CUSTOMIZED COATINGS

PHOTONIS
EXOSENS GROUP

PHOSPHOR SCREENS

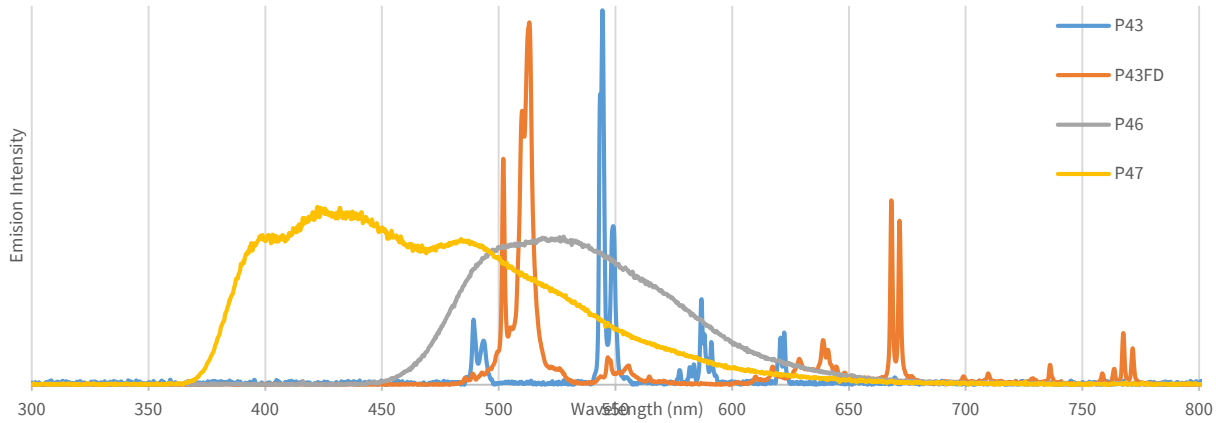
CONFIGURATION GUIDELINE FOR PHOSPHOR SCREENS

exosens.com

Phosphor Screens

Phosphor Properties

Emission Spectra



Type / Composition		P43 Gd_2O_2S:Tb	P43 FD Gd_2O_2S:Pr,Ce,F	P46 $Y_3Al_5O_{12}$:Ce	P47 Y_2SiO_5:Ce
Light Emission	Range	360 - 680 nm	480 - 780 nm	490 - 620 nm	370 - 480 nm
	Maximum	545 nm	513 nm	530 nm	400 nm
	Rel. Efficiency*	1	0.95	0.4	0.56
Decay Time	90 % to 10 %	1 ms	4 µs	300 ns	100 ns
	10 % to 1 %	1.6 ms		90 µs	2.9 µs
Excitation	Electrons	+	+	+	+
	X-Ray	+	+	-	-
	UV (peak sensitivity)	+ (<300 nm)	+ (<305 nm)	+ (<465 nm)	+ (<360 nm)
	α radiation	+	+	+	+
	β radiation	+	+	+	+
	γ radiation	+	+	-	-
	Neutrons	+	+	-	-

Further Phosphor types on request

Phosphor Screens

Available Additional Coatings

ITO (Indium-Tin-Oxid)

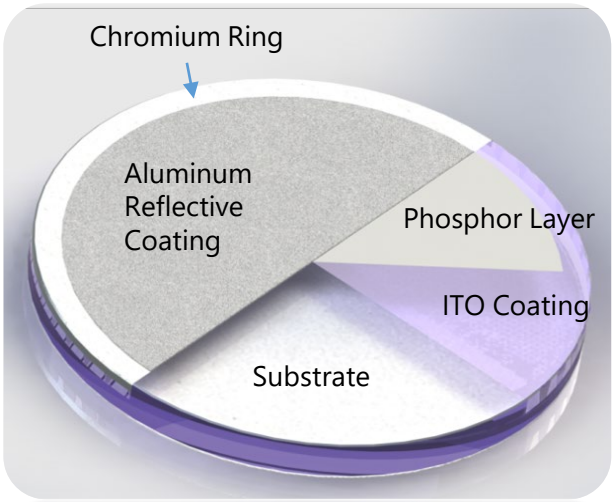
Conductive base coating to reduce electrostatic effects caused by electrons and ions or to apply electrical potential. ITO coating is also known under the name NESA coating. Standard and special conductive parameters can be achieved.

