

Large astronomical telescope system, space exploration system

MIRROR BLOCK & LIGHT WEIGHT

★ Fused silica (JGS-2)

★ Zerodur

★ Silicon carbide (SiC)

PRECISION ANNEALED FUSED SILICA (JGS-2)

JGS-2 is a type of fused silica that is equivalent to Pyrex. However, the processing technology is different from that of Pyrex, and the control of bubbles and streaks is better than that of borosilicate. JGS2 is a very good silica glass, which is widely used in semiconductors, electric light sources, and astronomical instruments.

Ingot impurity content analysis

Al	Fe	Ca	Mg	Ti	Mn
18.7	0.17	1.16	0.09	1.12	<0.02
Ni	Cu	Li	Na	K	Co
<0.04	<0.04	1.25	0.44	0.33	<0.05
Total			<23.41		

Performance characteristics

- High temperature resistance. The softening point temperature of JGS2 is about 1730°C, and it can be used for a long time at 1100°C, and the maximum use temperature can reach 1450°C in a short time.
- Corrosion resistance. The chemical stability of JGS2 at high temperatures is unmatched by any other engineering materials.
- Good thermal stability. The thermal expansion coefficient of the adaptable glass is very small, and it can withstand severe temperature changes. Heating JGS2 to about 1100°C, it will not burst when placed in water at room temperature.
- Good light transmission performance. JGS2 has excellent light transmittance in the entire spectrum band from ultraviolet to infrared, and the visible light transmittance is above 93%, especially in the ultraviolet spectral region, the maximum transmittance can reach above 80. 5. JGS2 has good electrical insulation performance. The resistance value of JGS2 is equivalent to 10,000 times that of ordinary glass. It is an excellent electrical insulating material and has good electrical properties even at room temperature.

ZERODUR

Zerodur is a glass-ceramics with a very low coefficient of thermal expansion.

The most important characteristics are as follows: near-zero thermal expansion and excellent 3D uniformity.

Excellent internal quality Good processing performance, can be polished to extremely high accuracy, good coating performance, low chemical helium permeability, no holes, excellent chemical stability.

Performance characteristics

- Low thermal expansion coefficient

Zerodur's low coefficient of thermal expansion gives it a significant advantage in optical device applications. Optical components in optical devices need to maintain stable performance at high temperatures, and Zerodur's low coefficient of thermal expansion helps to reduce thermal stress and improve the stability and service life of optical components.

- Excellent thermal stability Zerodur has excellent thermal stability and can maintain stable performance in high temperature environments. In optical device applications, Zerodur can be used to make infrared optical components, Windows and other components to improve the performance and stability of the device.
- Good optical performance Zerodur has good light transmission and reflection, and the reflectivity of the mirror can be adjusted according to the need. In addition, Zerodur has a higher refractive index, which is conducive to reducing the aberration of the mirror and improving the image quality.
- Chemical corrosion resistance Zerodur has good chemical resistance and can resist the attack of chemical media such as acid, alkali and salt. In optical applications, especially in corrosive environments such as chemical laboratories and Marine observations, Zerodur's chemical resistance guarantees its stability in corrosive environments.
- Electrical insulation Zerodur has good electrical insulation, which prevents current from passing through and reduces the risk of electrochemical corrosion. In optical applications, especially in high voltage environments, Zerodur's electrical insulation ensures safe operation of the system.

SILICON CARBIDE (SiC) CERAMICS

SiC is a technical ceramic material that not only exhibits excellent mechanical properties at room temperature, such as high bending strength, outstanding oxidation resistance, good corrosion resistance, high wear resistance and a low friction coefficient, but also boasts superior high-temperature mechanical properties (strength, creep resistance, etc.) among the well-known ceramic materials. Materials produced through hot pressing sintering, non-pressing sintering and hot isostatic pressing sintering can maintain their high-temperature strength up to 1600°C, making it the ceramic material with the best high-temperature strength. Its oxidation resistance is also the best among all non-oxide ceramics. SiC possesses excellent physical and chemical properties and is the ideal material for various high-performance and special environment applications.

SiC mirror block can be divided into many kinds according to the different preparation process. Major material types: SiC(Sintered SiC), SiC(HP SiC), SiC(RB SiC), SiC(CVD SiC), SiC(Porous SiC) ceramics, etc.

