE and other Standards.

### Tangent Delta/Dissipation Factor/Loss Angle Testing

When a non destructive diagnostic test is preferred over a withstand test, there are proven options. The first technique and the most common is a Tan Delta test. This is a “global” test of the cable, providing the condition from end to end. Using a VLF as the voltage source and a separate divider to make the measurements, the voltage is raised while measuring the Tan Delta of the cable. If a cable is perfect, it behaves like a capacitor where there is a phase shift of 90° between the voltage and current. The more degraded the insulation and accessories are, the more this angle becomes less than 90°, as resistive leakage current is added. This change in the angle is easily measured and assumptions can be made about the degree of degradation. The absolute TD number is important, but more indicative is if the curve trends sharply upward as the voltage is raised, the cable is highly degraded. Test many cables and rate them as Highly or Moderately Degraded, or Good. This data is used to help prioritize cable replacement, injection, and/or to determine what other tests may be of value. TD testing is easily performed and interpreted.



## Partial Discharge Testing

Partial Discharge testing is fairly new using VLF, yet proven and accepted. The obvious advantage to using VLF rather than power frequency systems is the smaller size, lower weight, far less power consumed, and price. PD testing attempts to locate defects and their severity along the cable path. While TD testing provides the overall health of the cable, PD testing finds individual locations of electrical discharge. The operator then makes a determination whether the level of PD is worrisome or acceptable. Any PD in the insulation at levels near or slightly above operating voltage is unacceptable, whereas accessories can survive with rather high levels of PD. This is where the interpretive nature of PD testing comes in. With no real guide as to what is and isn't acceptable PD and at what voltage level, particularly in accessories, interpretation can be difficult. Also measured are the Partial Discharge Inception Voltage (PDIV) and the PD Extinction Voltage (PDEV). Knowing where PD begins relative to applied voltage compared to normal operating voltage, and where the PD extinguishes when voltage is lowered, provides valuable data used in the interpretation. PD testing is of great value, although the most expensive and difficult to perform.

## VLF Withstand Testing

The most basic use of the VLF is to perform a go/no-go withstand test to expose defects that cannot hold the test voltage. If a cable can't hold ~1.5 – 3 times normal voltage, depending on cable class, find out now. Let failure occur during downtime, make the repair, and not worry about that cable for many years. It is very useful following installation, repair, or to insure critical cables are sound. In situations where the user can tolerate a failure during the test, it is the simplest and most certain way to test a cable. Any defect severe enough to be driven to partial discharge is allowed to fail. Lesser defects and good insulation are unaffected. It is the ultimate diagnostic test.

## Conclusion

All three methods of testing provide useful information, but different information. None are suited for every situation. None can provide all the information needed about a cable system. Ideally, all three technologies with the data they provide should be performed before making a decision. The cost of the test, the cost to buy the equipment, the ease of the test, the ease of interpretation, the skill of the operator necessary, the availability of the equipment, the cable design, age, ease of repair, the data needed to make cable maintenance decisions, and whether cable failure during the test is permissible are all vital in selecting what tests are best for your cable system.



200kV VLF Withstand, VLF TD & VLF PD Test Truck Inducor Ingenieria S.A. Argentina

## No other company can offer as much as HVI.

All three methods have been used for years and are well proven for testing cables. Select one or more to learn as much as possible about your cables.

## Model TD-34E VLF-TD Cable Diagnostic Testing

The High Voltage, Inc. **TD-34E** Tan Delta bridge is designed to work with and communicate wirelessly via the XBee protocol to the VLF-34E to form a complete cable diagnostic system. Together they offer high end features such as wireless communication, data acquisition, and report generation using the supplied E-Link PC software. This system is designed to perform Tan Delta testing, also known as Tan  $\delta$ , Dissipation Factor or Loss Angle on 5 to 25kV primary cables to the worlds standards; IEEE 400, IEEE 400.2, IEEE 433, DIN VDE 0276, CENELEC HD620 S1, NEETRAC CDFI, & others. Tan Delta testing is a non-destructive diagnostic test performed to measure the degree of deterioration of shielded MV/HV cable insulation. The results reveal how contaminated, damaged, or water tree strewn the insulation has become. Tan Delta testing is performed with the cable off-line where an AC power source, in this case a very low frequency (0.1Hz) hipot, provides the test voltage to the cable while the Tan Delta device records the results. The test voltage is increased in steps while readings are monitored to avoid possible cable failure should the TD numbers indicate severe degradation.



<b>Voltage Measurement:</b>	Range: 1 - 34 kV peak/1 - 25 kV rms Accuracy & Resolution: 1% & 0.1 kV peak
<b>Current Measurement:</b>	Range: 0 - 15 mA rms Accuracy & Resolution: 1% & 1 $\mu$ A
<b>Tan <math>\delta</math> Measurements:</b>	Load Range: Freq: 0.1 Hz - 0.01 Hz, 5 nF - 10 $\mu$ F Accuracy & Resolution: $1.0 \times 10^{-4}$ & $1 \times 10^{-5}$
<b>Communications:</b>	Range $\sim$ 30 m: XBee 802.15.4 (not Bluetooth)
<b>Power Input - Battery:</b>	Alkaline: Two "C" cells required – 4 provided NiMH: Rechargeable batteries acceptable – not included
<b>Dimensions:</b>	TD Transducer: 8" x 4.5" x 4" (203 x 114 x 102 mm) TD Carrying Case: 12" x 11" x 7.5" (305 x 280 x 191 mm) Accessories Bag w/cables, tripod: 15" x 5" x 12" (381 x 127 x 305 mm)
<b>Weight:</b>	TD Transducer - w/case: 5 lbs/2.3 kg 8 lbs/3.6 kg Access. bag: 10 lbs/4.5 kg
<b>Input Cable Connection:</b>	MC Connector - Male120 square mm
<b>Output Connection:</b>	1/4 - 20 female thread w/accessories
<b>Ground Connection:</b>	1/4 - 20 stud w/wingnut
<b>Environmental Requirements:</b>	Operating temp: - 10°C to + 55°C Storage temp: - 25°C to + 65°C Humidity: 80% up to 31°C (88°F)

## Model TD-65E VLF-TD Cable Diagnostic Testing

The High Voltage, Inc. **TD-65E** Tan Delta bridge is designed to work with and communicate wirelessly via the XBee protocol to the VLF-65E to form a complete cable diagnostic system. Together they offer high end features such as wireless communication, data acquisition, and report generation using the supplied E-Link PC software. This system is designed to perform Tan Delta testing, also known as Tan  $\delta$ , Dissipation Factor or Loss Angle on 5 to 35kV primary cables to the worlds standards; IEEE 400, IEEE 400.2, IEEE 433, DIN VDE 0276, CENELEC HD620 S1, NEETRAC CDFI, & others. Tan Delta testing is a non-destructive diagnostic test performed to measure the degree of deterioration of shielded MV/HV cable insulation. The results reveal how contaminated, damaged, or water tree strewn the insulation has become. Tan Delta testing is performed with the cable off-line where an AC power source, in this case a very low frequency (0.1Hz) hipot, provides the test voltage to the cable while the Tan Delta device records the results. The test voltage is increased in steps while readings are monitored to avoid possible cable failure should the TD numbers indicate severe degradation.



<b>Voltage Measurement:</b>	Range: 1 - 65 kV peak/1 - 38 kV rms Accuracy & Resolution: 1% & 0.1 kV peak
<b>Current Measurement:</b>	Load Range: 60 mA rms Accuracy & Resolution: 1% & 1 $\mu$ A rms
<b>Tan <math>\delta</math> Measurements:</b>	Load Range: Freq: 0.1 Hz - 0.01 Hz, 5 nF - 10 $\mu$ F Accuracy & Resolution: $1.0 \times 10^4$ & $1 \times 10^5$
<b>Communications:</b>	Range $\sim$ 30 m: XBee 802.15.4 (not Bluetooth)
<b>Power Input - Battery:</b>	Alkaline: Two "C" cells required – 4 provided NiMH: Rechargeable batteries acceptable – not included
<b>Dimensions:</b>	TD Transducer w/Tripod: 6" x 8" x 18" (152 x 203 x 457 mm) TD w/Pelican Type Case: 40 lbs / 18.14 kg (with equipt) plus HVI canvas bag
<b>Weight:</b>	TD Transducer - w/case: 5 lbs/2.3 kg 8 lbs/3.6 kg Access. bag: 10 lbs/4.5 kg
<b>Input Cable Connection:</b>	MC Connector - Male120 square mm
<b>Output Connection:</b>	1/4 - 20 female thread w/accessories
<b>Ground Connection:</b>	1/4 - 20 stud w/wingnut
<b>Environmental Requirements:</b>	Operating temp: - 10°C to + 55°C Storage temp: - 25°C to + 65°C Humidity: 80% up to 31°C (88°F)

## Model OCK-30 Concentric Neutral Tester

The **Ω-CHECK™** tester is designed to measure how many strands remain of a concentric neutral. The instrument consists of a variable 48 volt AC power supply, a microprocessor based programming, control, and acquisition module, a “clamp-on” current meter, and two 500’ reels of two-conductor test lead for connecting to the Local and Remote ends of the neutral being tested: one wire pair is used to inject the current through the neutral and the other pair is used to measure the voltage across the neutral. The AC power supply injects a current up to 30 amperes into the total ground system. The current probe placed around the neutral tested measures the current flowing only in that neutral.

The acquisition module receives the voltage across and the current through the tested neutral, from which the resistance and power factor are computed. Relays are used to swap the test current between polarities to help compensate for neutral load current effect. From the cable’s neutral data previously entered into the controls, the system computes, compares, and displays the % of the neutral remaining, and other valuable data.



