



Questionnaire: Testing Motor & Generator Coils With AC High Voltage

Determining the Voltage and Current Needed for an AC Dielectric Test Set or a VLF Hipot for AC Withstand, Tan Delta/Power Factor, or Partial Discharge testing

High voltage motors and generators should undergo several AC voltage tests during and after their winding. This questionnaire is designed to gather the information needed to select the appropriate voltage and current rated AC test set or VLF AC hipot to perform **AC Withstand** testing at a minimum and **Tan Delta/Power Factor** and **Partial Discharge** testing if desired. The answers given will help us to understand and serve your needs for test equipment and aid our attempt to make it as easy as possible for you to specify, purchase, and use the equipment needed. Please help us.

➡ This PDF contains writable fields for your answers. Once completed, resave and email to sales@hvinc.com.

Your Company Information

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|-------------|----------------------|----------|----------------------|----------|----------------------|
| Company | <input type="text"/> | Name | <input type="text"/> | Title | <input type="text"/> |
| Address | <input type="text"/> | City/St. | <input type="text"/> | Zip Code | <input type="text"/> |
| Email | <input type="text"/> | Web | <input type="text"/> | Phone # | <input type="text"/> |
| Misc. Info. | <input type="text"/> | | | | |

Section 1: Describe Your Work

Please tell us what type of work your company performs, and in specific terms, the voltage class of equipment wound (2400V, 4160V, 6600V, 13.2kV, 25kV, etc.) to help us know your test voltage requirements. We need to know the voltages and the sizes (hp, kW, etc.) of the coils wound and the types of motors/generators to help us calculate the voltage and power ratings needed from an AC test set.

1a. What type of apparatus do you produce or rewind/repair?

1b. What are the input voltage ratings of the coils you work on?

1c. What power ratings do you work on: HP, kW, MW, etc....?

1d. Do you intend to upgrade your abilities to handle higher voltage rated machines in the future?

Section 2: High Voltage Testing Abilities and Needs

There are several high voltage tests that are performed on coils rated 2,400 volts and higher. The AC tests recommended as interim and final tests are: **AC Withstand (or hipot), a Tangent Delta/Power Factor test, and a Partial Discharge test. These three tests all require an AC overvoltage** to be applied to the coils. This voltage can be supplied either from 50/60 Hz power frequency AC test sets, Series Resonant Systems, or from 0.1 Hz output Very Low Frequency (**VLF**) AC testers defined by IEEE Standard 433-2009. (VLF technology has been used for decades to test high capacitance cables.)

The next few questions ask about your present test methods regarding AC overvoltage testing. If you don't perform the above tests tell us why; is it the expense of the high kVA AC testers needed, or the belief that using DC voltage instead of AC is good enough, do not fully understand AC testing, don't need it, is never speced, etc...? Tell us what high voltage tests you now perform and what additional or different tests you would like to be able to do.

2a. Do you perform overvoltage testing during and/or after rewind? If yes, describe the tests performed.

2b. Do you use AC and/or DC voltage and which one for which tests? Are you happy with that – is it good enough?

2c. If you use DC high voltage for withstand testing instead of AC, why, and why not AC?

2d. Do you ever need to test with AC per customer specs but must decline the job because of no AC hipot?

2e. Then what about Tan Delta & Partial Discharge testing which needs an AC voltage source to perform?

2f. Would you like to be able to withstand test coils with AC voltage? What about the two diagnostic tests?

2g. If you don't own/use AC, and would like to, what are the obstacles? Cost, size, knowledge, training, etc.?

2h. What HV test equipment do you now have and what would you like/need to buy next?



Section 3: Selecting the Power or Output Current Required from an AC Test Set

When applying an AC voltage to a winding, and many other loads, it is the capacitance of the test specimen that determines how much AC current is needed, since during each half cycle (<9 ms) of the waveform the capacitance must be charged to full voltage and discharged, requiring far more current than if using a DC tester. It is this fact of physics that requires AC test sets to be higher in power rating, thus larger, heavier, and more costly than DC testers, discouraging their use even though AC testing is the proper method of overvoltage hipoting most electrical apparatus, especially coils. Also, AC sinusoidal voltage is the necessary wave form to perform Tan Delta/Power Factor and Partial Discharge testing.

$A = 2\pi fVC$: A = Amperes of test current, f = frequency (50/60 Hz), V = test voltage in volts, C = Capacitance in farads

To select the power required from an AC test set, the uF rating, or capacitance, of the load (like stator bars to ground, or rotor coil to core), and/or the mA of current draw, both at the rated test voltages must be known. Data from old tests, vendor product data, experience, the mA of test current at a lower voltage - then scaled up, or some other method of learning the current needed is necessary to size the tester. Do you need a 5 kVA or 50 kVA AC Dielectric Test Set?

3a. Do you know the AC current at the maximum test voltage of your largest coil (highest capacitance) tested?

3b. If you can you measure the current at only 3 or 4 kVac with a smaller hipot, what is it? We can ratio it to full V.

3c. What is the lowest power or current rated AC hipot used in the past that worked, or close to it? Model #?

3d. Do all three phases need to be hipoted at once or can the phase leads be isolated to test one at a time?

3e. If you were to order an AC tester today, what would be your specifications, maybe a multi-test combo unit?

3f. Are simple manual controls adequate or must you have programmable automatic controls with data logging?

3g. Is there any other info you can provide to help figure the equipment needed? What would be your ideal spec?

This questionnaire was prepared by High Voltage, Inc. HVI produces many types of high voltage test equipment for utility and industrial applications. We strive to design and produce the best products you need. Your help in answering this questionnaire will help us to help you and our industry. Thank you for your participation. Call with questions.

