AP5 Ultra-thin x-ray windows

Mounted AP5 x-ray window

AP5 ultra-thin polymer windows are the highest performing x-ray windows available for low and high energy x-ray analysis. AP5 windows are ideal for applications that require maximum transmission of low energy x-rays, high mechanical strength, light rejection, vacuum tightness, reliability, and increased solid angle. AP5 windows are used in applications where high temperature, light element detection is important and beryllium windows are ineffective (see Figure 1 and 2). AP5 windows are similar in application to AP3 windows but are designed to work for detectors larger than 100 mm^2 where AP3 windows are too small.

Applications

X-ray detectors

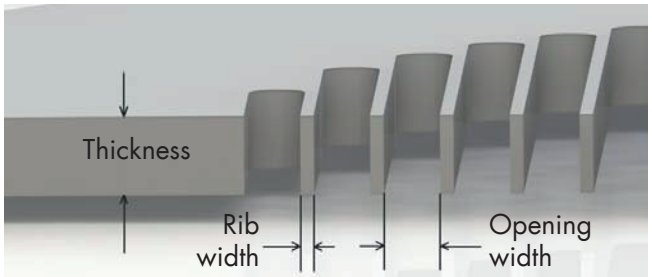
- Silicon drift detectors (SDD)
- Si(Li) detectors
- Si-PIN detectors

Light rejection and vacuum tightness

AP5 windows provide good rejection of UV, IR, and visible light. AP5 windows also provide a hermetic barrier to gases. Every window is tested and is guaranteed to have a leak rate of less than 1 x 10^{-10} mbar • L/s of helium. The helium leak rate is tested by exposing the parts to a minimum of 0.5 SCFH helium sprayed immediately above and around the window on a calibrated helium leak detector for a minimum of 30 seconds. Test conditions may need to be adjusted depending on mount geometry.

Window composition and structure

AP5 windows are composed of ultra-thin layers of polymer, and other thin films with low Z compositions. AP5 windows are supported by a carbon support structure designed to add support for the film at a minimal profi le with maximum open area and acceptance angle. Moxtek® attaches each window to a mount using vacuum compatible epoxy adhesive.



Features	Benefits
Ultra-thin polymer film	Maximum transmission of low energy x-rays
Thin multi-layer coating	Charge dissipation
	UV, IR and visible light rejection
	Corrosion resistant, hermetic seal
Carbon support structure	High mechanical strength, durable
	Improved x-ray transmission
	Unique design geometries possible
High purity	Minimal spectral contamination
Uniform thickness	Consistent transmission across entire window

Window specifications	
Open area	78%
Helium leak rate	<1x10^{-10} mbar • L/s *
Max. temp. (1 atm differential)	40 °C
Max. temp. (Zero pressure differential)	70 °C
Front pressure limit (atmosphere side)	2 atm
Back pressure limit (vacuum side)	0.5 atm
*See "Light rejection and vacuum tightness" section	

	AP3	AP5
Thickness (µm)	380	265
Rib width (µm)	59	45
Opening width (µm)	190	
Open area	76%	78%
Acceptance angle	53°	72°

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1005, Rev D

MOXTEK

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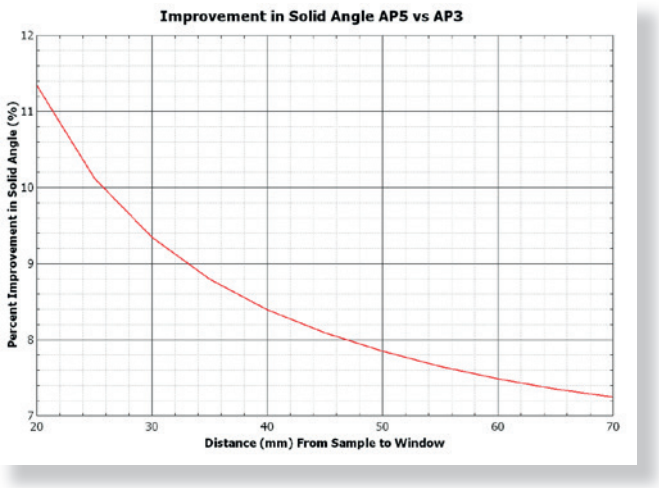
Mechanical strength

AP5 windows are supported by a rigid carbon grid. This patented window design enables the AP5 window to survive over 10,000 cycles at room temperature and a diff erential pressure of 1.2 atm with no degradation in window performance.

Elemental x-ray transmission			
Atomic Number	Element	Transmission (Kα) (% of maximum)	
		AP3	AP5
14	Si	74%	73%
13	Al	75%	75%
12	Mg	72%	73%
11	Na	69%	69%
9	F	54%	54%
8	O	47%	47%
7	N	31%	31%
6	C	47%	49%
5	B	29%	23%
4	Be	9%	7%

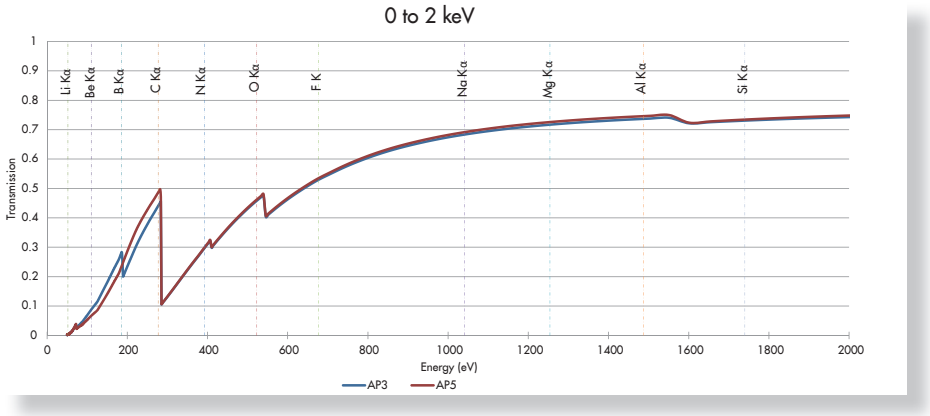
Acceptange angle graphic



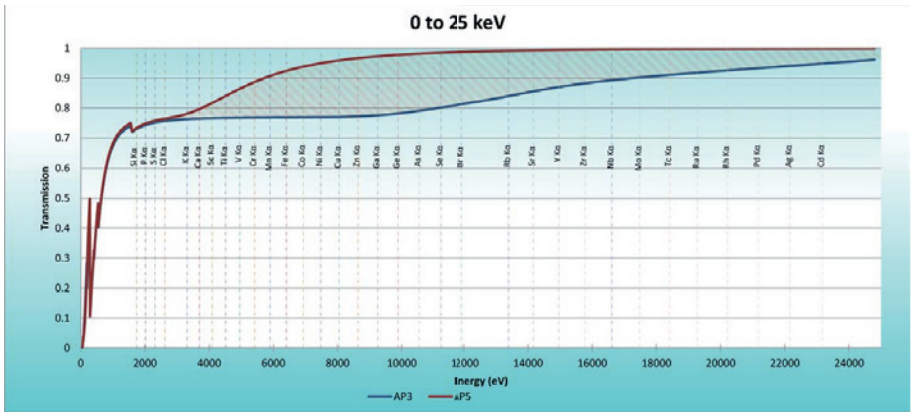
Mount design

Please refer to WIN-TECH-1003 for Ultra-thin AP x-ray window mount design requirements, available at www.moxtek.com.

X-ray transmission, composite film and grid



0-2 keV x-ray transmisson of AP3 and AP5 windows



0-25 keV x-ray transmisson of AP3 and AP5 windows

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