### Electrical

**Input Power:** 1800 VA, 120 V @ 60 Hz, 15 A max.

**Output Power:** 0-48 VAC, 30 A max.

### Instrumentation

**Current Probe:** Output: 1000:1

**V&I Meters:** Accuracy: ±2%

**V&I Measured:** Accuracy: ±1%

**Phase Angle – P.F.:** ±1.5°

### Environmental

**Temperature Operating:** 0 to 45°C, 0 to 113°F

**Storage:** -20° to 70°C, -5° to 158°F

**Humidity:** 85% noncondensing

### Dimensions & Weight

**Control box:** 20”w x 12”d x 19”h, 55 lbs

**Cable reels (ea.):** 12”w x 11.5”d x 14.75”h, 23 lbs

**Cables & Accessories:** Supplied in canvas HVI bag

### Test Data Export from SD Card

TEST	TIME	DATE	NEUTRAL	LENGTH	VOLTS	AMPS	PF	R/L	RES	PCT
8	13:22	03/26/13	20 #14	375	18.25	<b>30.70</b>	<b>0.22</b>	<b>0.035</b>	<b>0.130</b>	<b>40</b>
1	14:27	07/15/13	16 #12	468	5.27	<b>28.90</b>	<b>0.40</b>	<b>0.016</b>	<b>0.073</b>	<b>70</b>
2	14:30	07/15/13	16 #12	468	1.89	<b>10.33</b>	<b>0.40</b>	<b>0.016</b>	<b>0.074</b>	<b>69</b>



# Cable Fault Locators

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- ⚡ CDS-2010U
- ⚡ CDS-2010UF
- ⚡ CDS-3616U
- ⚡ CDS-3616UF
- ⚡ CDS-3632U
- ⚡ CDS-3632UF
- ⚡ VT33
- ⚡ VT33F

## Options Available

- Safety ground sticks (10inch & 14inch)
- Hand Safety Interlock Switch
- Foot Safety Interlock Switch
- Cable reels (100feet to 330feet)
- Load Break Elbow Output Adapter
- Hotline Clamp Output Adapter
- Time Domain Reflectometer (TDR/Cable Radar)
- Acoustical/Magnetic Listening Devices

# HVI – THE CABLE TESTING & FAULT LOCATING COMPANY

**HVI has extensive knowledge** and field experience in fault locating and cable testing along with the best tools for the job. Fault locating requires more than just a thumper. Efficient fault locating requires the convergence of knowledge, methodology, and the right hardware. A total approach is needed to get the job done quickly to minimize customer outage time and damage to the cable system. This includes knowledge of the cable systems design, construction, and history, accurate maps, proper fault locating procedures, the right thumper, some cable burn down method, use of tdr/radar, and a top level acoustical & electromagnetic listening device. HVI can assemble the best system and approach possible to meet all needs from 5kV – 230kV cable.

## Q. Why Choose HVI Thumpers?

### A. HVI Thumpers Offer All the Features Needed.

When fault locating, remember this: do no harm. Don't harm your insulation and accessories by thumping your 15kV cable at 25kV for hours looking for a fault. Use proper methods and technologies. The goal should be to thump at the lowest possible voltage yet deliver the highest possible energy to find the fault. Locate the fault without making more. To do this you need a thumper with a variable hipot output, multiple full energy discharge outputs, and ample burn current to condition a fault to arc at a lower voltage. HVI thumpers offer all the features and power necessary: many others don't. Don't handicap your fault finding efforts by spending the same or more for ½ a thumper. HVI thumpers provide all the tools needed.

- **Fully Variable Hipot Output On All Three Voltage Settings**

Needed to identify faulted cable, show breakdown voltage to help choose tap, burn fault, hipot cables after repair

- **Highest Burn Current** Burns down faults to permit thumping at lower, less damaging voltage levels. Some vendors offer no hipot/burn

- **Three Output Voltage Taps All At Full Energy**

Allows thumping at lower voltages. Noise of maximum joules @ 5kV = noise of maximum joules @ 20kV

- **Variable Discharge Rate:** 6 – 10 second discharge/thump rate. Faster and slower discharge rates are not advisable

- **TDR/Radar Ready** Use your old TDR or buy a new one. A separate TDR box is advantageous over a TDR built-in to the thumper: greater flexibility, versatility, ease in service, use without thumper, take to office for downloading and training, etc.

- **Battery Operation** HVI thumpers are not battery operated. Thumpers of this class that are battery operated must sacrifice other necessary features, like variable hipot outputs and cable burning, missing half of what a thumper should be. In addition, some have a long 15 seconds between discharges, greatly slowing the fault locate. Also, battery charge times are short, assuming that you remembered to keep it charged between uses. To get battery operation is not worth the sacrifice.

## Controlled Energy Thumpers With Burn Capability a Necessity

Due to the known problems associated with DC cable testing, most utilities worldwide have abandoned DC testing of solid dielectric cable (many have switched to VLF AC testing), or greatly reduced their test voltage levels, yet they then thump cables at voltages of 2 – 3 times normal line-to-ground voltage. They find the fault but make more in the process. This is avoided by using HVI thumpers with three output voltage taps, and high burn currents used to reduce fault impedances to permit lower voltage thumping. HVI thumpers can thump at voltages below normal line-to-ground voltage yet still deliver maximum joules, thereby minimizing damage to the cable system while delivering full energy to the fault needed for rapid location.

**Energy = Watt Seconds = Joules =  $\frac{1}{2} CV^2 =$   
Fault Arc Intensity = Noise = Electro-Magnetic Discharge**

**PROBLEM:** To deliver the full joules of energy possible to a fault, the capacitors within a thumper must be charged to the maximum voltage. With the wrong thumper, this often results in thumping a cable at an excessive voltage, causing significant damage to insulation and accessories. Since the applied voltage is a square function ( $\frac{1}{2} CV^2$ ), if the thumper is at 2/3 voltage, only 45% of the joules are delivered to the fault. At half voltage only 25% energy is delivered, making the fault hard to hear. Either fault locating takes far longer than necessary or the crew gets impatient and turns the voltage all the way up to get the loudest bang. The fault is found but more are made. This practice can and should be avoided.

**SOLUTION:** Use a multi-tapped, “controlled energy” thumper like those from HVI. With three output voltage taps and ample burn current to condition faults, thumping can be performed at voltages far lower than before. Find your fault quickly while avoiding damage. Wouldn't you rather thump at 5kV instead of 20kV, as long as the discharge energy, or noise, was equal? **The measure of a good thumper is not the maximum voltage it can discharge, but the minimum voltage still capable of delivering the full energy. For instance, our 5/10/20 kV output model is a far better choice than the 12.5/25kV model from others.**

## Model CDS-2010U / CDS-2010UF

The High Voltage Inc **CDS-2010U / CDS-2010UF** are designed for fault location on cable systems rated up to 35kV, where the line to neutral voltage is approximately 20kv. With 1000 joules available at 5/10/20 kV, the CDS-2010U / CDS-2010UF offers a powerful impulse ideal for using acoustic and electro-magnetic detection instruments and is a true controlled/constant energy thumper. Equipped with a built in high voltage coupler, the CDS-2010U / CDS-2010UF are TDR/cable radar ready for arc reflection and current impulse methods. With up to 400 mA of burn current, high resistance faults can be rapidly reduced permitting fault location at less damaging voltage levels. Find your fault without causing the next one!

There are no better thumpers. The CDS-2010F / CDS-2010UF offers best in class features: Full impulse energy at 5/10/20kV, variable hipot/burn in all 3 taps (400 mA @ 5 kV tap, 200 mA @ 10 kV tap, 100 mA @ 20 kV tap), EPR high voltage output cable that stays flexible even in cold weather, TDR/Radar ready, and extremely durable and portable design with small footprint for years of reliable operation. Available in 120 Vac, 20 A input and 230 Vac, 15 A input (F suffix).



**Input:** CDS-2010U: 120 V, 60 Hz, 25 A  
CDS-2010UF: 230 V, 50/60 Hz, 15 A

**Hipot Output:** 0 – 5/10/20 kVdc

**Hipot Burn Current:** 400/200/100 mAcd

**Discharge Output:** 1000 Joules at each output voltage

**TDR Interface:** Arc Reflection & Current Impulse

**Size:** 27" w x 27" d x 48" h  
686 mm w x 686 mm d x 1219 mm h

**Weight:** 260 lbs/118 kgs

**Output Termination:** 50' HV, return, & ground

**Other Features:** Rugged, transit protected meters  
External Interlock  
Emergency OFF mushroom switch  
Internal heater to limit condensation

**The Network Systems Thumper**

The High Voltage Inc CDS-36 series of primary cable fault locators are ideal for Network Systems or other situations involving cables rated up to 69kV, oil insulated cables, and/or long cable lengths. Available with either 1600 or 3200 joules, the CDS-36 series offers a powerful impulse ideal for using acoustic and electro-magnetic detection instruments. The CDS-3616U / CDS-3616UF offers 1600 Joules at 9/18/36 kV while the CDS-3632U / CDS-3632UF offers 3200 Joules at 9/18/36kV, true controlled/constant energy thumpers. Equipped with a built in high voltage coupler, the CDS-36 series are TDR/cable radar ready for arc reflection and current impulse methods. With up to 280 mA of burn current, high resistance faults can be rapidly reduced permitting fault location at less damaging voltage levels. Find your fault without causing the next one! There are no better thumpers.