Aluminum reflective coating

To increase light efficiency by up to 100 % and to reduce stray light, it is advantageous for most applications to seal the phosphor coating with an Aluminum layer on top of it. As a standard, a 40 nm to 50 nm coating is recommended, but on special request the thickness can be varied between 40 nm and 130 nm. For electrons, an acceleration voltage of 3 kV is required to penetrate the standard Aluminum reflection layer. With the use of an Aluminum coating, the maximum diameter for the phosphor screen is reduced by 1 mm to allow contact between the Aluminum layer and the substrate.

Chromium ring

Allowing direct electric contact to a phosphor screen, a chromium ring of width up to 100 mm diameter can be sputtered on the outer area of the substrate. This does reduce the area of the phosphor down to the inner diameter of the chromium ring.



Optional Coatings

- Water Glass

To improve the mechanic stability of a phosphor screen, water glass can be added during the sedimentation process.
A screen manufactured this way can resist a light finger touch. An efficiency decrease of 30 % to 40 % results from this manufacturing process as the density of the phosphor grains in the matrix is reduced.

- Optical Marks on substrate

Reference marks on glass and fiber optical substrate according customer´s requirements.

Phosphor Screens

Standard Substrates

Flat, round

Material	Diameter	Thickness
B270	5,0 mm	1,0 mm
Transmission >90%/2 mm thickness 300 nm - >1,4 µm Low aging by irradiation with UV light	20,0 mm	2,0 mm
	25,0 mm	2,0 mm
	50,0 mm	3,0 mm
	75,0 mm	3,0 mm
	100,0 mm	3,0 mm

Material	Diameter	Thickness
Fused Silica	5,0 mm	1,0 mm
Transmission >90%/2 mm thickness 200 nm - >1,5 µm Low fluorescence High stability to temperature	20,0 mm	2,0 mm
	25,0 mm	2,0 mm
	50,0 mm	4,0 mm
	75,0 mm	3,0 mm
	100,0 mm	8,0 mm

Stepped, round

Material	Diameter total	Diameter step	Step height	Total Thickness
Borosilicate	50,0 mm	42,0 mm	2,0 mm	4,0 mm
	50,0 mm	42,0 mm	2,4 mm	4,4 mm
	86,0 mm	77,0 mm	2,4 mm	4,4 mm
Quartz / Fiber optic	38,1 mm	29,2 mm	2,45 mm	5,5 mm
	55,0 mm	44,7 mm	2,45 mm	5,5 mm
Fiber optic	28,5 mm	27,0 mm	2,5 mm	15,0 mm
	42,0 mm	40,0 mm	2,0 mm	15,0 mm

Prism

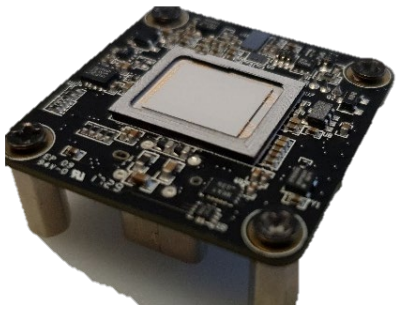
Material	Length Cathetus	Length Hypothenusis
N-BK7	20,0 mm	28,3 mm
	40,0 mm	56,0 mm

