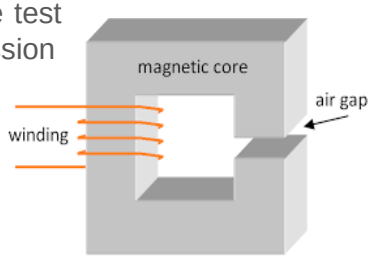
HOW MUCH CURRENT CAN I GET FROM MY AC HIPOT?

Why Less Than Expected, and "Tripping Off" the Hipot?

Overview of AC Hipots Input & Output Current Characteristics

The physics of AC voltage and current must be considered when specifying any AC output hipot, especially if now using DC. When AC testing cables, breakers, SG, etc., the loads appear as a capacitive element and can draw considerable charging currents as the AC voltage rises to its peak every ½ cycle. Unless testing a familiar load, or the capacitance of the load is known to calculate the current draw at the test voltage, the mAac required from the test set may be unknown. Following is a discussion of several factors affecting the available load currents, primary input currents, and current overload trip thresholds to be expected from AC hipots.



L = Inductance of Transformer

C = Capacitance of Load

Gapped Core Effect

The air gap creates additional Inductance in the circuit, designed to equal and cancel out ½ the capacitance of the load, reducing the input current.

HVI AC Hipot Design and RLC AC Circuit Theory

The **PFT Series** of AC hipots use a ***gapped-core HV transformer*** designed to **insert a calculated amount of inductive reactance** to the circuit to counter the capacitive reactance of the load. This minimizes the input/primary current into the hipot. This inductive compensation is designed to null ~50% of the capacitance of the load. In the case of the PFT-303CM or PFT-503CM, up to 3 kVA of Apparent/Reactive Power can be delivered to the load while consuming only 1.5 kVA of Real/True Power from the voltage source. This gapped core transformer design is also used on the **ALT Series** of aerial lift test sets.

The 3kVA rating is realized at full output voltage only. The PFT-303CM, rated for 0 – 30 kVac @ 3 kVA, will theoretically provide up to 100mA of load current, but only at 30 kVac and with the right capacitance load. But, since the 3 kVA load power would require up to 25 amps of input current from a 120 volt input, the gapped core adds a designed amount of inductance to provide a 50% compensation for the capacitive load. Now 3 kVA of power can be delivered with only 1.5 kVA of input power, or only 13 amps of input current at 120 volts, not 25 amps. **Advantage:** these 3 kVA hipots can be plugged into a standard 120 volt outlet and still deliver up to 3 kVA for testing capacitive loads.

Overload Current: The hipot may trip off at currents displayed on the current meter at levels less than anticipated. The overload circuit on the PFT Series reads the hipot primary, or input current, **not the actual load current**. The Overload circuit is designed to **"trip off" the hipot** when the input current reaches ~15 amps. This 15 amps can be reached with many different combinations of load voltage and current. (The inductance of the gapped core itself draws 7 amps of input current). The set overloads when the **current meter reads 60 – 80% of the maximum rating** of the model, or **60 - 80 mAac** if using a 100 mAac rated PFT-303CM or **40 - 50 mAac** if using a 60 mAac rated PFT-503CM.

Current Meter: The current meter reads the total output leakage current, which includes the 10 – 20 mAac from the shielded output cable (models ≤ 50 kVac) and other stray ground currents. Use the **Guard Return** circuit if precise load leakage currents must be measured or deduct the open circuit cable current (at the test voltage) from the total reading. Refer to the Operators Manual for further information.

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Maximum Load Current vs. Test Voltage for PFT & ALT Series

Maximum Current = Test Voltage/Full Voltage x 50%I + 50%I = Hipot Overload

PFT Series Load Rating Calculation

To calculate the maximum load current at any voltage, use the following formula:

(Test Voltage/Full Voltage) x 50%I + 50%I = Overload Current

(I = the maximum current rating of the hipot)

Example 1: A PFT-303CM rated 0 - 30 kVac @ 100 mAac set for a 12.5 kVac output voltage.

OL mAac = (12.5/30) x (.5 x 100) + (.5 x 100) = 70.8 mAac. When the current meter reaches this reading, the hipot primary is drawing its full rated power and the set will trip off.

Tech Note: The shielded output cable of this hipot draws **~15 mAac @ 30 kVac output** from the hipot. AC capacitive charging current is drawn as the voltage rises to peak every ¼ cycle.

Example 2: A PFT-503CM rated 0 - 50 kVac @ 60 mAac set for a 37 kVac output voltage.

OL mAac = (37/50) x (.5 x 60) + (.5 x 60) = 52 mAac.

ALT Series Load Rating Calculation

To calculate the maximum load current at any voltage, use the following formula:

(Test Voltage/Full Voltage) x 50%I + 50%I = Overload Current

(I = the maximum current rating of the hipot)

Example: An ALT-120/60 is rated 0 - 60 kVac @ 120 mAac and 0 - 120 kVac @ 60 mAac. If the 60 kVac output is used and set to test a liner at 35 kVac, the maximum current output reachable before the set trips on current overload is the following:

60 kVac output at 35 kVac: OL mAac = (35/60) x (.5 x 120) + (.5 x 120) = 95 mAac. When the current meter reaches 95 mAac, the primary is drawing full rated power and will trip off.

120 kVac output at 100 kVac: OL mAac = (100/120) x (.5 x 60) + (.5 x 60) = 53 mAac.

Tech Note: This model uses aluminum output terminations at each output tap. No capacitive current will be consumed as described above for the PFT Series models since no shielded EPR output cable is used. An uninsulated wire or pipe is recommended for connection to the load.

$I_{OL} = (kV_{TV}/kV_{HV}) \times .5I_H + .5I_H = I_{OL}$ hipot overload current

	kV_{TV}	kV_{HV}	mA_H	$.5I_H$	$.5I_H$	I_{OL}
Hipot Model	**Test Voltage Load (kVac)**	**Hipot Voltage Max. (kVac)**	**Hipot Current rating(mAac)**	**.5I Hipot Current (mAac)**	**.5I Hipot Max Gap Current (mAac)**	**Overload Max Current (mAac)**
PFT-503	37	50	60	30	30	**52**
PFT-503	27	50	60	30	30	**46**
PFT-303	27	30	100	50	50	**95**
PFT-303	19	30	100	50	50	**82**
PFT-103	8	10	300	150	150	**270**
ALT-120/60	50	60	120	60	60	**110**
ALT-120/60	35	60	120	60	60	**95**
ALT-120/60	100	120	60	30	30	**55**
ALT-210/50	160	210	32	16	16	**28**

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