The SiC mirror is light in weight, and has the characteristics of high elastic modulus, small thermal deformation coefficient and high specific stiffness. The main processing process of SiC mirror is ceramic blank system fabrication - ceramic mirror rough grinding/fine grinding - ceramic mirror rough polishing/fine polishing - ceramic mirror surface coating modification - ceramic mirror polishing - ceramic mirror plating reflective film.

PROCESS CAPACITY

Material	Fused silica (JGS-2), Zerodur, SiC	
Range of dimension	100mm - 2000mm diameter	
Range of thickness	5 mm~300 mm	
Radius processing	Upon customer's request	
Center hole	Upon customer's request	
Measurement / tolerance	Dimension	Vernier caliper
	Radius	Coordinate Measuring Machine (CMM)
	Flatness	Dial indicator
	Circularity and Concentricity	Dial indicator

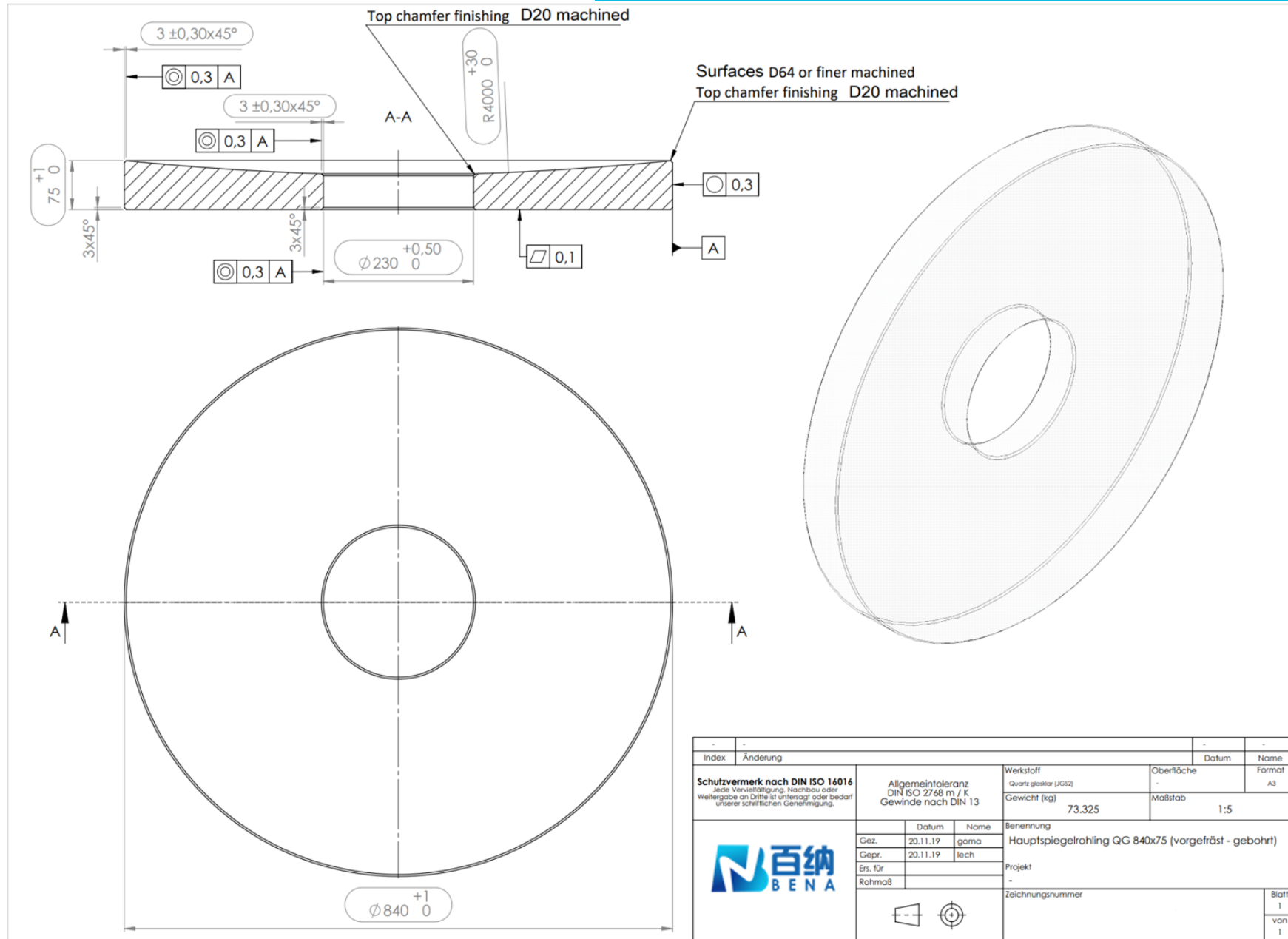
All indicators are available for graph machining, surface grinding, machining radius of curvature, center drilling and lightweight