Phosphor Screens

Customized Substrates

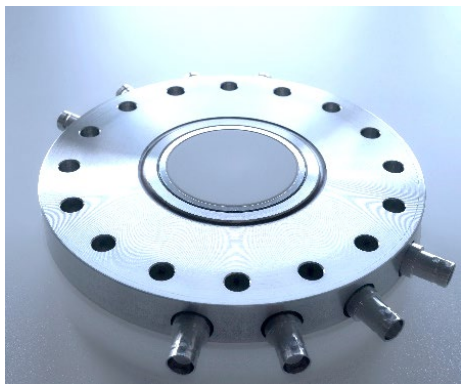
Materials

- Clear Glasses
  - fused silica
  - Quartz glasses
  - Sapphire
- Fiber optics
  - Fiber optical plates
  - Fiber optical tapers
- Metals
  - stainless steel
  - Aluminum
  - Copper
- Camera Sensors
  - CCD and CMOS Sensors
- Viewports



Dimensions and Geometries

- Round plates
  - flat and stepped substrates
  - ø ≤ 160 mm
  - Thickness 0.5 mm to 50 mm
- Rectangular plates
  - Diagonal ≤ 160 mm
  - Thickness 0.5 mm to 50 mm



Note: Customer specific substrates on request for minimum order quantity of 10 units

Phosphor Screens

Optional Integration

Mounting mechanics
For integration into special experimental setups mounting mechanics can be designed and assembled according to customer´s requirements

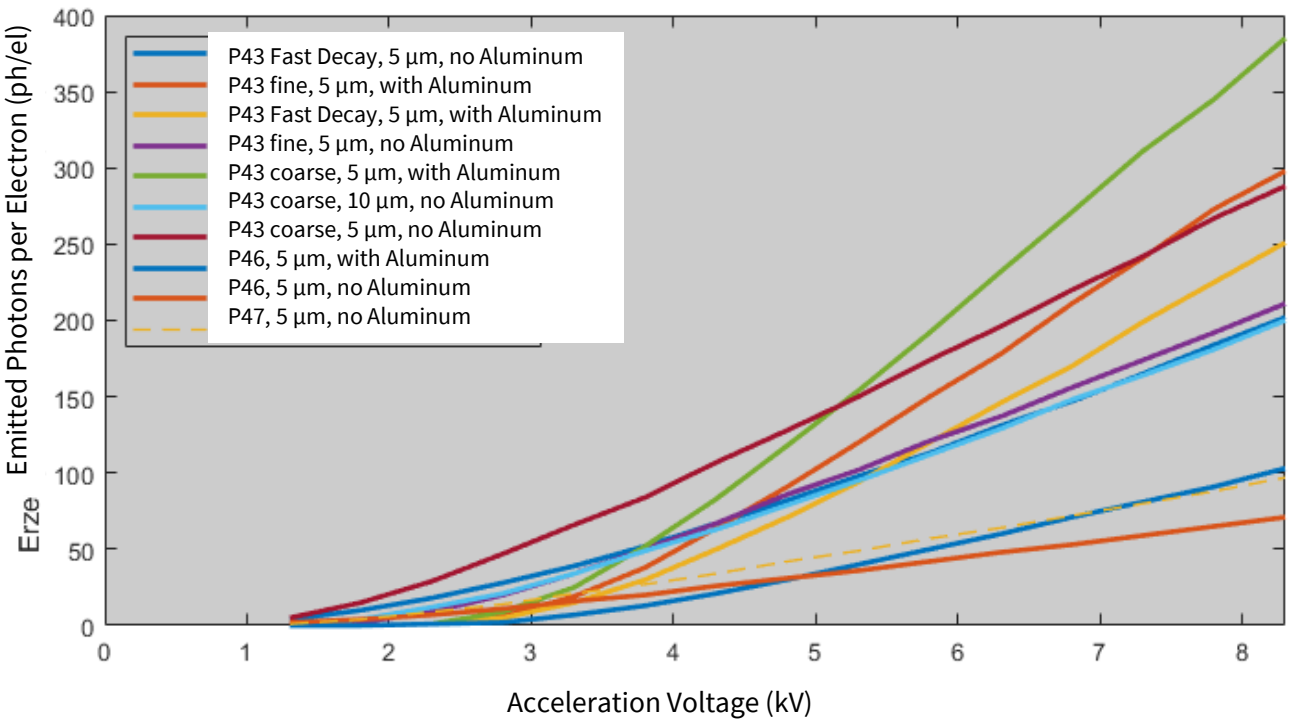
Flange integration
For mounting a phosphor screen onto a vacuum chamber the coating can be applied onto a viewport directly (without ITO coating) or the whole screen assembly can be integrated into a CF flange with the possibility of applying an electric potential.