- Input:** CDS-3616U/3632U: 120 V, 60 Hz, 25 A  
CDS-3616UF/3632UF: 230 V, 50/60 Hz, 15 A
- Hipot Output:** 0 – 9/18/36 kVdc
- Hipot Burn Current:** 280/140/70 mA
- Discharge Output:** CDS-3616U(F): 1600 Joules at each output voltage  
CDS-3632U(F): 3200 Joules at each output voltage
- Discharge Rate:** 6 – 10 seconds
- TDR Interface:** Arc Reflection & Current Impulse
- Size:** 25" w x 29" d x 44.5" h  
(30" w with attached cable reel)  
635 mm w x 737 mm d x 1130 mm h
- Weight:** 1600J model: 375 lbs/170 kgs  
3200J model: 450 lbs/204 kgs
- Output Termination:** 100' HV, return, & ground
- Optional Cable Reels:** 100' HV & return cable reel
- Other Features:** Rugged, transit protected meters  
External Interlock  
Emergency OFF mushroom switch  
Plexiglas panel to view grounding solenoid  
Internal heater to limit condensation

**Compare HVI Features and Specifications to Any Other – Why Utilities Choose HVI**

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

**Thumper Specification Review**

Don't handicap your fault finding efforts by buying a thumper with only half the features necessary. For the same money, you can buy a full featured thumper. When specifying, require:

- At least two full joule output voltage settings, preferably three, and with at least 1000 joules of energy
- A variable hipot output with high burn current of at least 200mA
- Variable discharge rate from 6 – 10 seconds
- A remote TDR/radar, not one built-in, for flexibility, versatility, ease in service, and ease in use

## Model VT33 / VT33F VLF Thumper Combination

With cable diagnostic testing becoming more common, the need for fault locating will rise. If a cable cannot withstand the test voltage, failure will occur, requiring fault locating. If you're in the market for a thumper, why not get one with a VLF hipot built-in to test the AC integrity of the cable following repair. The **VT33 / VT33F** incorporates a powerful VLF hipot, a VLF Burner that rapidly reduces a faults impedance (arc-over voltage), TDR/ radar capability, and continuous discharge for pinpointing the fault. Suitable for cables up to 25 kV. HVI puts all the tools needed in one box.



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

### Accessories

HVI can provide all the accessories needed to put together a complete fault locating system. Fault locating is an approach, not just a thumper. Don't spend a lot of money on a thumper but not the extra few thousand for a top level listening device to make it most effective. Don't thump for hours wasting time and damaging your cable when a TDR trace can show you the fault location in two minutes, quickening sectionalizing and repair. Consult with HVI on the accessories most appropriate for your situation. We have our favorites but can supply anything needed. For a TDR, nearly any model now available works great.



**Cable reels**  
(CRR-100T)



**Acoustical/Magnetic Listening Devices**  
(Aqua-Tronics SDAD)



**Custom Skid Option**

### Accessories with MC Connectors for Thumper and VLF HV output



**Load Break Elbow**  
(LBE-36)



**Hot Line Clamp**  
(88-051)



**MC Vice Grip**  
(88-050)



**15/25kV Stinger**  
(88-049)



**TDR/Radar**  
(Radar Engineers Model 1669)

All HVI Thumpers have included built in high voltage couplers to accommodate use with most third party TDR's/Time Domain Reflectometers.

# AC Dielectric Test Sets

## Withstand Testing for Electrical Apparatus

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### PFT Series

- ⚡ PFT-103CM
- ⚡ PFT-103CMF
- ⚡ PFT-301CM
- ⚡ PFT-301CMF
- ⚡ PFT-302CE
- ⚡ PFT-303CM
- ⚡ PFT-303CMF
- ⚡ PFT-401CEF
- ⚡ PFT-503CM
- ⚡ PFT-503CMF
- ⚡ PFT-652CM
- ⚡ PFT-652CMF
- ⚡ PFT-1003CM
- ⚡ PFT-1003CMF

### FPA – Field Portable AC Dielectric

- ⚡ FPA-12/066F

### HPA – High Power AC

- ⚡ 5kVA
- ⚡ 10kVA
- ⚡ 20kVA
- ⚡ 40kVA

### Options Available

- Digital Meters
- Burn Circuit
- Safety ground sticks (10inch & 14inch)
- Hand Safety Interlock Switch
- Foot Safety Interlock Switch
- Hand Cart (PFT-652CM, PFT-652CMF, PFT-1003CM, & PFT-1003CMF)
- Reusable Shipping Case

# SELECTING AN AC DIELECTRIC TEST SET

AC high voltage testing requires higher power/current ratings than when DC testing the same load. There are several parameters that must be considered when selecting an AC test set, the most important one being the capacitance of the load, which dictates the power required from the test set. Following are several considerations when specifying a test set:

## Voltage Output

Select a test set with perhaps 20 – 25% more voltage than presently needed for possible future increases in testing standards or changes in application. However, the output current of the test set is based on the kVA rating at full voltage. Any increase in the output voltage rating for the same kVA rated test set will proportionately decrease the current rating.

## Power/Current Rating

When AC testing, most loads appear capacitive. To apply high voltage AC at 50/60 Hz to capacitive loads requires higher power and current ratings from the test set than typical portable AC hipots can supply. A test set rated for 10 – 20 kVA may be needed depending on the load to be tested. The capacitance of the load must be known in order to calculate the required current at the required voltage. Don't undersize the set: select a test set with at least 20 - 25% extra power than believed needed. To determine the current needed from the test set, the following formula should be used:

$$A = 2\pi fCV$$

**A** = Test current required in Amps (A)  
**C** = Load capacitance in Farads (F)  
**f** = Test frequency in Hertz (Hz)  
**V** = Test voltage in volts (V)

Another way to determine the current needed at the required test voltage is to apply a lower voltage to the load and measure the current. The current required at the actual higher test voltage should be fairly linear. For example: if your load draws 10 mA @ 5 kV it will draw approximately 100 mA @ 50 kV. Remember, an AC test set is a constant current device. The maximum output current is the same at any output voltage.

## Duty Cycle

Most AC hipoting is performed for 60 seconds at a time. However, production testing may require consecutive tests over many hours. Most HVI AC test sets are duty rated for 50%, meaning full power can be delivered for one hour on followed by one hour off. The continuous duty rating is approximately 80% of full rating. Consult product specifications for details.

## Partial Discharge Requirements

Many HVI AC test sets are rated for <10pc of partial discharge at full voltage, but not all. Generally, steel tank bushing output models are <10pc while models with fiberglass HV sections and/or a cable output are not. Consult factory.



## Model PFT-103CM / PFT-103CMF Portable AC Hipot for Apparatus Testing

The **PFT-103CM / PFT-103CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-103CM) 120 V, 60 Hz, 15 A (PFT-103CMF) 230 V, 50/60 Hz, 8 A
<b>Output:</b>	0-10 kV AC, 1 kVA resistive load 3 kVA capacitive load Up to 300 mA current Output current is reduced at lower voltages
<b>Duty:</b>	3 kVA: 1 hour ON, 1 hour OFF 1.5 kVA: continuous
<b>Voltmeter:</b>	3.5", scaled 0-5/10 kV AC, $\pm 2\%$ F.S.
<b>Current Meter:</b>	3.5", scaled 0-1.0 mA, $\pm 2\%$ F.S. with range multipliers of x1, x10, x100 guard/ground load return
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	21 x 11.25 x 15.25 in., 62 lb. 534 x 286 x 387 mm, 28 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded EPR output cable with alligator clamp

## Model PFT-301CM / PFT-301CMF Portable AC Hipot for Apparatus Testing

The **PFT-301CM / PFT-301CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-301CM) 120 V, 60 Hz, 10 A (PFT-301CMF) 230 V, 50/60 Hz, 5 A
<b>HV Output:</b>	0-30 kV AC, 1 kVA resistive load 33 mA current
<b>Duty:</b>	1 kVA: 1 hour on, 1 hour off 700 VA: Continuous
<b>Voltmeter:</b>	3.5", scaled 0-30 kV AC, $\pm 2\%$ F.S.
<b>Current Meter:</b>	3.5", scaled 0-40 mA, $\pm 2\%$ F.S.
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	17 x 11.5 x 14 in., 45 lb. 431 x 292 x 365 mm, 20 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded EPR output cable with alligator clamp

## Model PFT-302CE AC High Voltage Test Set

The CE marked **PFT-302CE** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



CE

<b>Input:</b>	230 V, 15 A, 50/60 Hz, single phase
<b>Output:</b>	0 – 30 kV AC, up to 67 mA depending on load, sinusoidal
<b>Duty:</b>	2 kVA—1 hour ON, 1 hour OFF 1 kVA—Continuous
<b>Distortion:</b>	Less than 5%
<b>Meter Accuracy:</b>	1%
<b>Voltmeter:</b>	3.5" digital LED, scaled 0-30.0 kV AC (RMS)
<b>Current Meter:</b>	3.5" digital LED, scaled 0-67.0 mA
<b>Size &amp; Weight:</b>	23 x 11.5 x 15.5 in., 77 lb. (W x D x H) 585 x 293 x 395 mm, 35 kg
<b>Output Termination:</b>	20 ft. long shielded cable

## Model PFT-303CM / PFT-303CMF Portable AC Hipot for Apparatus Testing

The **PFT-303CM / PFT303CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-303CM) 120 V, 60 Hz, 15 A (PFT-303CMF) 230 V, 50/60 Hz, 8 A
<b>Output:</b>	0-30 kV AC, 1 kVA resistive load: 3 kVA capacitive load Up to 100 mA current Output current is reduced at lower voltages
<b>Duty:</b>	3 kVA: 1 hour ON, 1 hour OFF 1.5 kVA: continuous
<b>Voltmeter:</b>	3.5", scaled 0-12/30 kV AC, ±2% F.S.
<b>Current Meter:</b>	3.5", scaled 0-1 mA, ±2% F.S. with range multipliers of x1, x10, x100 guard/ground load return
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight:</b>	21 x 11.25 x 15.25 in., 75 lb. (W x D x H) 534 x 286 x 387 mm, 34 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded EPR output cable with alligator clamp Remains flexible in cold weather

## Model PFT-401CEF AC Dielectric Test Set

The **PFT-401CEF** is a CE Marked AC Dielectric Test Set, one of many in the PFT Series of field portable AC hipot test sets. These hipots provide continuously adjustable AC voltage typically used to provide a go/no-go, or pass/fail, AC over-voltage Withstand Test on high voltage apparatus, like switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, bus duct, and any other equipment needing an AC voltage proof test.



