

HIGH VOLTAGE RELAY & CONTACTOR APPLICATIONS

HIGH VOLTAGE PROCESSING OF VACUUM RELAYS

Vacuum is an excellent dielectric. However, sometimes a vacuum relay may show reduced dielectric strength over a period of time. This is generally caused by a trace amount of free ions out-gassing from the metal or ceramic materials inside the relay. Normally, this is not noticeable because when the rated high voltage is applied, the free ions become charged and deposit themselves on the inside walls of the relays much like what occurs in a vacuum deposition process. Sometimes when the high voltage is first applied the relay may "burp" as the particles become charged. On other occasions, some relays may not clean themselves and may require external processing. The following procedure explains how to process these types of relays.

This is not applicable to gas filled relays.

1. Connect a high voltage AC or DC variable power supply in series with a 10 megohm resistor, a microampere meter, and the relay. The relay should be on the ground side of the power supply.
 - **SPST, Normally Open** - Apply rated "test voltage" voltage between open contacts.
 - **SPST, Normally Closed** - Apply coil voltage and apply rated "test voltage" voltage between open contacts. The base should be grounded.
 - **SPDT** - With the coil energized and de-energized, apply rated "test voltage" voltage between open contacts. Ground the base and connect the normally open contacts to the base.
 - **DPDT** - Process the same as a SPDT relay for each pole.
2. Immerse the relay in a dielectric fluid. Transformer oil or Florinert (FC-77 made by 3M) can be used. The florinert evaporates from the relay surface quickly and is a much cleaner operation.
3. Slowly raise the voltage to the rated "test voltage". At the maximum voltage, if leakage current is less than 5 micro amps and no glow is visible in a darkened room, then the vacuum is good and no further processing is necessary.
4. If a glow occurs at a voltage lower than maximum, hold the voltage just above the glow initiation level until the glow disappears. This can take a couple of minutes. Then drop the voltage and raise it again to the onset of glow, or until the maximum specified test voltage is reached. If a DC supply is used, reverse the polarity and repeat the process.
5. IF needed, processing at levels up to 20% above the maximum "test voltage" may be used.

*Please note the use of the word "pollution" and "pollutants" is used only as an illustration relative to the vacuum inside the relay. The pollutants could be pure oxygen, air, or anything.

WARNING: Above 15 kV for vacuum relays, X-rays are produced during high voltage processing. Refer to [X-ray emission in vacuum relays](#).

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