

# CERAMIC MATERIALS

## Physical Properties

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## IMPERVIOUS POROUS

Material	Unit of measurement	Alsint 99.7	Pythagoras 1800Z	Pythagoras	Zirconia MgO-PSZ	Zirconia Y-TZP	Zirconia CaO-FSZ	Halsic-I	Halsic-S	Alsint porous	Sillimantint 60	Sillimantint 65	Sillimantint 60 NG	Sillimantint KS	SiC <sup>①</sup> clay-bonded	Halsic-R	Halsic-RX	Fused Silica
Al <sub>2</sub> O <sub>3</sub> content	%	99.7	76	60	–	–	–	–	–	99.5	72 - 74	78 - 80	72 - 74	70	–	–	–	–
Alkali content	%	–	0.5	3	–	–	–	–	–	–	1	1	1	1	–	–	–	–
SiC content	%	–	–	–	–	–	–	88 - 92	99	–	–	–	–	–	70 - 90	99	99	–
Si-free	%	–	–	–	–	–	–	8 - 12	0.1	–	–	–	–	–	–	0.1	0.1	–
Type according to DIN EN 60672	–	C 799	C 620	C 610	–	–	–	–	–	–	C 530	–	–	–	–	–	–	–
Water absorption capacity	%	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.2	≤ 0.1	≤ 0.1	2 - 7	9	11	6	9	8 - 13	5	5	4 - 6
Leakage rate at 20 °C	hPa dm <sup>3</sup> s <sup>-1</sup>	10 <sup>-10</sup>	–	10 <sup>-10</sup>	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bulk density	g cm <sup>-3</sup>	3.75 - 3.94	3	2.6	5.6	5.9	5.4	3.1	3.1	3.6	2.40 - 2.45	2.45 - 2.50	2.60	2.40 - 2.45	2.2 - 2.5	2.7	2.7	1.92 - 2
Flexural strength 20 °C (3-point)	MPa	300	150	120	500	800	200	240 - 280	350 - 400	70 - 110	45	55	60	45	30	80 - 100	80 - 90	30 - 40
Flexural strength 1300 °C (3-point)	MPa	–	–	–	–	–	–	250 - 300	370 - 420	–	–	–	–	–	–	90 - 110	90 - 110	45 - 60 <sup>②</sup>
Young's modulus	GPa	300 - 380	150	100	–	–	–	370	420	–	60	75	85	60	–	280	280	30 - 40
Hardness (Mohs' scale)	–	9	8	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Thermal expansion 20 - 700 °C	10 <sup>-6</sup> K <sup>-1</sup>	7.8	5.6	5.4	9.8	10.6	9.9	3.7	–	7.8	5.3	5.3	5.2	5.3	5	3.9	3.9	–
Thermal expansion 20 - 1000 °C	10 <sup>-6</sup> K <sup>-1</sup>	8.6	6	6	10.3	10.9	–	4.3	5	8.6	5.7	6.3	5.7	5.7	5	4.5	4.5	0.5 - 0.9
Thermal conductivity 200 °C	W m <sup>-1</sup> K <sup>-1</sup>	25	6	2	–	–	–	100	124	–	1.4	1.4	–	1.4	–	35	35	–
Maximal approximate temperature for load-bearing elements <sup>③</sup>	°C	1700	1600	1400	1500	1000	2000 (w/o load)	1350	1600 <sup>④</sup>	1700	1350	1400	1600	1350	1300	1600 <sup>④</sup> 2000 <sup>⑤</sup>	approx. 1650 <sup>④</sup>	1000
Dielectric strength according to IEC 672-2	kV mm <sup>-1</sup>	17	17	17	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Resistivity at DC voltage 20 °C	Ω cm	10 <sup>14</sup>	10 <sup>13</sup>	10 <sup>13</sup>	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Thermal shock resistance	–	good	excellent	good	good	good	–	good	excellent	good	excellent	excellent	good	excellent	excellent	excellent	excellent	excellent
Diameter of pores, average	µm	–	–	–	–	–	–	–	–	1 - 3	2	1.5	8.5	2	3	24	24	0.2
Specific heat capacity 20 - 100 °C	J kg <sup>-1</sup> K <sup>-1</sup>	990	900	900	–	–	–	–	–	–	800	900	900	–	–	–	–	–

The values listed above pertain to test specimens. They are for reference purposes only and cannot be applied unconditionally to other shapes and dimensions. In practice, Alsint 99.7 components show mechanical strength values between 160 and 300 MPa, depending on their wall thickness, actual shape, surface finish, shaping process, and post-processing.

<sup>①</sup> since different qualities are available, values are approximate (and for reference purposes only)  
<sup>②</sup> at 700 °C <sup>③</sup> dependent upon load <sup>④</sup> under oxidizing conditions <sup>⑤</sup> under inert atmosphere