



HIGH VOLTAGE, INC.
AC DIELECTRIC TEST SETS
HPA SERIES PRODUCT CATALOG

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DURABLE AC DIELECTRIC TEST SETS FOR PRODUCTION, WITHSTAND, PARTIAL DISCHARGE, AND OTHER DIAGNOSTIC TESTING

HVI offers a full line of AC Dielectric Test Sets up to 300 kV in voltage and 40 kVA in power designed for over voltage withstand testing for sample or production testing applications. These higher power AC dielectric test sets are commonly used for testing capacitors, insulators, switchgear, buss duct, hot-line tools, aerial lifts, bucket liners, transformers and other loads that draw more current than a conventional AC hipot can output. Specialty models also available designed specifically for motor winding, ASTM D149 testing, or as a power supply for performing Tan Delta, Power Factor, Partial Discharge, or other type of diagnostic testing. The HPA series are designed and built here in the USA with either oil filled steel or fiberglass high voltage sections with well designed, attractive controllers with all the high end features custom fit to your testing requirements. The high voltage sections are also available for integration into larger custom test systems, like our 50 kV @ 10 kVA HV tank used in equipment for dielectric testing of rubber gloves, aerial lift liners, hot sticks, and other OEM applications. If lower power models are sufficient for your application, then consider our standard, portable PFT Series of 1 kVA and 3 kVA AC Hipots, available from 10 kV – 100 kV or ALT Series of 7kVA AC Hipots.

How to Select an AC Dielectric Test Set?

Don't Undersize The Set

AC high voltage testing requires higher power and current ratings when compared to DC testing the same test object. There are several parameters that must be considered when selecting an AC hipot or dielectric test set, the most important one being the capacitance of the load. This capacitance dictates the amount of output power, or the relationship of the amount of current drawn by the device under test to the specified test voltage required from the test set. Following are several considerations when specifying a test set:

Voltage Output

Select a test set with 20 – 25% more voltage than your requirement for enough voltage headroom to compensate for any possible future changes in testing standards or the testing application. The output current of the test set is based on the kVA, or Power rating at full voltage. Any increase in the output voltage rating for the same kVA rated test set will proportionately decrease the current rating.



HPA-10020CF3

Power/Current Rating

The HPA series are listed by their kVA, or power rating. Power rating, or kVA is calculated by multiplying the maximum output voltage by the maximum output current. When AC testing, most loads appear capacitive. To apply high voltage AC at power frequency, 50 or 60 Hz to a capacitive load requires higher power and current ratings from the test set than most portable AC hipots can typically supply. The capacitance of the load must be known in order to calculate the required current at the desired test voltage. 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:



HPA-1005C5D149

$$A = 2\pi fCV$$

A = Test current required in Amps (A)

f = Test frequency in Hertz (Hz)

C = Load capacitance in Farads (F)

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 draw of the device under test at the actual higher test voltage should be a linear increase. For example, if your test load draws 10 mA @ 5 kV it will draw approximately 100 mA @ 50 kV. An AC test set is a constant current device, the maximum output current is the same at any output voltage.

Duty Cycle

Most AC dielectric strength testing is short duration testing performed for 60 seconds at a time, however, production testing may require consecutive tests over many hours. Most HPA AC test sets are rated for 50% duty. The full power rating can be delivered for one hour on followed by one hour off. Most HPA AC test sets are rated for continuous duty at approximately 80% of the full power rating.

Partial Discharge Requirements

Many of the HPA Series AC test sets are rated for <10pc of partial discharge at full output voltage. Models with an oil filled steel tank and using an output bushing are rated to <10pc, while models with fiberglass HV sections and/or a cable output are not PD rated. <5pc of partial discharge is available upon request.



HPA-1010FC3

Summary

When performing an AC Withstand, Power Factor, Tan Delta, or Partial Discharge testing on MV/HV apparatus, aerial lifts, motors, generators, or cable, the AC charging current can be high depending on the capacitance of the device under test. The test voltage is determined by the applicable test standard. The expected or real current draw of the test load at your test voltage and/or capacitance of the device under test must be known to size the set.

