Ceramic.

Zirconia and Alumina.

Description:

Zirconia and Alumina are advanced, technical ceramics offering unique properties for a 3D printed material. Built using a proprietary process based on fine powders, binding agents and sintering, finished parts are hard wearing and durable.

Why Choose.

- High Temperature Resistance
- High Wear Resistance
- Electrical and Thermal Insulation properties
- Good chemical resistance.
- Biocompatible for food and medical.

Applications:

- Laboratory sensors and devices.
- Electronics and Electrical
- Automotive EV battery and motor components.
- Mechanical bearings
- Medical

General Properties	Zirconia $ZrO_2+Y_2O_3$	Alumina Al_2O_3 (Fine & Coarse Grain)
Print Volume mm	80.3 x 50.3 x 146.5mm	83.6 x 52.4 x 156.8 mm
Part Density [g/cm3]	6.08	3.98
Hardness HV10	1250	1450-1800
Compressive Strength [MPa]	2300	2600
Flexural Strength 4-Point MPa]	890	395 or 480
Modulus of elasticity [GPa]	205-210	300 or 380
Surface Roughness [µm]	Ra 0.3	Ra 0.4 or Ra 0.9
Thermal Expansion Coefficient [10-6/K]	10	8
Thermal Conductivity [W/mK]	2.5-3	30-37
Elect. Resistivity at 20°C [Om]	10^{10}	10^{14}
Elect. Resistivity at 600°C [Om]	10^{4}	10^{6}

This data sheet contains approximate values. These values are influenced by part´s geometry, additives, and environmental influences. They were developed based on current experiences and knowledge. Therefore, the above mentioned properties cannot be claimed legally binding nor can a definite purpose be derived.

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Design Guide.

Overview:

As with most 3d printing processes and especially with technical ceramics you will see benefits from optimising your designs to the process.

The 3d printing process for these materials is broadly based on binder jetting. Once printed, 'green' parts are then processed to remove the binding agent and then sintered at high temperature. The total process time to build a single component is around 3 weeks or more.

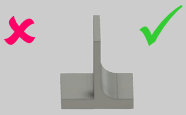
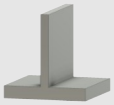
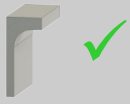
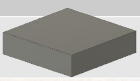
During the sintering process parts shrink by between 25 to 40% which is adjusted for at the printing stage. To allow for this please supply STEP files **and** a pdf engineering drawing to confirm the critical dimensions.

Designs with **low** material **volumes** are better suited to the process than solid 'chunky' geometries.

The process uses 'break away' support structures in ceramic, which results in a higher surface roughness at the touch point areas.

Alumina is a good first choice and provides greater scope for fine detail and suffers reduced shrinkage during the fabrication process.

General Design Rules. Some variation depending on geometry:

	Avoid "free falling" overhangs. I.e. downward sloping, unsupported features.
	Avoid right angles and corners, please add Rmin 0.3mm radius where possible.
	• **Alumina: Max** wall thicknesses is approx **6mm**. Min is approx **0.2mm** • **Zirconia**: **Max** wall thicknesses is approx **3mm**. Min is approx **0.2mm**
	Avoid horizontal overhangs, add chamfers or radii to add support. Small overhangs possible if 1 or 2mm. Self supporting 30 deg from horizontal.
	Min hole dia. approx 0.2mm. Holes may print slightly undersized.
	Metric threads ≥ M1.6 possible.
	The print needs to start from a flat surface face.

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