

INSTRUCTIONS FOR THE USE OF REFRACTIVE X-RAY LENSES

1. We fabricate refractive x-ray lenses with beryllium, aluminium, and nickel (on request) as lens material. They have or rotationally parabolic (2D-lenses in a circular frame, 12 mm in diameter) or cylinder parabolic profile (1D-lenses in a frame 20×20 mm²).
2. The lenses should only be touched by clean gloved hands and they should only be handled in a flow box in order to avoid contamination by dust particles.
3. Beryllium is poisonous, in particular, when inhaled as dust particles. Therefore the beryllium should not be touched by fingers and any production of dust particles must be avoided. Hence, the lenses should be kept in a dry atmosphere, free of ozone in order to avoid corrosion and the production of beryllium oxide or other compounds of beryllium.
4. In general, a refractive lens system will contain many individual lenses in a stack. In order to achieve optimum performance for focusing and imaging it is necessary to align the optical axes of the individual lenses in a stack with submicrometer precision. We provide lens casings which guarantee this precision.
5. During operation the lens stack must be installed in vacuum. The lens frames have an upper side and a lower side. All upper sides should show in the same direction in order to avoid air pockets when evacuating. For that purpose each lens frame has a 1 mm ventilation hole.
6. The frames of 1D-lenses are quadratic in shape with one corner having a triangular cut and an adjacent one having a circular cut. This defines a bottom and a top edge. The triangular edge is at the top edge and the circular one is at the bottom edge. The bottom edge must be in contact with the reference plane which is needed for aligning the individual lenses in the stack. When looking at the top surfaces of all frames the triangular corner must be on the right hand side and on the top edge.
7. At both ends of the lens stack should be installed a pinhole or a slit which limits the incoming beam in its lateral extension. The pinholes and the slits should be a little smaller than the geometric aperture of the lenses. This reduces scattered radiation from those parts of the lens which are outside on the paraboloids.
8. During operation in the synchrotron radiation beam the temperature of the stack must not exceed 100°C for aluminium lenses and 300°C for beryllium and nickel lenses. It may be necessary to cool the lens stack.

Beryllium Solid



WARNING



INHALING DUST OR FUMES MAY CAUSE CHRONIC BERYLLIUM DISEASE, A SERIOUS CHRONIC LUNG DISEASE, IN SOME INDIVIDUALS. CANCER HAZARD. OVER TIME, LUNG DISEASE AND CANCER CAN BE FATAL. TARGET ORGAN IS PRIMARILY THE LUNG.

READ THE MATERIAL SAFETY DATA SHEET (MSDS) ON FILE WITH YOUR EMPLOYER BEFORE WORKING WITH THIS MATERIAL.

Overexposure to beryllium by inhalation may cause chronic beryllium disease, a serious chronic lung disease.

- If processing or recycling produces airborne dust, fumes, or mists, use exhaust ventilation or other controls designed to prevent exposure to workers. Examples of such activities include melting, machining, welding, grinding, abrasive sawing, sanding and polishing. Any activity which abrades the surface of this material can generate airborne dust.
- The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational exposures.
- Beryllium metal, in solid form and as contained in finished products presents no special health risks.
- Sold for manufacturing purposes only. This product can be recycled; contact your sales representative.

The Occupational Safety and Health Administration requires employers to provide training in the proper use of this product.

For further information, please telephone or write to: Product Stewardship Department, Brush Wellman Inc., 6070 Parkland Boulevard, Mayfield Heights, Ohio 44124, telephone: (800) 862-4118, www.brushwellman.com. For transportation emergency call Chemtrec at (800) 424-9300.