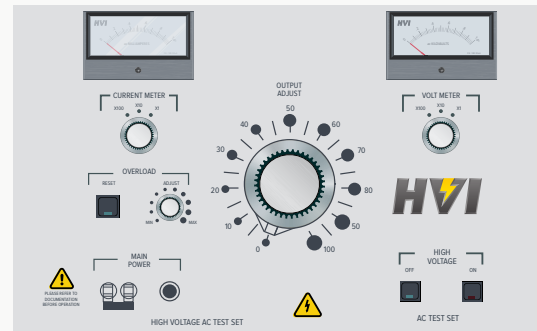
Customizable Controls and Configurations

Five Control Packages; Variations Available on Custom Basis

Various control packages are available, from simple manual controls to fully programmable logic control (PLC) options.

C1 Controls: 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, 10-110% of rated output current
- External interlock provisions



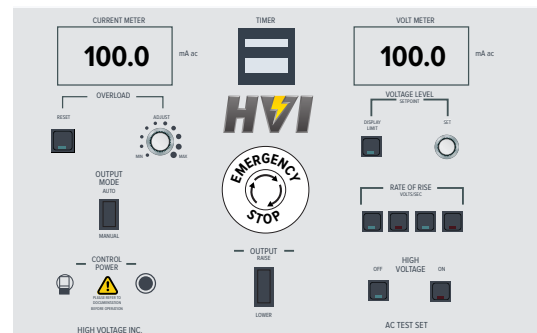
C2 Controls: Simplified Controls w/motorized output voltage control – up to 10 kVA

- 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
- Variable Overload w/reset, 10-110% of rated output current
- Emergency Off button
- External interlock provisions



C3 Controls: Automatic Controls with 3.5 Digit Digital Metering – any kVA

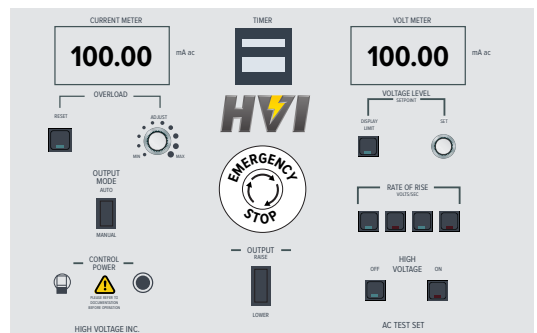
- Voltage meter: digital 3.5 digits
- Current meter: digital 3.5 digits
- Control Power breaker
- HV On/Off
- Output Mode: Manual/Auto
- Output Voltage: Raise/Lower control Four fixed volts/second rates-of-rise 10 – 100 seconds, consult factory
- Test Dwell timer
- Variable Overload w/reset, 10-110% of rated output current
- Emergency Off button
- External interlock provisions



C4 Controls: Automatic Controls with 4.5 Digit Digital Metering – any kVA

This is the same functionality as the C3 control package with 4.5 digit meters. The 4.5 digit meters instead of 3.5 digits offer a higher resolution in reading the voltage and current displayed.

- Voltage meter: digital 4.5 digits
- Current meter: digital 4.5 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, 10-110% of rated output current
- Emergency Off button
- External interlock provisions



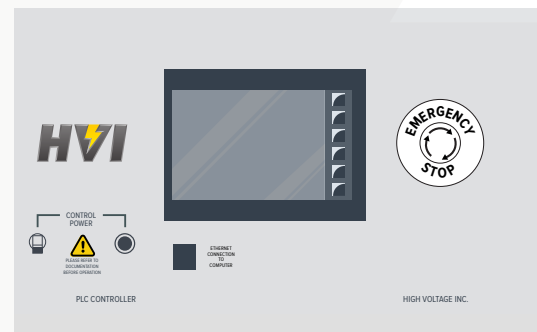
C5 Controls - PLC programmed and controlled – any kVA

