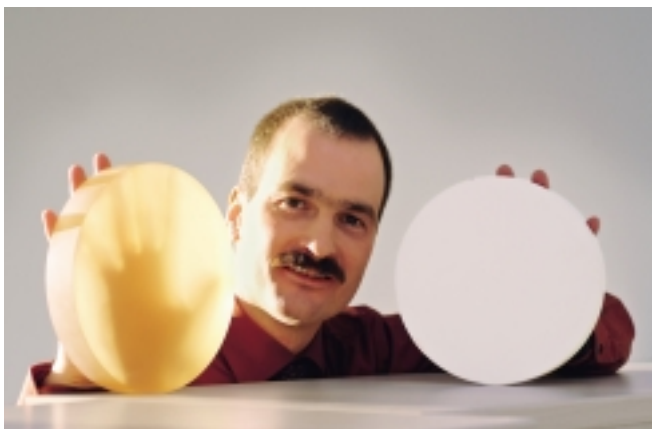


# ZERODUR® K20

## White Glass Ceramic Material with High Temperature Stability and Low Thermal Expansion

For over 30 years the zero expansion glass ceramic ZERODUR® has been used worldwide in very different and challenging applications. Now Schott can announce a promising modification called "ZERODUR® K20".

The new K20 glass ceramic material contains a crystal phase of over 90 % Keatite, produced by thermal transformation from the semi transparent ZERODUR® material. With an expansion coefficient of  $2.0 \cdot 10^{-6} \text{ K}^{-1}$  between  $20^\circ - 700^\circ \text{ C}$ , the new material has an even lower value of  $1.5 \cdot 10^{-6} \text{ K}^{-1}$  at room temperature. The material has high temperature stability and does not change during multiple temperature cycles.



Material samples before and after transformation to the high temperature stability glass ceramic ZERODUR® K20

### Innovative Properties:

The new glass ceramic ZERODUR® K20 is characterized by the following properties:

- A low coefficient of thermal expansion together with high long-term temperature stability up to  $850^\circ \text{ C}$ .
- ZERODUR® K20 can be matched with low thermal expansion metal alloys, e.g. Invar®.
- The excellent homogeneity and internal quality can be inspected optically in the semi transparent base material before transformation.
- After transformation the material has a radiance factor of more than 90% with a matt brilliant white finish.
- The glass ceramic is free of pores and can be polished to very low surface roughness levels.
- Large-scale parts can be produced with dimensions of several meters.

Properties	ZERODUR® K20	ZERODUR®
Density [g/cm <sup>3</sup> ]	2.53	2.53
Young's modulus E [GPa]	83	90
Poisson's ratio $\mu$	0.25	0.24
Knoop hardness [HK 0.1/20]	620	620
Expansion coefficient (20°-700°C) [10 <sup>-6</sup> /K]	2.0	0.2
Expansion coefficient (0°-50°C) [10 <sup>-6</sup> /K]	1.5	0 ± 0.1
Thermal capacity $c_p$ (20°C) [J/(gK)]	0.90 (extrapolated)	0.80
Thermal conductivity (90 °C) [W/(mK)]	1.6	1.46
Max. application temperature [°C]	850	600
Upper annealing ( $\mu=10^{13}$ dPas) [°C]	970	---

### Innovative Properties:

The new glass ceramic ZERODUR® K20 is now the material of choice for many different optical and engineering applications:

- High temperature usage
- High precision manufactured components
- Low expansion coefficient
- High thermal load resistance
- Pore-free surfaces that can be polished to high precision standards



ZERODUR® K20 used as a mould material for the production of X-Ray telescope mirror segments in astronomy applications

Optics for Devices

**SCHOTT AG**

Hattenbergstraße 10

55122 Mainz

Germany

Phone: + 49 (0)6131/66-3835

Fax: + 49 (0)6131/66-1998

E-mail: [info.optics@schott.com](mailto:info.optics@schott.com)

[www.schott.com/optics\\_devices](http://www.schott.com/optics_devices)

### Possible Applications:

- Mechanical and optical components within high energy laser systems
- Mould material in hot forming processes (glass, plastic, etc.)
- Ceramic engine components
- Calibration standards for optical and mechanical probes
- Serial production or prototype manufacture

**SCHOTT**  
glass made of ideas