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## 4 kV Primary to Secondary Isolation on the Xgen Series

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**Abstract:** This document was established to describe the issue of a failure seen in a customer location when a 4 kV primary to secondary test was conducted on the Xgen series. The Xgen series is rated for a 4 kV Primary to Secondary isolation, but it is not possible to run this test on a finished unit. The resultant damage caused by this test is not unique to the Xgen series, and is a fundamental feature of power supply design.

### Introduction

Fig 1 shows the various isolation levels on a generic power supply. These levels are also applicable to the Xgen series.

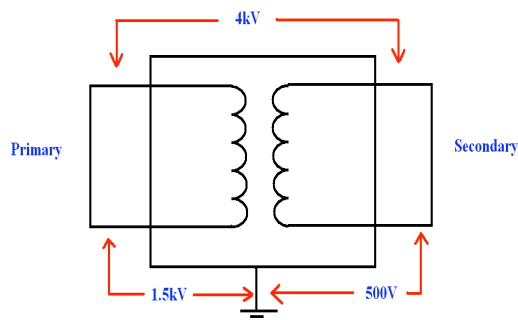


Fig 2: Isolation levels on an Xgen

Primary Circuit to Ground 1500 Vac  
Primary to Secondary Circuits 4000  
Vac Secondary to Ground 500 Vdc

### Hi-Pot Test:

The Dielectric Withstanding Voltage test is used to determine the ability of the installed equipment to protect against electrical shock. The dielectric withstand voltage test is typically referred to as a hi-pot test. The testing involved is to apply a high voltage between the points being tested and the resultant leakage current is measured.

### 4kV Primary to Secondary Test:

When testing from primary to secondary circuits, it is possible to overstress the basic insulation. Basic insulation is defined as the insulation used between primary or secondary circuits and ground. The higher voltages specified for primary to secondary tests will overstress the basic insulation, which is intended to support only 1500 V. This can result in a catastrophic failure of the unit.

Most low-voltage secondary circuits are connected to ground. With the secondary circuits grounded, the hi-pot voltage is unavoidably applied from primary circuits to ground. When the unit is fully assembled, both the PowerPac and PowerMods are earthed to the chassis. It is not possible to conduct a 4 kV isolation test from Primary to Secondary.

This may lead to a catastrophic failure of the unit. (However Arcing across spacing from primary circuits to ground under these conditions does not constitute a failure of the reinforced insulation.) We also expect that any other power supplies will also face the same issue. This is not limited to the Excelsys designed parts.

### How to test:

The solution to this problem is to perform the hi-pot test on the individual components that provide isolation between the primary and secondary circuits. These components consist of power transformers, opto-isolators, PCB's etc. However it is not feasible to test these components on a completed unit. We do carry out a Primary to secondary 4.4 kV isolation test on each PowerMod, and we meet the specification on the unit by design.

### Conclusion:

The damage caused by this test is not unexpected. Even though the unit is designed for a 4 kV primary to secondary isolation, it is not possible to test a fully assembled unit.

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