<b>Input:</b>	230Vac, 50/60Hz, 6A
<b>Output:</b>	0-40kV AC, 1kVA resistive load (25mA Max) 1kVA capacitive load (25mA max)
<b>Duty:</b>	1kVA: 1 hour ON, 1 hour OFF 0.8kVA: continuous
<b>Distortion:</b>	Less than 5%
<b>Meter Accuracy:</b>	1%
<b>Voltmeter:</b>	3.5" digital LED, scaled 0-40kV AC (RMS)
<b>Current Meter:</b>	3.5 digit LED, scaled 0-25ma AC (RMS)
<b>Size &amp; Weight: (W x D x H)</b>	14.5 x 12.5 x 23.5 in., 70 lb 368 x 318 x 597 mm, 32 kg HV Section: 35lb (16kg) Control Section: 35lb (16kg)
<b>Output Termination:</b>	Top mounted 1.5 in aluminum ball

## Model PFT-503CM / PFT-503CMF Portable AC Hipot for Apparatus Testing

The **PFT-503CM / PFT-503CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-503CM) 120 V, 60 Hz, 15 A (PFT-503CMF) 230 V, 50/60 Hz, 8 A
<b>Output:</b>	0-50 kV AC, 1 kVA resistive load 3 kVA capacitive load Up to 60 mA current Output current is reduced at lower voltages
<b>Duty:</b>	3 kVA: ½ hour ON, 2 hours OFF 2 kVA: 1 hour ON, 1 hour OFF 1 kVA: continuous
<b>Voltmeter:</b>	3.5", scaled 0-25/50 kV AC, ±2% F.S.
<b>Current Meter:</b>	3.5", scaled 0-1 mA, ±2% F.S. with range multipliers of x1, x10, x100
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	21 x 11.25 x 15.25 in., 75 lb. 534 x 286 x 387 mm, 34 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded output cable with alligator clamp
<b>Options:</b>	The PFT-503CM AC hipot can be upgraded to include a fault burning circuit.

## Model PFT-652CM / PFT-652CMF

## Portable AC Hipot for Apparatus Testing

The CE marked **PFT-652CM / PFT-652CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-652CM) 120 V, 15 A, 50/60 Hz, single phase (PFT-652CMF) 230 V, 8 A, 50/60 Hz, single phase
<b>Output:</b>	0-65 kV AC, 2.0 kVA resistive load
<b>Duty:</b>	2 kVA: 1 hour ON, 1 hour OFF 1.5 kVA: continuous
<b>Distortion:</b>	Less than 5%
<b>Meter Accuracy:</b>	+/- 2% of full scale
<b>Voltmeter:</b>	3.5", scaled 0-32.5/65 kV AC (RMS)
<b>Current Meter:</b>	3.5", scaled 0-1.0 mA with x1, x10, x100 range multiplier
<b>Size &amp; Weight: (W x D x H)</b>	Control: 120 V: 34 lb. (15kg) 230V: 49 lb. (22kg) HV Tank: 16.5 x 10.13 x 10.13 in., 50 lb. 42 x 26 x 26 cm, 23 kg
<b>Output Termination:</b>	Top toroid

## Model PFT-1003CM / PFT-1003CMF

## AC Hipot for Apparatus Testing

The CE marked **PFT-1003CM / PFT-1003CMF** AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, motor windings and other high voltage insulation requiring AC.



<b>Input:</b>	(PFT-1003CM) 120 V, 60 Hz, 15 A (PFT-1003CMF) 230 V, 50/60 Hz, 8 A
<b>Output:</b>	0-100 kV AC, 1 kVA resistive load 3 kVA capacitive load Up to 30 mA current Output current is reduced at lower voltages
<b>Duty:</b>	3 kVA: 1 hour ON, 1 hour OFF 1.5 kVA: continuous
<b>Voltmeter:</b>	3.5", scaled 0-50/100 kV AC, ±2% F.S.
<b>Current Meter:</b>	3.5", scaled 0-1.0 mA, ±2% F.S. with range multipliers of x1, x10, x100
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	Case: 21 x 11.25 x 15.25 in., 35 lb. 534 x 286 x 387 mm, 16 kg HV Tank: 13 x 13 x 22 in., 85 lb. 330 x 330 x 559 mm, 39 kg
<b>Output Termination:</b>	Top toroid

## Model FPA-12/066F

## Portable AC Hipot for Apparatus Testing

The **FPA-12/066F** is a PD free AC hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of motor windings, generator windings, bus duct switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks and other high voltage insulation requiring AC.



**Input:** 230 V, 50/60 Hz, 30 A, single phase

**Output:** 0-6 kV AC, 6 kVA resistive load (1000 mA)  
0-12 kV AC, 6 kVA resistive load (500 mA)

**Duty:** 6 kVA: 1 hour ON, 1 hour OFF  
5 kVA: continuous

**Distortion:** <5%

**Meter Accuracy:** 2% FS Accuracy

**Voltmeter:** 3.5", scaled 0-3/6/12 kV AC (RMS)

**Current Meter:** 3.5", scaled 0-250/500/1000 mA AC

**Size & Weight:** 23 x 23.5 x 46 in., 215 lb.  
(W x D x H) 58 x 60 x 117 cm, 98 kg

**Output Termination:** 20 ft. (6 m) shielded output cable  
with alligator clamp

# HPA – High Power AC Dielectric Models

## 5kVA

Input: 230V, 50/60 Hz,  
1 Ph, 25A  
Duty: 5kVA 1 hr. On / 1 hr. Off  
4 kVA Continuous

VOLT. (kv)	MODEL	CURRENT (mA)	CONTROL SECTION					HV SECTION					TYPE
			W (in / mm)	D (in / mm)	H (in / mm)	FIG.	WT (lbs / kg)	W (in / mm)	D (in / mm)	H (in / mm)	WT (lbs / kg)		
10	HPA-105FC*	500	21 / 533	25 / 635	30.5 / 775	C1,2,3	200 / 91	NONE - ONE PIECE DESIGN			N/A		
30	HPA-305FC*	167	21 / 533	16 / 406	15 / 381	C1,2,3	75 / 34	13 / 330	13 / 330	21 / 533	95 / 43	STEEL	
50	HPA-505FC*	100	21 / 533	16 / 533	15 / 381	C1,2,3	75 / 34	13 / 330	13 / 330	21 / 533	95 / 43	STEEL	
75	HPA-755FC*	67	21 / 533	16 / 406	15 / 381	C1,2,3	75 / 34	13 / 356	13 / 356	21 / 635	95 / 43	STEEL	
100	HPA-1005FC	50	21 / 533	25 / 635	30.5 / 775	C1,2,3	145 / 66	18.5 / 470	18.5 / 470	34 / 864	300 / 136	STEEL	

## 10kVA

Input: 230V, 50/60 Hz,  
1 Ph, 50A  
Duty: 10kVA 1 hr On / 1hr Off  
8 kVA Continuous

VOLT. (kv)	MODEL	CURRENT (mA)	CONTROL SECTION					HV SECTION					TYPE
			W (in / mm)	D (in / mm)	H (in / mm)	FIG.	WT (lbs / kg)	W (in / mm)	D (in / mm)	H (in / mm)	WT (lbs / kg)		
10	HPA-1010FC*	1000	21 / 539	25.5 / 648	47.3 / 1200	C2,3	390 / 177	NONE - ONE PIECE DESIGN			N/A		
30	HPA-3010FC*	333	21 / 533	25 / 635	30.5 / 775	C2,3	200 / 91	13 / 330	13 / 330	25 / 635	215 / 97	steel	
50	HPA-5010FC*	200	21 / 533	25 / 635	30.5 / 775	C2,3	200 / 91	13 / 330	13 / 330	25 / 635	215 / 97	steel	
75	HPA-7510FC*	133	21 / 533	25 / 635	30.5 / 775	C2,3	200 / 91	17 / 432	17 / 432	32 / 813	275 / 125	steel	
100	HPA-10010FC*	100	21 / 533	25 / 635	30.5 / 775	C2,3	200 / 91	18 / 457	18 / 457	37.5 / 953	325 / 147	steel	
150	HPA-15010FC*	67	21 / 533	25 / 635	30.5 / 775	C2,3	200 / 91	28 / 711	28 / 711	56.5 / 1435	825 / 374	fiberglass	

\*Insert a 1, 2, or 3 to the model number in place of the \* to specify which controller, described on page 4, will be needed.

## 20kVA

Input: 230V, 50/60 Hz,  
1 Ph, 90A  
Duty: 20kVA 1 hr On/1hr Off,  
16 kVA Continuous

VOLT. (kv)	MODEL	CURRENT (mA)	CONTROL SECTION					HV SECTION					TYPE
			W (in / mm)	D (in / mm)	H (in / mm)	FIG.	WT (lbs / kg)	W (in / mm)	D (in / mm)	H (in / mm)	WT (lbs / kg)		
10	HPA-1020FC3	2000	22 / 559	25.5 / 648	47.3 / 1200	C3	530 / 241	NONE - ONE PIECE DESIGN			N/A		
30	HPA-3020FC3	600	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	17 / 432	17 / 432	25 / 635	300 / 136	steel	
50	HPA-5020FC3	400	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	17 / 432	17 / 432	25 / 635	300 / 136	steel	
75	HPA-7520FC3	267	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	17 / 432	17 / 432	32 / 813	325 / 147	steel	
100	HPA-10020FC3	200	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	18.5 / 470	18.5 / 470	37.5 / 953	375 / 170	steel	
150	HPA-15020FC3	133	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	35.5 / 902	35.5 / 902	56.5 / 1435	850 / 386	fiberglass	
200	HPA-20020FC3	100	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	35.5 / 902	35.5 / 902	56.5 / 1435	850 / 386	fiberglass	
300	HPA-30020FC3	67	22 / 559	25.5 / 648	47.3 / 1200	C3	300 / 136	35.5 / 902	35.5 / 902	82 / 2083	1150 / 522	fiberglass	

OPTION: On 5 kVA - 40 kVA models, air and steel tank only configurations, a 50% voltage tap rated full kVA is possible.

