

# Technisches Datenblatt für vollkeramische Werkstoffe



| Bezeichnungen<br>Description   | Materialgruppe <i>Material group</i>   |                                  |  |                                       | Oxide                                   |   |   |   |                                      |                     |  |   |   |                           | Carbide                                  |  |                            |                     |              |                       | Nitride                               |  |  |  | Steel                  |    |
|--|--|----------------------------------|--|---------------------------------------|---|---|---|---|--------------------------------------|---------------------|--|---|---|---------------------------|--|--|----------------------------|---------------------|--------------|-----------------------|---------------------------------------|--|--|--|------------------------|----|
|  | Materialnummer von hofmann CERAMIC<br><i>Material No. From hofmann CERAMIC</i> |                                  |  |                                       | A96                                     | A985                                    | A995                                    | HCA92W                                  | A999                                 | AESD                | ZA10                                       | ZYMG  | HCZ95Y                                      | ZSYH                      | HCT90                                    | SCRB                                     | SCDS                       | SC                  | HCWC         | SiSC                  | ZC                                    | ANHP                                   | SN10                                   | SC20   | SNHT                   | ST |
|  | Eigenschaften<br><i>Properties</i>   | Einheiten<br><i>Units</i>        | Prüf-<br>verfahren<br><i>Test method</i> | 96%<br>Al <sub>2</sub> O <sub>3</sub> | 98,5%<br>Al <sub>2</sub> O <sub>3</sub> | 99,5%<br>Al <sub>2</sub> O <sub>3</sub> | 99,8%<br>Al <sub>2</sub> O <sub>3</sub> | 99,9%<br>Al <sub>2</sub> O <sub>3</sub> | Zirconia<br>Toughened<br>Alumina     |                     | MgO<br>Partially<br>Stabilized<br>Zirconia | Y2O3<br>Partially<br>Stabilized<br>Zirconia | Y2O3<br>Partially<br>Stabilized<br>Zirconia | TiO2<br>Titanium<br>oxide | Reaction<br>Bonded<br>Silicon<br>Carbide | Direct<br>Sintered<br>Silicon<br>Carbide | CVD Silicon<br>Carbide     | Tungsten<br>Carbide | SiSiC        | Zirconium<br>Carbide  | Hot<br>Pressed<br>Aluminium<br>Nitrid | Silicon<br>Nitride<br>(Glass<br>HiPed) | Silicon<br>Nitride<br>(Glass<br>HiPed) | High Temp.<br>Silicon Nitride<br>(Glass HiPed) | -                      |    |
| <b>Dichte</b><br><i>Density</i>  | -  | g/cm3                            | ASTM<br>C20                              | 3.72                                  | 3.80                                    | 3.90                                    | 3.92                                    | 3.92                                    | 3.85                                 | 4.01                | 5.72                                       | 6.02  | 6.07  | 4.00                      | 3.10                                     | 3.15                                     | 3.21                       | 14.90               | 3,02         | 6,73                  | 3.26                                  | 3.21                                   | 3.16                                   | 3.22   | 7.5-8.0                |    |
| <b>Korngröße</b><br><i>Crystal Size</i>                                | Mittelwert<br><i>Average</i>   | MICRONS                          | ASTM<br>E112                             | 6                                     | 6                                       | 6                                       | 6                                       | 3                                       | 6                                    | 2                   | 25   | 1   | 1   | -                         | 12                                       | 4  | -                          | 1                   | -            | -                     | 3                                     | -                                      | -                                      | -  | -                      |    |
| <b>Wasseraufnahme</b><br><i>Water Absorption</i>                       | -  | %                                | ASTM<br>373                              | 0                                     | 0                                       | 0                                       | 0                                       | 0                                       | 0                                    | 0                   | 0  | 0   | 0   | -                         | 00                                       | 0  | 0                          | 0                   | -            | -                     | 0                                     | 0                                      | 0                                      | 0  | 0                      |    |
| <b>Gasdurchlässigkeit</b><br><i>Gas Permeability</i>                   | -  | -                                | -  | 0                                     | 0                                       | 0                                       | 0                                       | 0                                       | 0                                    | 0                   | 0  | 0   | 0   | -                         | 0  | 0  | 0                          | 0                   | -            | -                     | 0                                     | 0                                      | 0                                      | 0  | 0                      |    |
| <b>Farbe</b><br><i>Color</i>   | -  | -                                | -  | Pink<br>Pink                          | Weiß<br>White                           | Elfenbein<br>Ivory                      | Elfenbein<br>Ivory                      | Elfenbein<br>Ivory                      | Schwarz<br>Black                     | Weiß<br>White       | Elfenbein<br>Ivory                         | Elfenbein<br>Ivory                          | Grau<br>Gray                                | Schwarz<br>Black          | Schwarz<br>Black                         | Schwarz<br>Black                         | Schwarz<br>Black           | Grau<br>Gray        | Grau<br>Gray | Schwarz<br>Black      | Grau<br>Gray                          | Grau<br>Gray                           | Grau<br>Gray                           | Grau<br>Gray                                   | Grau<br>Gray           |    |