Phosphor Screens

Detection Efficiency to Electrons

Dependency to

- Phosphor material
- Grain size of phosphor
- Coating thickness
- Additional Coating



Phosphor Screens

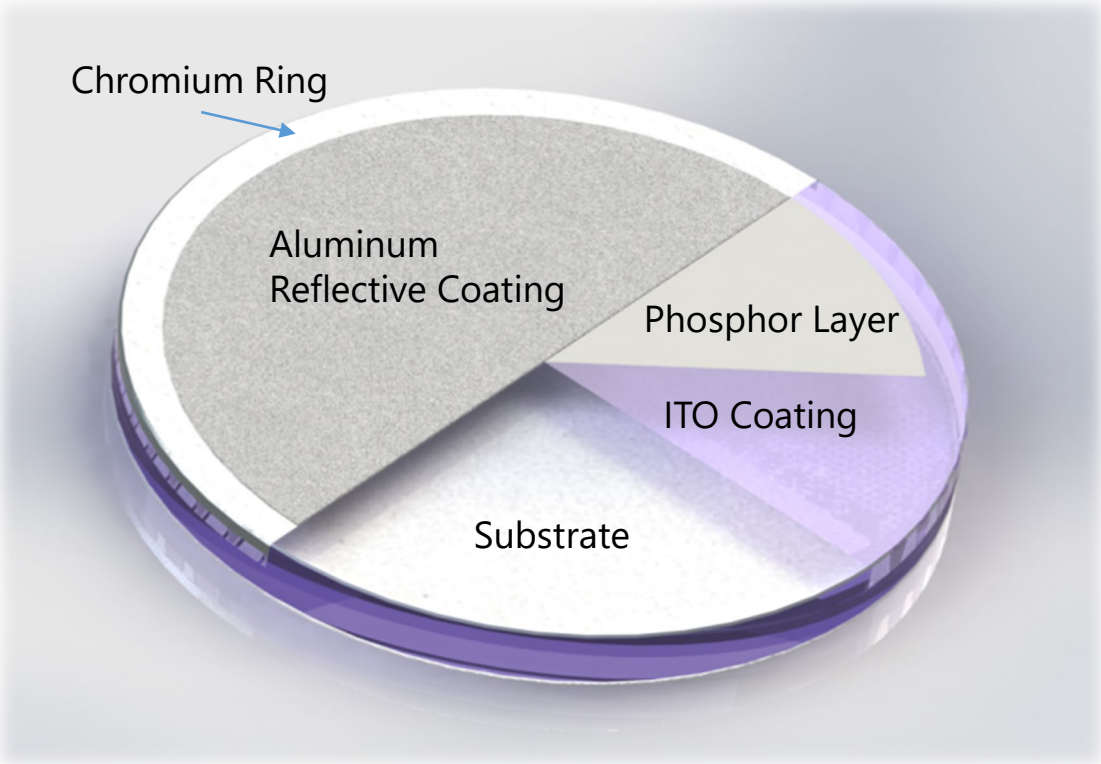
Electron detection (<50 kV)

Coating

Phosphor type:	P43, 6 – 10 µm
Active diameter:	25 mm
ITO conductive underlayer:	yes
Aluminum reflective coating:	yes
Chromium ring:	recommended

Substrate

Material:	clear glass, NBK 7
Dimensions:	dia: 40 mm



Phosphor Screens

X-Ray detection (8 kV – 100 kV)

Coating

Phosphor type:	P43, 30 µm
Active diameter:	25 mm
ITO conductive underlayer:	no
Aluminum reflective coating:	no
Chromium ring:	no