The C5 PLC controller provides an on-board PLC for complete operational and programming control and includes a PC interface to download tests results for report generation. The PLC can fully automate repetitive testing in automatic mode or perform simple hipot tests in manual mode. Test profiles for automatic mode can be preset at the factory or can be entered via the touch screen control. Operation is easily modified using Ladder Logic Programming. The C5 controller allows the user to fully program the operation of the set from the PLC and allows complete downloading of test results for report generation using your reporting software.

- 320 x 240 color touch screen display for programming and operation
- Graphical display of output voltage and current during test
- Output voltage and current final test results displayed
- PC Interface for data download via RS-232
- Save and recall test profiles easily
- External interlock provisions

User Selectable/Settable Parameters:

- Automatic or Manual Mode
- Voltage set point
- Over Current set point
- Test Dwell Timer
- Voltage Rate of Rise (10-100 Seconds)



Optional Upgrades

PLC Interface

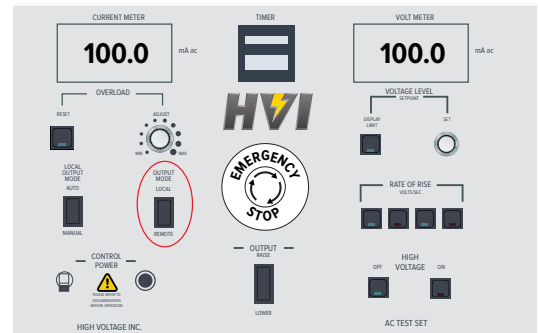
A C3 or C4 controller that also offers input and output control provisions to interface with a remote programmable logic controller (PLC) or some other customer supplied controller. It can be operated in the Local mode using the front panel controls or in the Remote mode via customer supplied external controls. Includes 0-10Vdc Input Control and Output Feedback signals, permitting the remote control over the dielectric test set for most functions with output signals to communicate to an external customer supplied PLC controller. When in the REMOTE mode, all front panel controls are disengaged except for the Emergency Off, Voltmeter and Current meter. Available only on the C3 and C4 control packages.

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: N/O
- 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



BURN Circuit

An optional BURN reactor provides the ability to enable current limiting of the output for burning a fault within the device under test in order to locate it. The OVERLOAD function is disabled when BURN is ON. Available on all control packages.



Guard Circuit

Adds Guard circuit to the current metering circuit. Used for measuring accurate leakage current of the device under test by shunting ground current around the current meter.



Flashing Warning Light

Flashing Red Warning Lamp that illuminates when the high voltage circuit has been energized. Available on all control packages.



Safety Light Stack

Status light option, illuminates green when the high voltage circuit is not energized and illuminates red when the high voltage circuit is energized. Available on all control packages.



Safety Key Interlock Switch

Front panel mounted key operated interlock switch. Available on all control packages.



Casters

2 inch or 6 inch casters mounted under the Control and/or High Voltage Section. Available on all control packages.



4 Wheel Push Cart

Two piece HPA steel tank models can be mounted on a 4 wheel push cart with pneumatic tires for portability in the field or factory. Consult factory for availability.

High Voltage Section Configurations

Except for the lowest voltage 5 kVA, 10 kVA, and 20 kVA models 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. 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.

A half voltage, full kVA secondary output is optional on many of the HPA AC Dielectric Test Sets. This allows for lower voltage but higher current testing when compared to the full voltage, full kVA output tap. Both output voltage taps will be active at the same time. The pictures below for examples of the various layout configurations.



Cable Output

Standard on 10kV and below up to 20kVA. Optional half voltage, full kVA separate output tap available. No PD Spec.



Bushing Output

Standard on 10kV to 150kV, Optional 10kV and below. Optional half voltage, full kVA separate output tap available. PD free at less than 10pc. Less than 5pc available upon request.



