

DESIGN OF PRESSURE WINDOWS

The calculation of minimum thickness of a window to withstand a pressure gradient should be approached with caution. The published figures for apparent elastic limit, flexural strength, or rupture modulus may be used but it should be realized that these three terms relate to different methods of test. Further, the published data should not be considered absolute as the samples from which the original data was obtained may not be representative of all samples of crystal. A conservative safety factor should always be applied to the minimum calculated thickness therefore.

For a circular window, avoiding plastic deformation, the minimum design thickness is indicated by

$$t_{\min} = \left(\frac{K \times p \times D^2}{S} \right)^{1/2}$$

Where K is a constant which incorporates a minimum safety factor.

For an unclamped window $K = 1.1$ For a clamped window $K = 0.8$

D is the unsupported diameter
S is the apparent elastic limit
p is the pressure differential

Values of S (MPa):
BaF2 = 26.9
CaF2 = 46.5
MgF2 = 9.6
Al2O3 = 448
ZnSe = 55
ZnS = 59
Fused Quartz = 22.5

Note:

The above information is for reference only. Meller Optics has not verified the data presented and it is the end user's responsibility to ensure the adequacy of any design.