Substrate

Material:	Fiber optical plate
Dimensions:	dia: 40 mm

Phosphor Screens

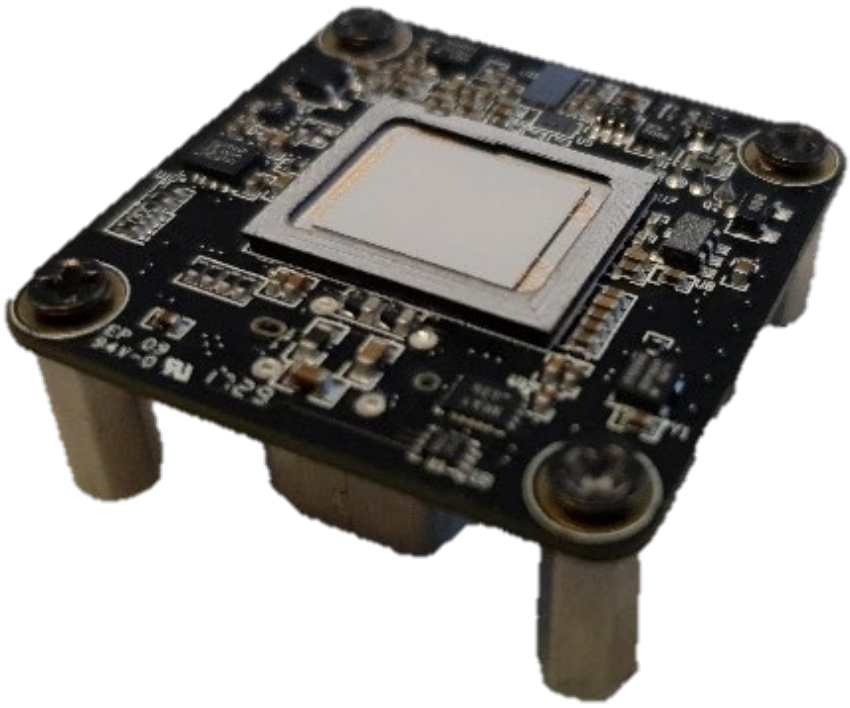
Deep UV detection (<250 nm)

Coating

Phosphor type:	P43, 6 – 10 µm
Active diameter:	25 mm
ITO conductive underlayer:	no
Aluminum reflective coating:	no
Chromium ring:	no

Substrate

Material:	CMOS Sensor Sony IMX 174
Dimensions:	dia: 13,3 mm



Phosphor Screens

General advice
The characteristics of the phosphor coatings require a professional treatment under defined conditions. To ensure a long lifespan below mentioned advice must be followed without fail. The coating will be destroyed irreversibly by non-compliance.
Please do not hesitate to contact us in case of any doubt or queries.

Note on safety
Please pay attention to the enclosed material safety data sheet(s). Handling of the unprotected coatings requires that content of the material safety data sheet(s) is known and understood. Before unpacking and handling the coating, please forward the material safety data sheet(s) to the responsible authority of your organization (this is usually the occupational safety specialist).

Handling
Phosphor coatings are suitable for a variety of applications. Among others, these are electron-, x-ray- and UV-applications. Especially in electron applications, high electric field strengths may structurally damage the coating. In general, our coatings are designed for field strength of up to 6 kV/mm. In UV or x-ray applications, the dosage is the determining factor for a degradation of the coating. In this case, a structural damage is not to be expected, but browning may occur over the lifetime, affecting the efficiency.

Avoid unconditionally
- any contamination, in case of contamination please contact us
- any mechanical stress
- any even slight contact – e. g. by fingers or any other object
- handling outside of cleanrooms (ISO cleanroom classification 8 or better)

Storage
The container in which the substrate is delivered is only in particular circumstances suitable for long-time storage. In case of doubt please contact us.

We recommend storage in darkness at moderate temperature (+10…+90°C):
- under vacuum conditions or under dry nitrogen
- in a diffusion resistant container
- Pay attention to the cleanliness of the container: it must not be contaminated by dust or particles

Warranty is limited to liability for correct mechanical construction with the defined materials and operation with the specified maximum field strength under the defined maximum pressure in this field free from particles.

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