

# PHOSPHOR SCREENS RUGGED and UHV P22 PHOSPHOR

## FOR USE IN:

BEAM DETECTION BEAM ALIGNMENT LENS TESTING UNIFORMITY TESTING SURFACE PHYSICS UHV EXPERIMENTS

### FEATURES / OPTIONS:

HIGH LUMINOSITY P22 PHOSPHOR SENSITIVE TO ELECTRONS, STARTING AT 500 eV EASY HANDLING / HIGH ABRASION RESISTANCE (RUGGED SCREENS) UHV COMPATIBLE, BAKEABLE METAL or GLASS BACKING STANDARD SIZES MATCH eV Parts<sup>®</sup> RAPID AVAILABILITY, LOW COST

Kimball Physics Phosphor Screens are made of high luminosity P22 phosphor (ZnS:Ag). The screens are sensitive to electrons starting at approximately 500 eV with a threshold of 1 x  $10^{-7}$  A/cm<sup>2</sup> at 500 eV. The maximum recommended input beam power density is 1 Watt/cm<sup>2</sup>. Two general types of phosphor screens are made by Kimball Physics: UHV screens and Rugged screens.

Rugged Phosphor Screens (designated by RP22) are easy to handle and unusually resistant to mechanical damage and rough handling. Ruggedized Screens are bonded to their metal or glass backings using a bonding agent which has a low but non-zero vapor pressure. Due to the binder, the rugged phosphor is only suitable for vacuum pressures down to  $10^{-8}$  torr (at the lower end of this operating range, some outgassing may be observed). The rugged screens are particularly suited for use in experimental vacuum systems. Rugged screens have a phosphor thickness of approximately 75  $\mu$ m.

UHV Phosphor Screens (designated by UP22), with no binder, are compatible with vacuums better than 1 x  $10^{-8}$  torr. Although these screens are better for ultra high vacuum, they are more fragile and require greater care when handling; since the phosphor coating is delicate and can be easily destroyed. Damage will result from touching a UHV Phosphor coating; shock from knocking or dropping the screen may cause the phosphor coating to flake off. Standard UHV screens are shipped with a stainless steel protective cover. The thickness of the UHV phosphor ranges from 50  $\mu$ m to 70  $\mu$ m.

The phosphor can be deposited either on a 0.012 or 0.025 inch thick 304 stainless steel plate (SS) or on 0.030 inch thick conductive glass (GL) fitted into a stainless plate for mounting. The screens deposited on metal must be viewed from the electron impact side (since the metal is opaque). The screens deposited on glass and held in a metal frame, can be viewed from either side (since the glass is transparent).

Custom Phosphor Screens can be deposited on almost any metal, glass, or ceramic surface on a special order basis. Round screen diameters can range from 10 mm diameters, up to more than 200 mm in diameter. Rugged phosphor screens can be made in a variety of custom sizes and shapes; rectangles, strips, and patterned shapes are possible; edge definition is better than 100 micrometers. Custom screen can be made up even in quantities of one. Contact Kimball Physics Engineering for more information.

### **PHOSPHOR:**

PHOSPHOR TYPE: SATURATION THRESHOLD: PEAK EMITTED WAVELENGTH: MAXIMUM INPUT POWER DENSITY: MINIMUM POWER DENSITY: ZnS:Ag Type 1330 (P-22 Blue) 3 x  $10^{-2}$  Amps/cm<sup>2</sup> 450 nanometers 1 Watt/cm<sup>2</sup> 5 x  $10^{-5}$  Watts/cm<sup>2</sup>



6 inch CF flange-mounted UHV Phosphor Screen and three standard Phosphor Screens on 0.7, 1.4, and 2.0 inch squares

#### NOTES:

- Using the phosphor screens at electron energies below the first unity-secondary-emission crossover point may cause the screen to charge up to electron cathode potential, at which point the screen temporarily goes out.
- 2) When using the phosphor screen, input power density should not exceed 1 Watt/cm<sup>2</sup>, or the phosphor coating may be damaged To preserve screen brightness, it is advisable to use the lowest beam power density that provides a clear spot. Normal usage will result in gradual browning of the screen.
- Ruggedized screens are bakeable up to 200°C; UHV screens are bakeable up to 350°C.
- 4) Larger screens, mounted in either six or eight inch viewports are also available. The diameter of a screen for a six inch viewport would be 4.2 inch and the diameter of a screen for a eight inch viewport would be 6.2 inch. These larger phosphor screens can be deposited on leaded glass if required.
- 5) Rugged screens on stainless steel are deposited directly on the square plate. UHV screens on stainless steel are deposited on a round stainless steel plate that is affixed to the square mounting plate by four equally-spaced tabs spot-welded to the square mounting plate and to the underside of the round (phosphorcoated) plate.
- 6) Standard phosphor screens deposited on conductive glass (both Rugged and UHV) are held between two stainless steel plates, within a center hole, by four equally-spaced tabs on both sides of the screen. The tabs, which are spot-welded to the stainless steel plates, also serve to bleed off charge from the screens.