## 40kVA

Input: 230V, 50/60 Hz,  
1 Ph, 180A  
Duty: 40kVA 1 hr On/1hr Off,  
32 kVA Continuous

VOLT. (kv)	MODEL	CURRENT (mA)	CONTROL SECTION					HV SECTION					TYPE
			W (in / mm)	D (in / mm)	H (in / mm)	FIG.	WT (lbs / kg)	W (in / mm)	D (in / mm)	H (in / mm)	WT (lbs / kg)		
10	HPA-1040FC3	4000	22 / 559	31 / 787	67 / 1702	C3	600 / 272	20 / 508	20 / 508	27 / 686	400 / 204	steel	
30	HPA-3040FC3	1333	22 / 559	31 / 787	67 / 1702	C3	600 / 272	25 / 635	25 / 635	35 / 890	500 / 227	steel	
50	HPA-5040FC3	800	22 / 559	31 / 787	67 / 1702	C3	600 / 272	25 / 635	25 / 635	35 / 890	500 / 227	steel	
75	HPA-7540FC3	533	22 / 559	31 / 787	67 / 1702	C3	600 / 272	25 / 635	25 / 635	37 / 940	550 / 250	steel	
100	HPA-10040FC3	400	22 / 559	31 / 787	67 / 1702	C3	600 / 272	30 / 762	30 / 762	41 / 1041	650 / 293	steel	

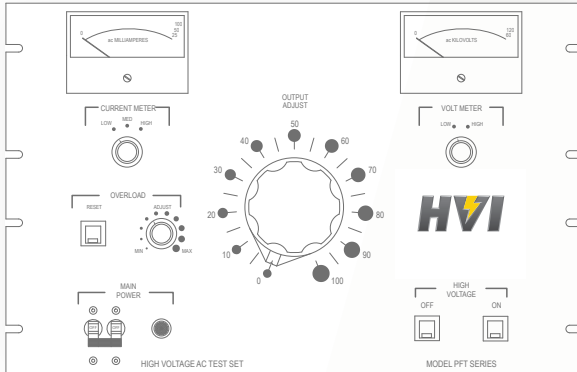
## Motor Shop Models

VOLT. (kv)	MODEL	CURRENT (mA)	POWER (kVA)	INPUT Voltage (V)	INPUT Current (A)	FREQ. (Hz)	ONE PIECE - SIZE & WEIGHT					
							W (in / mm)	D (in / mm)	H (in / mm)	CONTR. FIG.	LBS	KG
3	HPA-033MF	1000	3	230	13	50 / 60	18 / 457	21 / 533	49 / 1245	C1	145	66
5	HPA-055MF	1000	5	230	22	50 / 60	18 / 457	21 / 533	48 / 1245	C1	185	84

## High Voltage Section Configurations

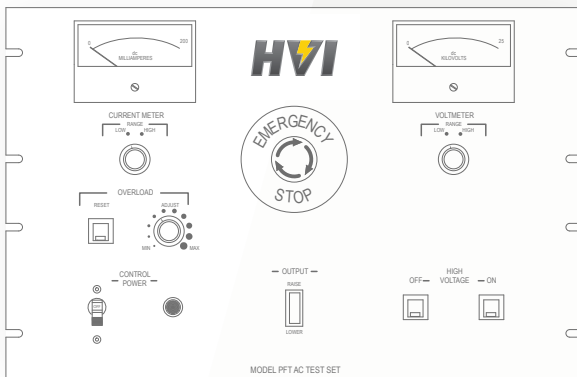
Except for the lowest voltage 5 kVA, 10 kVA, and 20 kVA model that contain the HV section within the control cabinet, all models have a separate HV section. There are two HV section designs, a steel tank with a bushing output and a fiberglass cylinder with a toroid/spinning output. HVI can supply a one piece design on several of the lower voltage models. A steel tank with a cable output on models rated up to 50 kV is possible on a custom basis. No HV output cable is provided on bushing and spinning output models.

## Three Standard Control Packages – Variations Available On a Custom Basis



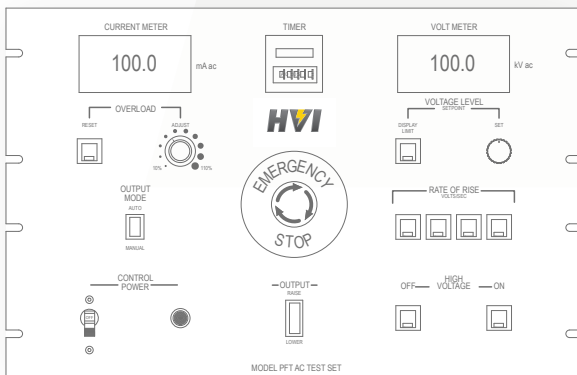
**FIG. C1**

Simplified Controls w/manual output voltage control – up to 5 kVA  
 Voltage meter: two range  
 Current meter: three range  
 Main Power breaker/indicating light  
 HV On/Off  
 Output Adjust control knob  
 Variable Overload w/reset



**FIG. C2**

Simplified Controls w/motorized output voltage control – up to 10 kVA  
 Voltage meter: two range  
 Current meter: three range  
 Control Power breaker/indicating light  
 HV On/Off  
 Voltage Raise/Lower control  
 Fixed voltage rate-of- rise



**FIG. C3**

Automatic Controls & Digital Metering – any kVA  
 Voltage meter: digital 3.5 digits  
 Current meter: digital 3.5 digits  
 Control Power breaker  
 HV On/Off  
 Output Mode Manual/Auto  
 Output Voltage Raise/Lower control  
 Four fixed volts/second rates-of-rise  
 10 – 100 seconds, consult factory  
 Test Dwell timer  
 Variable Overload w/reset  
 Emergency Off button

**OPTIONS:** PLC Interface: Includes 0-10Vdc signal outputs for voltage and current monitoring, 0-10Vdc signal inputs for voltage and current set points, and normally open contacts for control of power on/off, remote enabled, overload, voltage raise & lower, and other control features. Consult factory for additional controller packages.

## HPA Series AC Test Set Controllers

**C3/P OPTION** - C3 Controls with PLC interface

**C4 OPTION** - C3 Controls with 4.5 digit meters

**C5 OPTION** - Touch Screen programmable and PC interfaced

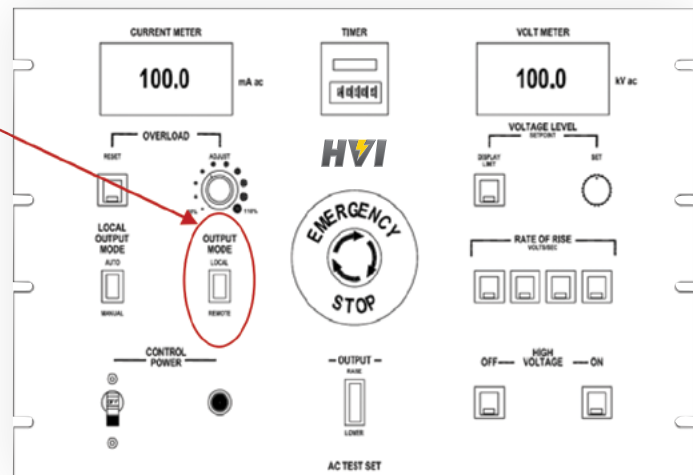
**C3/P CONTROLLER** is the C3 controller that also offers input and output control provisions to interface with a remote programmable logic controller (PLC) or some other customer supplied controller. It can be operated in the Local mode using the front panel controls or in the Remote mode via customer supplied external controls.

### LOCAL CONTROLS – FRONT PANEL

Same as C3 controller but with OUTPUT MODE switch to engage remote control operation.

### REMOTE CONTROLS – INPUTS/OUTPUTS

Input Control terminals and Output Feedback signals are provided, permitting the remote control of the unit for most functions and output signals to communicate with the external controller. When in the REMOTE mode, all front panel controls are disengaged except for the Emergency Off and Volt and Current meters



### INPUT REMOTE CONTROL SIGNALS

Contact N/O: Close HV ON - Open HV OFF  
Rate of Rise: 0-10V = 10s – 100s to full output  
Contact N/O: RAISE – Close to operate  
Contact N/O: LOWER – Close to operate  
Contact N/C: Overload Reset – Open to operate  
Overload Set Point: 0-10Vdc = 10 - 110% current

### OUTPUT FEEDBACK SIGNALS

Remote Enabled: N/O  
Main Power ON& High Voltage ON: N/O  
Overload FAULT: N/O  
Voltage: 0-10Vdc = 0 - 100% output voltage  
Current: 0-10Vdc = 0 - 100% output current  
Voltage return to 0 (automatic after overload): N/O

**C4 CONTROLS** – C3 but with digital meters upgraded from standard 3.5 digits to 4.5

The C4 controller is the same as the C3 controller but offers 4.5 digit meters rather than the 3.5 digits found on the standard C3 controller. The 4.5 digit meters instead of 3.5 digits offer a higher resolution in reading the voltage and current displayed. The description of the C3 controller can be found on the rear of the HPA Series brochure.

