



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai - 400076

PR No. 1000028724

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Technical specification of Booster IMS tube Cu Prealigned

1. The $\text{I}\mu\text{S}$ is a high-brilliant microfocus source which consists of a sealed tube, a multilayer optics and a high voltage generator.
2. The production and assembly of all key components are carried out in-house.
3. The $\text{I}\mu\text{S}$ is equipped with the latest generation of Montel Optics, the so-called Quazar Optics, which can be up to 15 cm in length.
4. The coating of these multilayer optics is produced using the highly reliable and precise method of magnetron sputtering. With various types of sputtering systems different sizes of substrates ensure a cost-effective production.
5. The plasma inside the high-vacuum chamber enables the deposition of single layers in the sub-nanometer range down to a precision of 0.2%.
6. The high quality of multilayer structure is displayed in the transmission electron microscopy image of a standard multilayer. To maintain a high standard in quality all optics are measured at several positions with X-ray reflectometry.
7. In the next step the multilayer optics are mounted and pre-aligned in our patented optics housing guaranteeing high stability.
8. The microfocus source consists of two parts: firstly an X-ray tube mounted and aligned inside the cooling body and secondly an upper housing part containing the fans, the electronic controls and the safety shutter system.
9. Due to the low weight it is possible to mount the $\text{I}\mu\text{S}$ on all kinds of standard goniometers and positioning stages, making a customer-specific integration into existing setups possible.
10. This type of installation has been carried out successfully for numerous customers.
11. For the electronic control of the $\text{I}\mu\text{S}$ an intelligent X-ray generator has been developed that is also produced in-house.
12. From the first $\text{I}\mu\text{S}$ model on, Incoatec implemented a sensor inside the optics housing that closes the shutter if the multilayer is not used in vacuum (the brilliant X-ray beam would otherwise destroy the optics by producing ozone).
13. The new $\text{I}\mu\text{S}$ High-Brilliance is even more advanced as the generator collects additional information on the properties of the tube and the optics.
14. Furthermore, for safety reasons the shutter between source and optics can only be opened if the optics housing is mounted correctly.



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15. Customer-specific wishes such as individual safety circuits or motorized optics alignment are fulfilled by Incoatec experienced electronics group.
16. After manufacturing every IpS is tested in our X-ray lab .
17. The beam profile is measured with a calibrated detector and the intensity of the beam is checked and recorded.
18. This value is the benchmark which needs to be achieved at the customer's site after the IpS has been installed.
19. Tube: the main principle The IpS provides a highly brilliant X-ray beam in a power range of 10-50 W. It reaches an amazing performance by using air-cooling and a low-power sealed tube.
20. The IpS is a microfocus source as the focal spot of the electron beam on the anode only has a diameter of 20-50 μm . Incoatec offers all typical anode materials like Cu, Mo, Ag and Cr.
21. Due to the higher surface-to-volume ratio of the focal spot compared to the old 1-2 kW sealed tubes, the IpS has an improved heat conductivity and thus allows significantly increased power densities.
22. With values larger than 5 kW/ mm² the performance of the IpS is comparable to 5 kW-class rotating anodes (see graphic).
23. The brilliance cannot be increased by the optics, therefore it is of utmost importance to achieve the highest possible brilliance within the tube.
24. Consequently, it is best to combine the tube with a multilayer optics as opposed to other types of optics, as this ensures that the small focal spot is directed to the sample with the highest possible brilliance conservation.
25. Warranty is 6 months from the date of installation and commissioning.

X-ray Tube

1. sealed tube microfocus spot at anode (< 40 μm)
2. easy replacement
3. wavelength: Cu, Mo, Ag or Cr
4. long life-time >> 3y