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Pollution Degree Ratings for Power Supplies

A less common question that TDK-Lambda's Technical Support team gets asked is "what is the pollution degree of your products?" It is very important for the safety of the end equipment and can be found listed in the safety certification reports.

Our products go into a wide range of industrial applications, from semiconductor fabrication facilities to off-shore drilling platforms. The environment that they operate in varies dramatically, and a walk through the service department will show which customers haven't paid attention to pollution degree! By "pollution" we mean contaminants that could be condensation, water and a variety of dusts.



The three main safety standards for power supplies (IEC 60950-1, IEC 60601-1 and IEC 61010-1) all call up pollution degree classifications, and in general the wording is similar.

Pollution Degree 1 is the least stringent. It applies where there is no pollution or only dry, non-conductive pollution. This not only applies to applications like clean rooms, but also where the power supply is placed in a sealed cabinet or enclosure.

Pollution Degree 2 is a little tougher, applying to non-conductive pollution that with occasional condensation could become temporarily conductive. Applicable for products used in office environments, laboratories and test equipment.

Pollution Degree 3 you would find in harsh industrial and farming, particularly with unheated rooms. Conductive pollution is to be expected, with or without condensation.

Pollution Degree 4 is outdoor equipment. Persistent conductivity, rain or even snow is the norm.

Could a pollution degree 2 power supply be used in an outdoor application? Yes, providing it is mounted in a suitable enclosure.

When the power supply is submitted to the safety test houses for certification, careful attention is paid to distance between components, pcb traces and the product housing. The voltage measured say between two traces on a pcb will determine the insulation thickness or creepage/clearance distance. Creepage is the shortest distance measured on the surface of an insulator; clearance is the shortest distance through the air. With pollution, this distance could become reduced, leading to the risk of electrical shock or failure. The manufacturer will advise upon submittal what pollution degree they want the product evaluated to. For TDK-Lambda's ZMS100 series of AC-DC power supplies, pollution degree 2 was chosen and because of the product's 5,000m altitude specification, those spacings were multiplied by 1.48 according to IEC 60664-1.

Power Guy