Toroidal Output

200kV and above. Optional half voltage, full kVA separate output tap available on some models, consult factory. , No PD Spec.

Matrix of Models/Specs

AC Dielectric Models:

5kVA

- Input: 230V, 50/60Hz, 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 | 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 | 200/91 | none - one piece design | | | | NA | |
| 30 | HPA-305FC* | 167 | • | • | • | 75/34 | 13/330 | 13/330 | 21/533 | 95/43 | steel | |
| 50 | HPA-505FC* | 100 | • | • | • | 75/34 | 13/330 | 13/330 | 21/533 | 95/43 | steel | |
| 75 | HPA-755FC* | 67 | • | • | • | 75/34 | 13/356 | 13/356 | 21/635 | 95/43 | steel | |
| 100 | HPA-1005FC* | 50 | • | • | • | 145/66 | 145/66 | 18.5/470 | 34/864 | 300/136 | steel | |

- C1 Controls: 21" W x 16" D x 15" H. 533 mm W x 406 mm D x 381 mm H
- C2, 3, 4, or 5 Controls: 21" W x 25" D x 30.5" H. 533 mm W x 635 mm D x 775 mm H

10kVA

- Input: 230V, 50/60Hz, 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 | 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 | 390/177 | none - one piece design | | | | NA | |
| 30 | HPA-3010FC* | 333 | 21/533 | 25/635 | 30.5/775 | 200/91 | 13/330 | 13/330 | 25/635 | 215/97 | steel | |
| 50 | HPA-5010FC* | 200 | 21/533 | 25/635 | 30.5/775 | 200/91 | 13/330 | 13/330 | 25/635 | 215/97 | steel | |
| 75 | HPA-7510FC* | 133 | 21/533 | 25/635 | 30.5/775 | 200/91 | 17/432 | 17/432 | 32/813 | 275/125 | steel | |
| 100 | HPA-10010FC* | 100 | 21/533 | 25/635 | 30.5/775 | 200/91 | 18/457 | 18/457 | 37.5/953 | 325/147 | steel | |
| 150 | HPA-15010FC* | 67 | 21/533 | 25/635 | 30.5/775 | 200/91 | 22/559 | 33/838 | 48/1219 | 700/317 | steel | |

*Insert a 1, 2, 3, 4, or 5 to the model number in place of the * to specify which controller, described starting on page 4.

*OPTION: On 5 kVA - 40 kVA models, a 50% voltage tap rated full kVA is optional, consult factory

20kVA

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

| Volt (kV) | Model | Current mA | Control Section | | | | HV Section | | | | |
|-----------|--------------|------------|-----------------|----------|-----------|-----------|-------------------------|----------|-----------|-----------|-------------|
| | | | W in/mm | D in/mm | H in/mm | WT LBS/KG | W in/mm | D in/mm | H in/mm | WT LBS/KG | Type |
| 10 | HPA-1020FC* | 2000 | 21/559 | 25.5/648 | 47.3/1200 | 530/241 | none - one piece design | | | | NA |
| 30 | HPA-3020FC* | 667 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 17/432 | 17/432 | 25/635 | 300/136 | steel |
| 50 | HPA-5020FC* | 400 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 17/432 | 17/432 | 25/635 | 300/136 | steel |
| 75 | HPA-7520FC* | 267 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 17/432 | 17/432 | 25/635 | 325/147 | steel |
| 100 | HPA-10020FC* | 200 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 18.5/470 | 18.5/470 | 37.5/953 | 375/170 | steel |
| 150 | HPA-15020FC* | 133 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 29/737 | 30/762 | 56/1422 | 1050/476 | steel |
| 200 | HPA-20020FC* | 100 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 28/711 | 28/711 | 56.5/1435 | 1120/508 | fiber-glass |
| 300 | HPA-30020FC* | 67 | 21/559 | 25.5/648 | 47.3/1200 | 300/136 | 28/711 | 28/711 | 82/2083 | 1600/726 | fiber-glass |