| <b>Biegefestigkeit</b><br><i>Flexural Strength (MOR)</i>               | 20°C   | Mpa<br>(psi x 10 <sup>^3</sup> ) | ASTM<br>F417                             | 358<br>(52)                           | 375<br>(54)                             | 379<br>(55)                             | 390<br>(57)                             | 400<br>(58)                             | 300<br>(44)                          | 450<br>(65)         | 900<br>(131)                               | 1240<br>(180)                               | 1720<br>(249)                               | 140                       | 462<br>(67)                              | 480<br>(70)                              | 470-520<br>(68-75)         | 2330<br>(338)       | 250          | 990                   | 340<br>(49)                           | 1000<br>(145)                          | 900<br>(131)                           | 900<br>(131)                                   | -                      |    |
| <b>Elastizitätsmodul</b><br><i>Elastic Modulus</i>                     | 20°C   | Gpa<br>(psi x 10 <sup>^6</sup> ) | ASTM<br>C848                             | 303<br>(44)                           | 350<br>(51)                             | 370<br>(54)                             | 380<br>(55)                             | 386<br>(56)                             | 370<br>(54)                          | 360<br>(52)         | 200<br>(29)                                | 210<br>(30)                                 | 210<br>(30)                                 | 230                       | 393<br>(57)                              | 410<br>(59)                              | 435-460<br>(63-67)         | 614<br>(89)         | 330          | -                     | 330<br>(48)                           | 310<br>(45)                            | 320<br>(46)                            | 310<br>(45)                                    | 210-235<br>(30-34)     |    |
| <b>Poissonzahl</b><br><i>Poisson's Ratio</i>                           | 20°C   | -                                | ASTM<br>C848                             | 0.21                                  | 0.22                                    | 0.22                                    | 0.22                                    | 0.22                                    | 0.22                                 | 0.30                | 0.30                                       | 0.30  | 0.30  | -                         | 0.20                                     | 0.21                                     | 0.21                       | -                   | -            | -                     | 0.25                                  | 0.27                                   | 0.26                                   | 0.27   | 0.29                   |    |
| <b>Druckfestigkeit</b><br><i>Compressive Strength</i>                  | 20°C   | Mpa<br>(psi x 10 <sup>^3</sup> ) | ASTM<br>C773                             | 2068<br>(300)                         | 2500<br>(363)                           | 2600<br>(377)                           | 2650<br>(384)                           | 2700<br>(392)                           | 1975<br>(287)                        | 2900<br>(421)       | 1750<br>(254)                              | 2500<br>(363)                               | 2500<br>(363)                               | 680                       | 2700<br>(392)                            | 3500<br>(508)                            | -                          | 4343<br>(630)       | -            | -                     | -                                     | 2500                                   | 2500                                   | -  | 1000-2000<br>(145-290) |    |
| <b>Härte</b><br><i>Hardness</i>  | -  | R45N                             | ROCKWELL<br>45 N                         | 78                                    | 82                                      | 83                                      | 83                                      | 86                                      | 78                                   | 85                  | 77   | 81  | 81  | -                         | -  | -  | -                          | -                   | -            | 24,4                  | -                                     | -                                      | -                                      | -  | 55-60                  |    |
|  | -  | GPa<br>(kg/mm2)                  | KNOOP<br>1000 gm                         | 11.5<br>(1175)                        | 13.7<br>(1400)                          | 14.1<br>(1440)                          | 14.1<br>(1440)                          | 14.5<br>(1480)                          | -                                    | 14.5<br>(1475)      | 11.8<br>(1200)                             | 12.7<br>(1300)                              | 12.7<br>(1300)                              | -                         | 24.5<br>(2500)                           | 27.4<br>(2800)                           | 27<br>(2750)               | 15.2<br>(1548)      | -            | -                     | 11<br>(1120)                          | 16<br>(1630)                           | 15<br>(1530)                           | 16<br>(1630)                                   | 6.4-8.8<br>(650-900)   |    |
| <b>Zugfestigkeit</b><br><i>Tensile Strength</i>                        | 25°C   | Mpa<br>(psi x 10 <sup>^3</sup> ) | ACMA<br>Test #4                          | 221<br>(32)                           | 248<br>(36)                             | 262<br>(38)                             | 272<br>(39)                             | 283 (41)                                | -                                    | 290<br>(42)         | 483<br>(70)                                | -   | -   | -                         | 307<br>(44.5)                            | -  | -                          | -                   | -            | -                     | -                                     | -                                      | -                                      | 630 (91)                                       | 1110 (103)             |    |
| <b>Bruchzähigkeit</b><br><i>Fracture Toughness</i>                     | K(I c)   | Mpa m <sup>1/2</sup>             | NOTCHED<br>BEAM                          | 4-5                                   | 4-5                                     | 4-5                                     | 4-5                                     | 4-5                                     | 3-4                                  | 5-6                 | 11   | 13  | 13  | -                         | 4  | 4  | 3.5                        | 24                  | -            | 2,8                   | 3                                     | 6.5                                    | 5.5                                    | 6.0  | 50 - 80                |    |
