

Crystal optical materials vary widely in how they may be treated thermally and particularly in regard to rates of heating and cooling to avoid thermal shock. There are no definite answers. Apart from the material, the size and shape of the component has a large factor in the assessment. These suggestions are based on moderate circular windows up to approximately 50mm diameter and 6mm thick. Always err on the safe side. If the component is to be of a high specification, try to arrange to test an unpolished blank before proceeding.

For very large pieces >1kg of CaF<sub>2</sub> (Grade 2) we would use a rate of 10°C/hour

Smaller pieces may be heated and cooled at higher rates.

We cannot find any firm correlation between Thermal Expansion and Conductivity and our practical knowledge of how different materials behave in actual handling.

Maximum working temperatures are Crystran recommendations only and not related to melting points.

Grade 1. Natural cooling rate on removal from oven, ~ 5°C/min No particular precautions.

Grade 2. Slightly Sensitive to thermal shock. ~ 2°C/min (Cool over 1 to 2 hours from 150°C)

Grade 3. Sensitive to thermal shock. ~ 0.75°C/min (Cool over 3 to 4 hours from 150°C)

Grade 4. Very sensitive to thermal shock. ~ 0.3°C/min (Cool overnight. 7 to 8 hours from 150°C)

MATERIAL	Symbol	Thermal Conductivity W m <sup>-1</sup> K <sup>-1</sup>	Thermal Expansion x 10 <sup>-6</sup> K <sup>-1</sup>	Max Temp °C	Crystran Shock Grade
Barium fluoride	BaF <sub>2</sub>	11.7	18	300	IV
Calcium fluoride	CaF <sub>2</sub>	9.71	19	500	III
Lithium fluoride	LiF	11.3	37	400	IV
Magnesium fluoride	MgF <sub>2</sub>	21 / 33	13.7 / 8.9	500	II
Strontium fluoride	SrF <sub>2</sub>	8.3	18	500	III
Sodium chloride	NaCl	6.49	44	400	II
Sodium fluoride	NaF	3.75	36	400	III
Potassium bromide	KBr	4.82	43	300	III
Potassium chloride	KCl	6.53	36	400	II
Cesium bromide	CsBr	0.94	48	400	I
Cesium iodide	CsI	1.1	48	200	I
Silver bromide	AgBr	1.21	30	200	I
Silver chloride	AgCl	1.15	31	200	I
Thallium bromo-iodide	KRS-5	0.54	58	200	I
Magnesium oxide	MgO	42	10.8	2000	I
Sapphire	Al <sub>2</sub> O <sub>3</sub>	27	5.6	1700	I
Crystal quartz	SiO <sub>2</sub>	10.7 / 6.2	7.1 / 13.2	1000	I
Zinc sulfide (multispectral)	ZnS	27.2	6.5	250	I
Zinc selenide	ZnSe	18	7.1	250	I
Diamond	C	2600	1	700	I
Silicon	Si	163	2.6	150	I
Germanium	Ge	58	6.1	80	I
Gallium arsenide	GaAs	48	5.7	200	II

## CRYSTRAN LTD

Unit 1 Broom Road Business Park,

Poole, Dorset, UK BH12 4PA

TEL: +44 1202 307650 FAX: +44 1202 307651

Email: [sales@crystran.co.uk](mailto:sales@crystran.co.uk)

Website: [www.crystran.co.uk](http://www.crystran.co.uk)