**C1, C2, & C3 controls are described in the HPA Series Brochure**  
**Complete C5 controls can be found on its own specification sheet**



# Aerial Lift Testers

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## AC Testers

- ⚡ ALT-120/60
- ⚡ ALT-120/60F
- ⚡ ALT-210/50
- ⚡ ALT-210/50F
- ⚡ ALT-300F

## DC Testers

- ⚡ PTS-100U
- ⚡ PTS-100UF

### Options Available

- Digital Meters
- Safety ground sticks (10inch & 14inch)
- Hand Safety Interlock Switch
- Foot Safety Interlock Switch
- Reusable Shipping Case

## Model ALT-120/60 / ALT-120/60F Aerial Lift Tester

The popular **ALT-120/60 / ALT-120/60F** is the most powerful and full-featured standard aerial lift tester available. This CE marked AC Hipot was primarily designed for testing bucket truck booms and liners per the ANSI 92.2 standard. However, its continuously adjustable dual output voltages, high power rating, and mobility also make it ideal for field testing other high capacitance loads requiring AC withstand testing. This unit is also used for overvoltage AC withstand testing of ISO phase bus, switchgear, circuit breakers, reclosers, vacuum bottles, and hot sticks.



<b>Input:</b>	(ALT-120/60) 120 V, 60 Hz, 30 A (ALT-120/60F) 230 V, 50/60 Hz, 15 A
<b>Output:</b>	0-120 kV AC / 0-60 kV AC 7 kVA capacitive (1.3 $\mu$ F @120 kV, 5.3 $\mu$ F @ 60 kV)
<b>Duty:</b>	7 kVA: 1 hour ON, 1 hour OFF 4 kVA: Continuous
<b>Voltmeter:</b>	3.5", scaled 0-30/60 kV and 0-60/120 kV AC RMS +/- 2% F.S.
<b>Current Meter:</b>	3.5", scaled 0-250 mA and 0-1.0 mA +/- 2% F.S. with multipliers: x1, x10, x100 up to 100 mA
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	Case: 21 x 11.25 x 15.25 in., 46 lb. 534 x 286 x 387 mm, 21 kg
	HV Tank: 15.5 x 15.5 x 27.5 in., 160 lb. 394 x 394 x 699 mm, 73 kg
	Overall with Hand Cart: 22 x 29 x 46.75 in., 271 lb. 559 x 737 x 1188 mm, 123 kg
<b>Output Termination:</b>	Top Toroid – 0-120kV Side Tap – 0-60kV

## Model ALT-210/50 / ALT-210/50F Aerial Lift Tester

The CE marked **ALT-210/50 / ALT-210/50F** was primarily designed for testing bucket truck booms and liners per the ANSI 92.2 standard. However, its continuously adjustable dual output voltages, high power rating, and mobility also make it ideal for field testing other high capacitance loads requiring AC withstand testing. This unit is also used for overvoltage AC withstand testing of ISO phase bus, switchgear, circuit breakers, reclosers, vacuum bottles, and hot sticks.



<b>Input:</b>	(ALT-210/50) 120 V, 50/60 Hz, 30 amps, single phase (ALT-210/50F) 230 V, 50/60 Hz, 15 amps, single phase
<b>Output:</b>	0-210kVac 3KVA resistive load 0-50kVac 3KVA resistive load Up to 7KVA capacitive load (both taps)
<b>Duty:</b>	7KVA:1 hour ON, 2 hour OFF 4KVA: continuous (Capacitive Load)
<b>Distortion:</b>	<5%
<b>Meter Accuracy</b>	2% F.S Accuracy
<b>Kilovoltmeter:</b>	3.5 inch Scaled 0-20/50,0-80/210 kVac (RMS)
<b>Current Meter:</b>	3.5 inch 0-250 $\mu$ A / 0-1.0 mA ac with multipliers
<b>Case Size HV TANK:</b>	21"w x 11"d x 15"high 15.5"w x 15.5"d x 37"high
<b>Weight:</b>	CONTROL-59 lbs.(27kg) HV TANK- 240lbs.(109kg)
<b>Output Termination:</b>	Top Toroid – 0-210kV Side Tap – 0-50kV

## Model ALT-300F Aerial Lift Tester

The CE marked **ALT-300F** was primarily designed for testing bucket truck booms per the ANSI 92.2 standard. However, its high power rating and mobility make it ideal for field or in house testing of ISO phase bus, switchgear, circuit breakers, reclosers, vacuum bottles, and hot sticks.



<b>Input:</b>	230 V, 50/60 Hz, 15 A
<b>Output:</b>	0-300 kV AC, 7 kVA with resistive load
<b>Duty:</b>	7 kVA: 1 hour ON, 2 hours OFF 5 kVA: Continuous
<b>Voltmeter:</b>	3.5", scaled 0-120/300 kV AC RMS +/- 2% F.S.
<b>Current Meter:</b>	3.5", scaled 0-250 mA and 0-1.0 mA +/- 2% F.S. with multipliers: x1, x10, x100 up to 100 mA
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	Case: 21 x 15.5 x 15.25 in., 80 lb. 534 x 394 x 387 mm, 36 kg HV Tank: 28 x 28 x 69 in., 1050 lb. 712 x 712 x 1753 mm, 476 kg
<b>Output Termination:</b>	Toroid Output

## Model PTS-100U / PTS-100UF Aerial Lift Tester

For testing that requires DC voltage, the **PTS-100U / PTS-100UF** is a CE marked DC hipot and megohmmeter for testing the dielectric strength and insulation resistance of electric insulation such as cable, switchgear, motors, transformer, insulators, generators and other electrical apparatus. With the included 50 ft output cable, this instrument is capable of testing large booms on aerial lifts per the ANSI 92.2 Standard.



<b>Input:</b>	(PTS-100U) 120 V, 60 Hz, 10 A (PTS-100UF) 230 V, 50/60 Hz, 5 A
<b>Output:</b>	0 – 100 kV DC, 10 mA, negative polarity, positive ground
<b>Duty:</b>	Continuous
<b>Voltmeter:</b>	3.5", scaled 0 – 50/100 kV DC, ±2% F.S.
<b>Current Meter:</b>	3.5", scaled 0 – 1.0 uA DC, ±2% F.S. with multipliers of x 1, x 10, x 100, x 1 k, x 10 k Guard/ground load return
<b>Megohmmeter:</b>	Scaled 100 -1 MΩ with multipliers of x 0.1, x 1, x 10, x 100, x 1 k
<b>Size &amp; Weight: (W x D x H)</b>	Case: 14 x 11 x 14 in., 30 lb. 356 x 279 x 356 mm, 14 kg HV Tank: 9.5 x 11.75 x 14.5 in., 68 lb. 241 x 298 x 368 mm, 31 kg
<b>Output Termination:</b>	50 ft. (15 m) shielded EPR output cable

# DC Hipots- Megohmmeters

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## PTS Series

- ⚡ PTS-37.5
- ⚡ PTS-37.5F
- ⚡ PTS-75
- ⚡ PTS-75F
- ⚡ PTS-80
- ⚡ PTS-80F
- ⚡ PTS-100
- ⚡ PTS-100F
- ⚡ PTS-130
- ⚡ PTS-130F
- ⚡ PTS-200
- ⚡ PTS-200F
- ⚡ PTS-300
- ⚡ PTS-300F
- ⚡ PTS-600
- ⚡ PTS-600F

### Options Available

- Digital Meters
- Safety ground sticks (Included with all DC Hipot - Megommeter Test Sets)
- Hand Safety Interlock Switch
- Foot Safety Interlock Switch
- Reusable Shipping Case

## Model PTS-37.5 / PTS-37.5F DC Hipot and Megohmmeter

The **PTS-37.5 / PTS-37.5F** (F5 or 6) is a CE marked DC hipot and megohmmeter in one convenient package for testing the dielectric strength and insulation resistance of electric insulation such as cable, switchgear, motors, transformer, insulators, generators, and other electrical apparatus.



CE

<b>Input:</b>	(PTS-37.5) 120 V, 60 Hz, 10 A, +/-1% input voltage regulator 1,2 (PTS-37.5F*) 230 V, 50/60 Hz, 5 A, +/-1% input voltage regulator 1,2
<b>Output:</b>	0 – 37.5 kV DC @ 10 mA, negative polarity, positive ground Full Wave Bridge Rectification
<b>Duty:</b>	Continuous
<b>Voltmeter:</b>	3.5", scaled 0 – 15/37.5 kV DC, ±2% F.S. 3.5", scaled 0 – 1.0 µA <sub>dc</sub> , ±2% F.S. with multipliers of x 1, x 10, x 100, x 1 k, x 10 k
<b>Current Meter:</b>	Guard/ground load return
<b>Megohmmeter:</b>	Scaled 100 -1 MΩ with multipliers of x 0.1, x 1, x 10, x 100, x 1 k
<b>Size &amp; Weight: (W x D x H)</b>	14 x 11 x 14 in., 50 lb. 356 x 279 x 356 mm, 23 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded output cable with alligator clamp

\* Frequency Dependent

## Model PTS-75 / PTS-75F DC Hipot and Megohmmeter

The **PTS-75 / PTS-75F** (F5 or 6) is a CE marked DC hipot and megohmmeter in one convenient package for testing the dielectric strength and insulation resistance of electric insulation such as cable, switchgear, motors, transformer, insulators, generators, and other electrical apparatus.



