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Number 31

APPLICATION NOTE

Use of Stabilant 22 on Relays and Switches

Introducing Stabilant 22

Stabilant 22 is an initially nonconductive block polymer which when used in a thin film between metal contacts becomes conductive under the effect of an electrical field. This occurs at an electric field gradient such that the material will remain nonconductive between adjacent contacts in a multiple pin environment. In addition, Stabilant 22 exhibits surfactant action as well as lubrication ability, providing a single component resident solution to virtually all contact problems.

When applied to electromechanical contacts, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contact surfaces together.

In this Application Note, some concerns with switches and relays are described. The solution of contact problems with Stabilant 22 is described for open contact types and the environments involved, along with different ranges of voltage and current.

Causes of intermittent behavior in relay and switch contacts

Many types of switches and some relays have contacts that are open to the air. Such contacts are more vulnerable to contamination, corrosion and wear than those in connectors that are infrequently opened. Contamination by airborne smoke, dust and chemicals may impair exposed contacts even before corrosion begins; most such deposits will also initiate corrosion, inevitably leading to failed or intermittent switch or relay operation. It is to be emphasized that any source of mechanical stress will have more impact on these contact surfaces than in the case of simple connectors.

Aggravating conditions and mitigation using Stabilant 22

Switches and relays have different lifetime ratings (usually stated as MTBF or open/close cycle estimates), depending on the current levels they carry and the switched voltages. Failure modes for their contacts also depend on these factors. The improvements offered by Stabilant 22 likewise depend on these failure modes, as we describe in the following section.

Low current circuits

Switches or relays used in analog signal paths or most digital circuits are vulnerable to contaminant films and corrosion from any source. These lead to intermittency, microphonics (making the contacts vibration sensitive) and eventual failure. Stabilant treatment is especially effective for the protection of low current contacts.

High current / voltage circuits

The switching of high currents can produce arcing where inductive loads are present. Even in the absence of visible sparking, contact wear increases over time. This is especially true in circuits already handling higher voltages (e.g., over 100V). While Stabilant treatment of connectors is effective for high current circuits, we do not recommend it where sparking can occur. Since Stabilant 22 is a polymer, high heat and electrical discharge will cause it to break down.

Contact cycling frequency

Switches that remain normally closed are still able to deteriorate due to vibration and cycles of temperature. In the presence of moisture, some configurations even allow capillary action to draw contaminants into the contact interface area. Stabilant treatment seals out these foreign substances. Normally open contacts naturally are more exposed to the environment, and a Stabilant 22 film likewise keeps contaminants away from the contact surface.

Finally, since frequently cycled contacts are more prone to mechanical wear (fretting, pitting, etc.), greater vulnerability to corrosion results. Stabilant 22 provides a lubricating effect that reduces such wear. Application should be sufficient to coat contact surfaces. Excess amounts should be avoided, as contact motion could allow contaminants to migrate into the Stabilant treated area, possibly reducing its effectiveness. Visible excess amounts are easily cleaned up with isopropyl alcohol.

Equipment and environmental contaminants

Some materials used in the manufacture of electronic equipment can leave compounds in the vicinity of switch or relay contacts that can promote corrosion or insulating film formation:

- hygroscopic plastic such as polycarbonates
- plasticizers in switch or relay body parts or protective covers
- solder flux residues (e.g., on internal wire leads in relays)
- cleaning solvent uses that may leave residues on components

We also recommend that Stabilant treatment be done for connectors to switches and for relay sockets, which can be prone to the same problems as the moving contacts.

Incomplete sealing of relay or switch contacts

It is notable that switches or relays with covers that are not air-tight may still admit contaminants from the air, as temperature or air pressure cycles allow a slight “breathing” effect. Any cover that is removable without breaking a seal is a candidate for treatment with your choice of Stabilant 22 or 22A (depending on convenience and accessibility of the contacts). As mentioned above, a switch or relay must be non-sparking to allow Stabilant treatment to be effective.

NATO CAGE/Supplier Code 38948

5mL Stabilant 22 (Concentrate), NATO Stock Number 5999-20-002-1112

15mL Stabilant 22 (Concentrate), NATO Stock Number 5999-21-909-9981

15mL Stabilant 22A (Isopropanol Diluted), NATO Stock Number 5999-21-900-6937

15mL Stabilant 22E (Ethanol Diluted), NATO Stock Number 5999-21-909-9984

Stabilant products are patented. Because the patents cover contacts treated with the material a Point-of-Sale license is granted with each sale of the material.

SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST

NOTICE

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