

## TEM Window Grid Membrane Strength

### Membrane Window Strength - Differential Pressure Tolerance

#### Silicon Nitride

All our membrane types and membrane area configurations have been robustness tested by application of differential pressure. In these tests, the membrane was oriented such that differential pressure forced the membrane against the chip frame. In the opposite orientation where the membrane would be delaminated from the chip frame, the pressure tolerance would be several times lower.

All values below are the maximum tolerated differential pressure reported as mean +/- standard deviation (n = 3), in units of PSI.

#### Window Sizes:

- 9 Windows: (8) 100x100, (1) 100x350 micron
- 9 Small Windows: (8) 50x50, (1) 50x350 micron
- 2 Slots: (2) 50x1500 micron
- Single Windows: (1) square window of x micron side-length

Pure Silicon	Thickness				
	5 nm	9 nm	15 nm	30 nm	35 nm
9 Windows		3.90 ± 0.71	11.57 ± 0.26		
9 Small Windows	2.30 ± 0.29				
2 Slots	2.60 ± 0.99	2.53 ± 0.40	14.73 ± 2.61		
Single 25 Micron	35.33 ± 0.78				
Nanoporous - 9 Windows				16.47 ± 0.95	
Nanoporous - Single 500 Micron				3.33 ± 0.17	
Single Crystal - 9 Windows					34.03 ± 1.07

Silicon Nitride	Thickness				
	5 nm	10 nm	20 nm	50 nm	35 nm
9 Windows		6.13 ± 2.00	40+	40+	
9 Small Windows	37.30 ± 3.08				
9 Large Windows		11.57 ± 0.66			
2 Slots	6.53 ± 0.24				
Single 25 Micron	40+				
Single 100 Micron				25.13 ± 4.45	
Single 500 Micron			9.90 ± 0.36	13.37 ± 1.25	34.03 ± 1.07
Single 1000 Micron				7.80 ± 0.29	
Microporous - Single 500 Micron			5.37 ± 0.37	10.13 ± 0.52	
Nanoporous - Single 500 Micron			5.33 ± 1.39		

Silicon Dioxide	Thickness				
	20 nm	40 nm	75 nm	50 nm	35 nm
9 Windows	11.33 ± 0.37	12.73 ± 0.68		40+	
G-Flat™ Single 1000 Micron			2.93 ± 0.17		

X-Ray Windows	Thickness				
	50 nm	100 nm	200 nm	300 nm	35 nm
Single 500 Micron	20.47 ± 0.33	24.40 ± 0.99			
Single 1000 Micron	9.67 ± 0.12	13.13 ± 0.09			
Single 1500 Micron			6.97 ± 0.25		
Single 2500 Micron			4.07 ± 0.09		
G-Flat™ Single 500 Micron		5.60 ± 0.29		11.53 ± 0.12	
G-Flat™ Single 1000 Micron			2.63 ± 0.05		