CE

<b>Input:</b>	(PTS-75) 120 V, 60 Hz, 10 A, +/-1% input voltage regulator 1,2 (PTS-75F*) 230 V, 50/60 Hz, 5 A, +/-1% input voltage regulator 1,2
<b>Output:</b>	0 – 75 kV DC @ 10 mA, negative polarity, positive ground Full Wave Bridge Rectification
<b>Duty:</b>	Continuous
<b>Voltmeter:</b>	3.5", scaled 0 – 37.5/75 kV DC, ±2% F.S.
<b>Current Meter:</b>	3.5", scaled 0 – 1.0 uA DC, ±2% F.S. with multipliers of x 1, x 10, x 100, x 1 k, x 10k Guard/ground load return
<b>Megohmmeter:</b>	Scaled 100 -1 MΩ with multipliers of x 0.1, x 1, x 10, x 100, x 1 k
<b>Size &amp; Weight: (W x D x H)</b>	14 x 11 x 18 in., 68 lb. 356 x 279 x 457 mm, 31 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded output cable with alligator clamp

\* Frequency Dependent

## Model PTS-80 / PTS-80F DC Hipot and Megohmmeter

The **PTS-80 / PTS-80F** is a CE marked DC hipot and megohmmeter in one convenient package for testing the dielectric strength and insulation resistance of electric insulation such as cable, switchgear, motors, transformer, insulators, generators, and other electrical apparatus.



<b>Input:</b>	(PTS-80) 120 V, 60 Hz, 10 A (PTS-80F) 230 V, 50/60 Hz, 5 A
<b>Output:</b>	0 – 80 kV DC @ 10 mA, negative polarity, positive ground Full Wave Bridge Rectification
<b>Duty:</b>	Continuous
<b>Voltmeter:</b>	3.5", scaled 0 – 37.5/75 kV DC, $\pm 2\%$ F.S.
<b>Current Meter:</b>	3.5", scaled 0 – 1.0 $\mu$ A DC, $\pm 2\%$ F.S. with multipliers of x 1, x 10, x 100, x 1 k, x 10k Guard/ground load return
<b>Megohmmeter:</b>	Scaled 100 – 1 M $\Omega$ with multipliers of x 0.1, x 1, x 10, x 100, x 1 k
<b>Size &amp; Weight: (W x D x H)</b>	14 x 11 x 18 in., 68 lb. 356 x 279 x 457 mm, 31 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded output cable with alligator clamp

## Model PTS-100 / PTS-100F DC Hipot and Megohmmeter

The **PTS-100 / PTS-100F** is a CE marked DC Hipot designed as a two-piece system with a small, portable controller and high voltage section with 20 ft. shielded output cable.



<b>Input:</b>	(PTS-100) 120 V, 60 Hz, 10 A (PTS-100F) 230 V, 50/60 Hz, 5 A
<b>Output:</b>	0 – 100 kV DC @ 10 mA, negative polarity, positive ground Full Wave Bridge Rectification
<b>Duty:</b>	Continuous
<b>Voltmeter:</b>	3.5", scaled 0 – 50/100 kV DC, $\pm 2\%$ F.S.
<b>Current Meter:</b>	3.5", scaled 0 – 1.0 $\mu$ A DC, $\pm 2\%$ F.S. with multipliers of x 1, x 10, x 100, x 1 k, x 10k Guard/ground load return
<b>Megohmmeter:</b>	Scaled 100 -1 M $\Omega$ with multipliers of x 0.1, x 1, x 10, x 100, x 1 k
<b>Size &amp; Weight: (W x D x H)</b>	Case: 14 x 11 x 14 in., 30 lb. 356 x 279 x 356 mm, 14 kg HV Tank: 9.5 x 11.75 x 14.5 in., 68 lb. 241 x 298 x 368 mm, 31 kg
<b>Output Termination:</b>	20 ft. (6 m) shielded EPR output cable with alligator clamp EPR cable stays flexible in cold weather

## Model PTS-130 / PTS-130F

## DC Hipot and Megohmmeter

The **PTS-130 / PTS-130F** is a CE marked DC Hipot designed as a two-piece system with a small, portable controller and high voltage section with 20 ft. shielded output cable.



CE

**Input:** (PTS-130) 120 V, 60 Hz, 15 A  
(PTS-130F) 230 V, 50/60 Hz, 8 A

**Output:** 0 – 130 kV DC @ 10 mA, negative polarity, positive ground  
Full Wave Bridge Rectification

**Duty:** Continuous

**Voltmeter:** 3.5", scaled 0-70/150 kV DC,  $\pm 2\%$  F.S.

**Current Meter:** 3.5", scaled 0-1.0  $\mu$ A DC,  $\pm 2\%$  F.S. with multipliers  
of x 1, x 10, x 100, x 1 k, x 10 k  
Guard/ground load return

**Megohmmeter:** Scaled 100 -1 M $\Omega$  with multipliers of x 0.1, x 1, x 10, x 100, x 1 k

**Size & Weight:**  
(W x D x H)  
Case: 14 x 11 x 14 in., 34 lb.  
356 x 279 x 356 mm, 15 kg  
HV Tank: 12.5 x 12 x 18 in., 82 lb.  
318 x 305 x 457 mm, 37 kg

**Output Termination:** 20 ft. (6 m) shielded EPR output cable with alligator clamp  
EPR cable stays flexible in cold weather

## Model PTS-200 / PTS-200F

## DC Hipot and Megohmmeter

The **PTS-200 / PTS-200F** is a CE marked DC Hipot designed as a two-piece system with a small, portable controller and high voltage section with 20 ft. shielded output cable.



CE

**Input:** (PTS-200) 120 V, 60 Hz, 15 A  
(PTS-200F) 230 V, 50/60 Hz, 8 A

**Output:** 0 – 200 kV DC @ 5 mA, negative polarity, positive ground  
Full Wave Bridge Rectification

**Duty:** Continuous

**Voltmeter:** 3.5", scaled 0-80/200 kV DC,  $\pm 2\%$  F.S.

**Current Meter:** 3.5", scaled 0-1.0  $\mu$ A DC,  $\pm 2\%$  F.S. with multipliers  
of x 1, x 10, x 100, x 1 k, x 10 k  
Guard/ground load return

**Megohmmeter:** Scaled 100 – 1 M $\Omega$  with multipliers of x 0.1, x 1, x 10, x 100, x 1 k

**Size & Weight:**  
(W x D x H)  
Case: 14 x 11 x 14 in., 34 lb.  
356 x 279 x 356 mm, 15 kg  
HV Tank: 13 x 14.5 x 30.5 in., 150 lb.  
330 x 368 x 775 mm, 68 kg

**Output Termination:** 20 ft. (6 m) shielded EPR output cable with alligator clamp  
EPR cable stays flexible in cold weather

## Model PTS-300BT / PTS-300BTF

The **PTS-300BT / PTS-300BTF** is a CE marked DC Hipot designed as a two-piece system with a small, portable controller and a single piece high voltage section housed in a fiberglass cylinder with a spinning output.



<b>Input:</b>	(PTS-300BT) 120 V, 60 Hz, 30 A (PTS-300BTF) 230 V, 50 Hz, 15 A
<b>Output:</b>	0-300kV @ 10mA Full Wave Bridge Rectification
<b>Polarity/Ripple:</b>	Negative output, positive ground Ripple 2% – 3% depending on model
<b>Duty:</b>	Continuous, capacitive charging
<b>Voltmeter:</b>	PTS-300: 0 – 120/300 kV DC, +/- 2% FS accuracy
<b>Current Meter:</b>	0 – 1.0 dc $\mu$ A w/x1, x10, x100, x1 k, x10 k, +/- 2% FS accuracy
<b>Megohmmeter:</b>	100 – 1 M $\Omega$ w/x.1, x1, x10, x100, x1k ranges, w/analog meters
<b>Size &amp; Weight: (W x D x H)</b>	Controls: 14 x 11 x 14 in., 34 lb. 356 x 279 x 356 mm, 15 kg Tank: 36 in. base, 15 in. dia. cylinder x 43.5 in. h, 380 lb. 914 mm base, 381 mm dia. cylinder, 1105 mm h, 172 kg
<b>Output Termination:</b>	Toroid Output

## Model PTS-600BT / PTS-600BTF

The **PTS-600BT / PTS-600BTF** is a CE marked DC Hipot designed as a two-piece system with a small, portable controller and a single piece high voltage section housed in a fiberglass cylinder with a spinning output.



<b>Input:</b>	(PTS-600BT) 120 V, 50/60 Hz, 30 A (PTS-600BTF) 230 V, 50 Hz, 15 A
<b>Output:</b>	0-600kV @ 5mA Full Wave Bridge Rectification
<b>Polarity/Ripple:</b>	Negative output, positive ground Ripple 2% – 3% depending on model
<b>Duty:</b>	Continuous, capacitive charging
<b>Voltmeter:</b>	0 – 300/600 kV DC, +/- 2% FS accuracy
<b>Current Meter:</b>	0 – 1.0 dc $\mu$ A w/x1, x10, x100, x1 k, x10 k, +/- 2% FS accuracy
<b>Megohmmeter:</b>	100 – 1 M $\Omega$ w/x.1, x1, x10, x100, x1k ranges, w/analog meters
<b>Size &amp; Weight: (W x D x H)</b>	Controls: 21 x 15.5 x 15 in., 70 lb. 535 x 395 x 382 mm, 32 kg Tank: 36 in. base, 15 in. dia. cylinder x 89 in. h, 580 lb. 914 mm base, 381 mm dia. cylinder, 1105 mm h, 263 kg
<b>Output Termination:</b>	Toroid Output



# Oil Dielectric Test Sets

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## DTS Series

- ⚡ DTS-60D
- ⚡ DTS-60DF
- ⚡ DTS-60A
- ⚡ DTS-60AF
- ⚡ DTS-100D
- ⚡ DTS-100DF
- ⚡ DTS-100A
- ⚡ DTS-100AF

### Options Available

- Reusable Shipping Case
- Test Cell for ASTM D877 Standard
- Test Cell for ASTM D1816 Standard
- Test Cell for IEC 156 Standard

## Model DTS-60D / DTS-60DF Oil Dielectric AC Test Set

The CE marked **DTS-60D / DTS-60DF** offers 0 - 60 kV AC output, three user-selectable automatic voltage rates-of-rise, and automatic voltage shutdown with the meter indicating the breakdown voltage of the insulating liquid under test. Convenience features like a removable oil drip tray and removable storage shelf to keep up to 2 test cells organized for storage and transportation make our DTS series ideal for field use. Various test cells are available.



