

Application Note

Why should I purchase my High Voltage Power supply from Oxford Instruments (XT)?

Summary

Oxford Instruments primarily manufactures x-ray tubes and sells high voltage power supplies with its x-ray tubes. These power supplies are either designed and manufactured by Oxford Instruments or are specifically designed and manufactured for Oxford Instruments. This application note sets out the rationale for purchasing the necessary power supply from Oxford Instruments when you purchase the x-ray tube from us as well.

Filament Control

Several relevant application notes, available on XT's User forum (<http://www.oxfordxtg.com/IndexUserforum.htm>) set out the criteria for a long-lived x-ray tube. Of these, the most important is the proper design of the power supply used to drive the x-ray tube. Since an x-ray tube uses a thermionic, and therefore, heated filament, the control of this filament is critical to the precise and reliable operation of the x-ray tube. In designing an x-ray tube, the choice of the filament will vary depending upon the desired characteristics. These include focal spot size, total beam current, and focal spot position stability. Furthermore, the operation of the filament places severe restrictions on the design of the power supply to ensure the filament is not allowed to operate above its maximum rating, yet at the same time rapidly cycle to ensure a highly stable beam current. These conflicting requirements can result in a design which impacts the longevity of the x-ray tube itself. A frequent example of this is a closed loop filament control circuit, which is designed not to exceed a set filament limit rating, but which in fact "shoots" through the limit for microseconds during normal operation, such as ramping up or down the x-ray beam current. Thus, and although the filament limit circuit is thought to be set correctly, a closer examination yields a damaging design.

Matched Filament Limit

The exact specification of a filament will change from x-ray tube to x-ray tube such that arbitrarily setting the maximum filament limit to a datasheet specification may result in a shorter life for the x-ray tube. Variations from tube to tube dictate the need to set the actual filament limit to match the individual x-ray tube. Thus, purchasing the power supply from a separate company ensures the filament limit has not been uniquely set to the purchased x-ray tube.

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Matched Set

Each of the x-ray tube and power supply sets purchased from XT are matched to provide maximum operation and reliability. Specifically, this relates to the length of the high voltage and low voltage cables with respect to the ability of the power supply circuits to close loop control the x-ray tube output. Voltage drops along the low voltage cables are calibrated and the proper power supply chosen based upon the intended requirements. Thus, when you purchase an x-ray set, you are assured the power supply, cables, and x-ray tube are matched.

Warranty

The warranty offered on the XT x-ray tube does not cover damage to the x-ray tube caused by improper operation of the filament, unless the power supply has been purchased from XT along with the x-ray tube. When a filament is allowed to operate past its maximum rating, the filament will violently fracture, such that examination under an optical microscope will yield a characteristic image. Alternatively, if a filament has reached its natural end of life through evaporation, the filament will, again, demonstrate a “thinning” or characteristic image. Thus, it is readily possible to discern if an x-ray tube has been operated properly. In purchasing the power supply from Oxford Instruments, along with the x-ray tube, your warranty is extended to cover this potential damage.