40kVA

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

| Volt (kV) | Model | Current mA | Control Section | | | | HV Section | | | | |
|-----------|--------------|------------|-----------------|---------|---------|-----------|------------|---------|---------|-----------|-------|
| | | | W in/mm | D in/mm | H in/mm | WT LBS/KG | W in/mm | D in/mm | H in/mm | WT LBS/KG | Type |
| 10 | HPA-1040FC* | 4000 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/533 | 32/813 | 850/385 | steel |
| 30 | HPA-3040FC* | 1333 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/533 | 32/813 | 865/392 | steel |
| 50 | HPA-5040FC* | 800 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/533 | 32/813 | 875/397 | steel |
| 75 | HPA-7540FC* | 533 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/533 | 37/940 | 550/250 | steel |
| 100 | HPA-10040FC* | 400 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/787 | 45/1143 | 1100/499 | steel |
| 150 | HPA-15040FC* | 267 | 22/559 | 31/787 | 67/1702 | 500/227 | 28/711 | 21/787 | 58/1473 | 1315/596 | steel |

*Insert a 1, 2, 3, 4, or 5 to the model number in place of the * to specify which controller, described starting on page 4.

*OPTION: On 5 kVA - 40 kVA models, a 50% voltage tap rated full kVA is optional, consult factory

Specialty Applications

ASTM D149 Testing

HVI offers custom AC Dielectric test sets purpose built for the testing of solid dielectric insulations at power frequency per the ASTM D149 standard, up to 100kV AC. Equipped with an interlocked test chamber, test chamber viewing window, optional custom test fixtures or an optional oil bath. Offered with C3, C4, or C5 control packages based on your testing needs. HVI has what you need for testing insulation films, sheets, mylars or other solid dielectric insulations. Consult factory for more information on custom ASTM D149 testing systems.



HPA-1005C5D149

AC Motor/Generator Testing

Motors and generators have some very specific high current test requirements, for this HVI offers the HPA-033MF which offers 0-3kV AC at 3kVA with up to 1 Amp of output current and the HPA-055MF which offers 0-5kV AC at 5kVA also with up to 1 Amp of available output current. Ready for field or factory use, these units are built into an upright cart for portability, terminated with a shielded output cable, the C1 control package, a burn circuit, and flashing warning light. For up to 12kV needs, HVI offers the **FPA-12/066F** which offers a dual output, 0-6kV AC at 6kVA with up to 1 amp and 0-12kV at 6kVA with up to 500mA of available output current. The FPA-12/066F is also built onto a cart, equipped with a C1 control package, a burn circuit, a guard circuit, and an safety light stack which make it ideal for field or factory testing as well.



HPA-055MF

| Volt (kV) | Model | Current mA | W in/mm | D in/mm | H in/mm | WT LBS/KG |
|-----------|-------------|------------|----------|----------|---------|-----------|
| 3 | HPA-033MF | 1000 | 14.5/370 | 21/535 | 48/1220 | 140/64 |
| 5 | HPA-055MF | 1000 | 14.5/370 | 21/535 | 48/1220 | 140/64 |
| 6/12 | FPA-12/066F | 1000/500 | 23/580 | 23.5/600 | 46/1170 | 215/98 |

Optional Accessories



DVR Series

The DVR-150 and DVR-300 are precision voltage dividers used to verify the voltage calibration of your HPA AC Dielectric Test Set.



Grounding Sticks

Safely confirm the device under test has been discharge and is at at ground potential before handling after testing.



Hand and Foot Safety Interlock Switches

Dead man style safety switches that connect to the external interlock provisions on the rear terminal block of the HPA AC Dielectric Test set The switch must be depressed before "HV On" and remain depressed during the duration of the testing. Releasing the switch has the same effect as hitting "HV Off", turning off the high voltage circuit. Supplied with 12 foot lead.



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