<b>Input:</b>	(DTS-60D) 120 V, 60 Hz, 7 A (DTS-60DF) 230 V, 50/60 Hz, 4 A
<b>Output:</b>	0 – 60 kV AC, 800 VA resistive load
<b>Voltmeter:</b>	3.5" digital LED, scaled 0 – 60 kV AC, $\pm 2\%$ F.S.
<b>Optional Test Cells:</b>	TCD-3 for ASTM D877, TCD-5 for ASTM D1816, TCD-I2 for IEC 156
<b>Operating Temperature:</b>	14° to 104° F, -10° to 40° C
<b>Distortion:</b>	Less than 5%
<b>Size &amp; Weight: (W x D x H)</b>	15 x 14 x 11.5 in., 65 lb. 381 x 356 x 292 mm, 29.5 kg
<b>Output Termination:</b>	Dual capacitive graded bushings with cradle contact mounting in test chamber

## Model DTS-60A / DTS-60AF Oil Dielectric AC Test Set

The **DTS-60A / DTS-60AF** is a fully automatic liquid dielectric test set, typically used for testing the voltage breakdown level of insulating oils. The most common world standards are preprogrammed into the controls. Just hit the start button and the test is performed. Custom test sequences can also be programmed. Test results stored internally can be downloaded to a computer or printed using the on board thermal printer. Convenience features like a removable oil drip tray and removable storage shelf to keep up to 2 test cells organized for storage and transportation make our DTS series ideal for field use.



<b>Input:</b>	(DTS-60A) 120 V, 60 Hz, 7 A (DTS-60AF) 230 V, 50/60 Hz, 4 A
<b>Output:</b>	0 – 60 kV AC, 800 VA resistive load
<b>Optional Test Cells:</b>	TCD-3 for ASTM D877, TCD-5 for ASTM D1816, TCD-I2 for IEC 156
<b>Controls:</b>	10 pre-programmed test sequences User programmable test routines 128 x 64 dot matrix crystal display Intuitive, easy to use controls English, German, Spanish, French, Greek Thermal printer
<b>Size &amp; Weight: (W x D x H)</b>	15 x 14 x 11.5 in., 65 lb. 381 x 356 x 292 mm, 29 kg

## Model DTS-100D / DTS-100DF Oil Dielectric AC Test Set

The CE marked **DTS-100D / DTS-100DF** offers 0 – 100 kV AC output, three user-selectable automatic voltage rates-of-rise, and automatic voltage shutdown with the meter indicating the breakdown voltage of the insulating liquid under test. Its durable aluminum construction and small footprint make it ideal for field or laboratory use. Various test cells are available.



**Input:** (DTS-100D) 120 V, 60 Hz, 7 A  
(DTS-100DF) 230 V, 50/60 Hz, 4 A

**Output:** 0 – 100 kV AC, 800 VA resistive load

**Voltmeter:** 3.5" digital LED, scaled 0 -100 kV AC,  $\pm 2\%$  F.S.

**Optional Test Cells:** TCD-N3 for ASTM D877, TCD-N5 for ASTM D1816, TCD-NI2 for IEC 156

**Operating Temperature:** 14° to 104° F, -10° to 40° C

**Distortion:** Less than 5%

**Size & Weight:** 18.5 x 16.5 x 16.5 in., 100 lb.  
(W x D x H) 470 x 419 x 419 mm, 45 kg

**Output Termination:** Dual high voltage sections with brass corona spheres in test chamber

## Model DTS-100A / DTS-100AF Oil Dielectric AC Test Set

The **DTS-100A / DTS-100AF** is a fully automatic liquid dielectric test set, typically used for testing the voltage breakdown level of insulating oils. The most commonly used testing standards are preprogrammed into the controls. Just hit the start button and the test is performed. Custom test sequences can also be programmed. The results are stored internally for downloading to a computer and/or for printing on the printer included.



**Input:** (DTS-100A) 120 V, 50/60 Hz, 7 amps  
(DTS-100AF) 230 V, 50/60Hz, 4 amps

**Output:** 0 – 100 kVac, 800 VA resistive

**Optional Test Cells:** TCD-N3 for ASTM D877, TCD-N5 for ASTM D1816, TCD-NI2 for IEC 156

**Controls:** 10 pre-programmed test sequences  
User programmable test routines  
128 x 64 dot matrix crystal display  
Intuitive, easy to use controls  
English, German, Spanish, French, Greek  
Thermal printer

**Size & Weight:** 18.5 x 16.5 x 16.5 in., 100 lb.  
(W x D x H) 470 x 419 x 419 mm, 45 kg

# HV AC/DC Dividers

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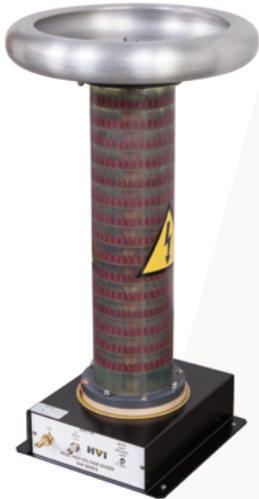
## DVR Series

⚡ DVR-150

⚡ DVR-300

## Model DVR-150 HV AC/DC Divider

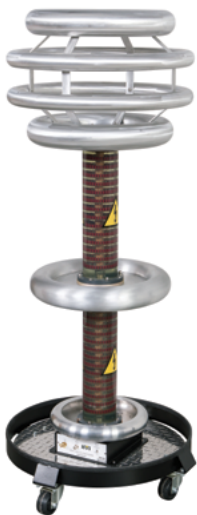
The **DVR-150** is HVI's 150 kV precision divider that functions as a probe for your oscilloscope or multimeter. Designed with a precision resistor / capacitor network, it provides a low voltage output signal proportional to the applied high voltage. The low-end impedance is switch selectable between 1 MOhm and 10 MOhm, to match your measuring device. Suitable for DC or AC (up to 1 kHz sinusoidal) measurements. Perfect for in-house high voltage calibrations, no external power source required. This divider is not designed for impulse or square wave applications. A reusable shipping case is an available option for the DVR-150.



<b>Voltage Range:</b>	1-150 kV DC or AC to 1 kHz sinusoidal
<b>Output:</b>	1 V per 1 kV applied (1000:1 ratio)
<b>Divider Accuracy:</b>	±0.5%, -14 to 104o F, -10 to 40o C
<b>Input Resistance:</b>	715 MΩ
<b>Input Capacitance:</b>	96.3 pF
<b>Cable Length:</b>	25 ft. (7.6 m) RG 58/U coaxial cable
<b>Divider Termination:</b>	13 in. (330 mm) diameter spinning
<b>Size &amp; Weight:</b>	13 x 13 x 24.5 in., 20 lb.
<b>(W x D x H)</b>	330 x 330 x 622 mm, 9 kg

## Model DVR-300 HV AC/DC Divider

The **DVR-300** is HVI's 300 kV precision divider that functions as a probe for your oscilloscope or multimeter. Designed with a precision resistor / capacitor network, it provides a low voltage output signal proportional to the applied high voltage. The low-end impedance is switch selectable between 1 MOhm and 10 MOhm, to match your measuring device. Suitable for DC or AC (up to 1 kHz sinusoidal) measurements. Perfect for in-house high voltage calibrations, no external power source required. This divider is not designed for impulse or square wave applications



<b>Voltage Range:</b>	1-300 kV DC or AC to 1 kHz sinusoidal
<b>Output:</b>	1 V per 10kV applied (10,000:1 ratio)
<b>Divider Accuracy:</b>	±0.5%, -14 to 104o F, -10 to 40o C
<b>Input Resistance:</b>	1430 MΩ
<b>Input Capacitance:</b>	49.0 pF
<b>Cable Length:</b>	25 ft. (7.6 m) RG 58/U coaxial cable
<b>Divider Termination:</b>	15.75 x 23 in. top pipe toroid spinning
<b>Size &amp; Weight:</b>	24 x 24 x 61 in., 85 lb.
<b>(W x D x H)</b>	609 x 609 x 1549 mm, 39 kg



# NOTES





-  [hvinc.com](http://hvinc.com)
-  **31 County Rt. 7A • Copake, NY 12516**
-  **phone: 518.329.3275**
-  **fax: 518.329.3271**
-  **email: [sales@hvinc.com](mailto:sales@hvinc.com)**

© **COPYRIGHT 2018 - HIGH VOLTAGE, INC.** – Manufacturers of high voltage test equipment. Products include portable VLF AC .1Hz to .01Hz. Very Low Frequency, sinewave output hipots up to 200 kV; Tan delta and PD diagnostic measurement bridges for cable diagnostics, portable switchgear and bottle testers up to 100 kV AC ; Portable DC Hipots/Megohmmeters to 300 kV DC ; Oil Test sets at 60 kV or 100 kV; Aerial lift and bucket truck testers to 300 kV AC; High Power AC Dielectric test sets up to 300 kV AC @ 40 KVA; OHM Check concentric neutral tester; Controlled energy cable fault locators, Radar and Tracing devices; 150 kV and 300 kV HV voltage dividers.