Maltese-cross shaped spot from an unfocused LaB<sub>6</sub> cathode seen on a custom phosphor screen inside the vacuum chamber

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# PHOSPHOR SCREEN PART NUMBERS AND DESCRIPTIONS:

PHOS-RP22SS-B5x5-R500 (Rugged) PHOS-UP22SS-B5x5-R500 (UHV) 0.50 inch phosphor on 0.700 inch square, 0.012 inch thick stainless steel B5x5 plate

PHOS-RP22GL-B5x5-R500 (Rugged) PHOS-UP22GL-B5x5-R500 (UHV) 0.50 inch phosphor on 0.030 inch thick conductive glass fitting in a 0.700 inch square, 0.012 inch thick stainless steel B5x5 plate

PHOS-RP22SS-B7x7-R750 (Rugged) PHOS-UP22SS-B7x7-R750 (UHV) 0.75 inch phosphor on 1.000 inch square, 0.012 inch thick stainless steel B7x7 plate

PHOS-RP22GL-B7x7-R750 (Rugged) PHOS-UP22GL-B7x7-R750 (UHV) 0.75 inch phosphor on 0.030 inch thick conductive glass fitting in a 1.000 inch square, 0.012 inch thick stainless steel B7x7 plate

PHOS-RP22SS-C5x5-R1000 (Rugged) PHOS-UP22SS-C5x5-R1000 (UHV) 1.00 inch phosphor on 1.400 inch square, 0.025 inch thick stainless steel C5x5 plate

PHOS-RP22GL-C5x5-R1000 (Rugged) PHOS-UP22GL-C5x5-R1000 (UHV) 1.00 inch phosphor on 0.030 inch thick conductive glass fitting in a 1.400 inch square, 0.025 inch thick stainless steel C5x5 plate

PHOS-RP22SS-C7x7-R1500 (Rugged) PHOS-UP22SS-C7x7-R1500 (UHV) 1.50 inch phosphor on 2.000 inch square, 0.025 inch thick stainless steel C7x7 plate

PHOS-RP22GL-C7x7-R1500 (Rugged) PHOS-UP22GL-C7x7-R1500 (UHV) 1.50 inch phosphor on 0.030 inch thick conductive glass fitting in a 2.000 inch square, 0.025 inch thick stainless steel C7x7 plate



Phosphor Screens on conductive glass on 0.7, 1.4, and 2.0 inch diameter stainless steel plates

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PHOS-RP22GL-B5x5-R500



PHOS-UP22SS-B7x7-R750



PHOS-RP22SS-C5x5-R1000



Drawings shown actual size



# **PHOSPHOR SCREENS**

Thin Flange Mounted UHV and Rugged Phosphor Screens 2<sup>3</sup>/<sub>4</sub> CF, 4<sup>1</sup>/<sub>2</sub> CF, 6 CF and 8 CF sizes RHEED Applications

HIGH LUMINOSITY P22 PHOSPHOR UHV COMPATIBLE, BAKEABLE CONDUCTIVE GLASS BACKING FLANGE - MOUNTED FOR EASY INSTALLATION

PHOSPHOR SPECIFICATIONS: Phosphor type: ZnS: Ag Type 1330 (P-22 Blue) Saturation threshold: 3x10<sup>-2</sup> A/cm<sup>2</sup> Peak emitted wavelength: 450 nm Max. input power density: 1 W/cm<sup>2</sup> Min. power density for screen response: 5x10<sup>-5</sup> W/cm<sup>2</sup>

Careful handling is required with UHV phosphor screens as the coating is extremely delicate.



UHV Phosphor Screen on conductive glass, mounted in a 6 inch CF Thin Flange

### PART NUMBER

PHOS-UP22GL-CF2.75 P22 UHV or PHOS-RP22GL-CF2.75 P22 Rugged

PHOS-UP22GL-CF4.5 P22 UHV or PHOS-RP22GL-CF4.5 P22 Rugged

PHOS-UP22GL-CF6 P22 UHV

PHOS-UP22GL-CF8 P22 UHV

# DESCRIPTION

1.43 inch dia. phosphor on conductive glass, mounted in a 0.4 inch thick  $2\frac{3}{4}$  inch Multi-CF Thin Flange

2.83 inch dia. phosphor on conductive glass mounted in a 0.4 inch thick 4½ inch Multi-CF Thin Flange

4.20 inch dia. phosphor on conductive glass, mounted in a 0.4 inch thick 6 inch Multi-CF Thin Flange

6.20 inch dia. phosphor on conductive glass, mounted in a 0.4 inch thick 8 inch Multi-CF Thin Flange