Common machining sizes

The following sizes are all our cases, processed in full accordance with customer requirements and drawings

Diameter	Thickness
230mm	35mm
230mm	40mm
305mm	35mm
325mm	50mm
425mm	38mm
590mm	60mm
590mm	75mm
625mm	60mm
640mm	65mm
825mm	80mm
840mm	75mm
1040mm	100mm
1040mm	115mm
1240mm	115mm

PROCESS DRAWING SHOWS

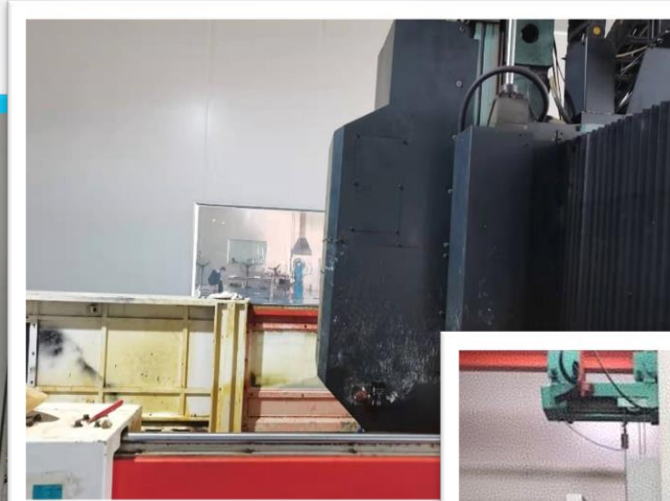


Index	Änderung	Datum	Name
-	-	-	-
Schutzvermerk nach DIN ISO 16016 <small>Jede Vervielfältigung, Nachbau oder Weitergabe an Dritte ist untersagt oder bedarf unserer schriftlichen Genehmigung.</small>		Allgemeintoleranz DIN ISO 2768 m / K Gewinde nach DIN 13	Werkstoff Quarz glaslar (JGS2) Oberfläche - Gewicht (kg) 73.325 Maßstab 1:5
		Datum 20.11.19 Name goma Gepr. 20.11.19 lech Ers. für Projekt - Rahmaß Zeichnungsnummer	Benennung Hauptspiegelrohling QG 840x75 (vorgefräst - gebohrt)
			Blatt 1 von 1

- With the rapid development of space optical technology, the resolution of space optical remote sensor has been improved, and the aperture of reflective space optical primary mirror is required to increase continuously. Lightweight design, analysis and manufacturing of large aperture space optical mirror has become an indispensable key support technology active in the forefront of modern science and technology. Bena Optics is a Zerodur commonly used for space optical mirrors. SiC and fused quartz for lightweight processing, to apply to the space ultra-low temperature environment of elliptical plane mirror as an example, CAD optimization lightweight structure, finite element analysis, flat light mirror in the state of self-weight mirror deformation is $0.014\lambda(\text{rms})$, in the ultra-low temperature -150°C environment mirror deformation is $0.002\lambda(\text{rms})$, the numerical control system in the graphic way to control the actual lightweight machining, using chemical methods to eliminate the stress and micro cracks generated in the process of machining, the final surface shape accuracy of $0.022\lambda(\text{rms})$.



PROCESSING WORKSHOP



Bena Optics hold that a company should be as tolerant / encompassing as the vast ocean which admits hundreds of rivers and should draw upon other's strengths.



海纳百川

★ Leading in optics with cutting-edge technology ★