Venting of Sealed (washable) Relays (that have vents provided)

Introduction:

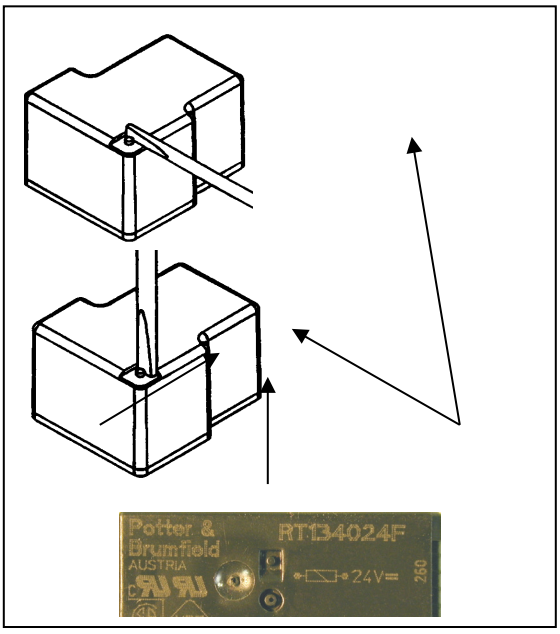
Unless specifically advised otherwise by TE Engineering, all sealed relays (that have a venting means provided by the manufacturer) must be vented after PCB assembly and cleaning, but before use electrically, in order for published ratings to remain applicable.

There are several types of relays that have no venting means provided by the manufacturer. This Application Note does not apply to those types.

For additional relay processing information, see related Application Note *"Mounting, Termination and Cleaning of Printed Circuit Board Relays"*.

Identification, location and removal of the vent covering: (See figures following)

- Vents may be either a small hole covered by a tape seal or a small cylindrical plastic pin (called a "vent nib").
- Tape vents can be located anywhere except on the PCB mounting surface and should be opened after processing by peeling off the tape.
- Pin/nib-type vents are usually located inside a small depression – typically on the top of the relay opposite the mounting surface -- but can be located anywhere.
- Pin-type vents are removed by cutting the pin with a sharp knife blade or by breaking it off using a small sharp-edged tool like a screwdriver. Deflecting the pin sideways will result in fracture of the pin leaving the small vent hole.
- Care should be used to avoid extruding the plastic into the hole or smearing into the hole any coating or other contaminant that might be on the relay surface which would result in constriction of air-flow through the vent.



Why sealed washable relays should be vented:

There are two main effects/conditions that may occur if sealed relays are not properly vented before electrical use): 1) possible insulation failure and 2) reduced contact switching life.

"Rated" life of the relay takes these effects into account, so neither condition should occur during the rated life at a specified loading. However, if the sealed relay is not vented or if it is operated beyond rated life to actual failure, either condition can occur.

- **Insulation failure:**

  When relay contacts switch a voltage and current sufficient to generate an arc, arcing of the contacts results in formation of metal vapor, ozone, carbon and other contaminants. This increases with higher load current, voltage and temperature.

  These contaminants then fall or condense upon internal surfaces of the relay. Because these contaminants may be slightly conductive, they can result in formation of a leakage current path between electrically live parts inside the relay. This is especially critical if such a path forms on the plastic surface between relay contacts or terminals.

  The continued build-up of these contaminants can result in increasing current flow across insulated surfaces – which may form a carbon track of decreasing resistance over time. Eventually this path may conduct sufficient current to cause the plastic to melt or ultimately char, which may result in structural impairment of relay function and, in severe instances, fire.

- **Reduced contact life:**

  Arcing of contacts as described above also results in a contaminated, ion-rich environment inside the relay which increases the length of the switching arc. This results in accelerated contact erosion and generation of more contaminants.

  Eventually, the relay contact will erode until it no longer makes contact, which can result in an open circuit (failure to make) or in contact force so low that the contact welds when it makes the load current (failure to break).

  Contact life can be reduced to 20 to 50% of the rated value for some relays. This effect is largely dependent on the percent of rated current being switched along with ambient temperature conditions.

  Venting a sealed relay allows natural "breathing" of the relay, helping to reduce contaminant build-up which leads to reduction/elimination of the accelerated failure modes mentioned above.

  Notably, most Agency testing and internal reliability testing on sealed relays is conducted with the relay properly vented.

Conditions where sealed relays are not vented:

Under special conditions for specific applications, it may be recommended that sealed relays not be vented. Such conditions include (but are not limited to):

- Much less than full rated contact current.
- Low level contact voltages and/or currents
- Low ambient temperatures

- Low switching rate and low number of lifetime switching operations expected in the application.
- The need for low contact resistance at low voltage and current – especially in very contaminated environments.
- Operation at low to medium contact loads in a dirty environment (dust, grease, salt air, urban pollution, etc.)
- The application of spray or dip conformal coating on PCB mounted relays where the relay vent nib area is not masked off

Caution - TE Engineering should always be consulted to review the application prior to using sealed relays in the sealed, unvented condition during service.