| <b>Wärmeleitfähigkeit</b><br><i>Thermal Conductivity</i>               | 20°C   | W/mK                             | ASTM<br>C408                             | 24.7                                  | 27.5                                    | 30.0                                    | 31.0                                    | 33.0                                    | 25                                   | 27.0                | 2.2  | 2.2   | 2.2   | 11,7                      | 125.0                                    | 150.0                                    | 140.0                      | 84.0                | 45           | -                     | 80.0                                  | 34                                     | 29                                     | 38   | 35-55                  |    |
| <b>Wärmeausdehnungskoeff.</b><br><i>Coefcient of Thermal Expansion</i> | 25-1000°C  | 1X 10 <sup>-6</sup> /°C          | ASTM<br>C372                             | 8.2                                   | 8.2                                     | 8.2                                     | 8.2                                     | 8.2                                     | 8                                    | 8.3                 | 10.2                                       | 10.3  | 10.3  | 9                         | 4.3                                      | 4.4                                      | 4.6                        | 5.9                 | 4,5          | -                     | 5.0                                   | 3.7                                    | 2.9                                    | 3.1  | 12                     |    |
| <b>Spez. Wärmekapazität</b><br><i>Specifc Heat</i>                     | 100°C  | J/kg*K                           | ASTM<br>E1269                            | 880                                   | 880                                     | 880                                     | 880                                     | 870                                     | -                                    | 885                 | 400  | 400   | 400   | -                         | 800                                      | 800                                      | 665                        | -                   | -            | -                     | 740                                   | -                                      | -                                      | 724  | 475                    |    |
| <b>Thermoschockbeständigkeit</b><br><i>Thermal Shock Resistance</i>    | Δ Tc   | °C                               | (1)                                      | 250                                   | 200                                     | 200                                     | 200                                     | 200                                     | -                                    | 300                 | 350  | 350   | 350   | -                         | 400                                      | 300                                      | -                          | -                   | -            | -                     | -                                     | -                                      | -                                      | -  | -                      |    |
| <b>Durchschlagsfestigkeit</b><br><i>Dielectric Strength</i>            | 6.35mm   | ac-kV/mm<br>(ac V/mil)           | ASTM<br>D116                             | 8.3<br>(210)                          | 8.7<br>(220)                            | 8.7<br>(220)                            | 8.7<br>(220)                            | 8.7<br>(220)                            | -                                    | 9.0<br>(228)        | 9.4<br>(240)                               | 9.0<br>(228)                                | 9.0<br>(228)                                | 4                         | -  | -  | -                          | -                   | -            | -                     | 8.2<br>(207)                          | -                                      | -                                      | -  | -                      |    |
| <b>Dielektrizitätskonstante</b><br><i>Dielectric Constant</i>          | 1 MHz  | 25°C                             | ASTM<br>D150                             | 9                                     | 9.6                                     | 9.7                                     | 9.8                                     | 9.8                                     | -                                    | 10.6                | 28.0                                       | 29.0  | 29.0  | 85                        | -  | -  | -                          | -                   | -            | -                     | 9                                     | 8                                      | 8                                      | -  | -                      |    |
| <b>Dielektrischer Verlust</b><br><i>Dielectric Loss (tan delta)</i>    | 1 MHz  | 25°C                             | ASTM<br>D150                             | 0.0002                                | 0.0002                                  | 0.0001                                  | < 0.0001                                | <0.0001                                 | -                                    | 0.0005              | 0.001                                      | 0.001                                       | 0.001                                       | 0,0005                    | -  | -  | -                          | -                   | -            | -                     | < 0.001                               | -                                      | -                                      | -  | -                      |    |
| <b>Spezifischer Widerstand</b><br><i>Electrical Resistivity</i>        | 25°C   | ohm-cm                           | ASTM<br>D1829                            | > 10 <sup>14</sup>                    | > 10 <sup>14</sup>                      | > 10 <sup>14</sup>                      | > 10 <sup>14</sup>                      | > 10 <sup>15</sup>                      | > 10 <sup>8</sup> - 10 <sup>10</sup> | > 10 <sup>14</sup>  | > 10 <sup>13</sup>                         | > 10 <sup>13</sup>                          | > 10 <sup>13</sup>                          | -                         | < 10 <sup>13</sup>                       | ~ 10 <sup>5</sup>                        | < 0.10 - > 10 <sup>5</sup> | < 10 <sup>3</sup>   | -            | 78 x 10 <sup>-6</sup> | > 10 <sup>3</sup>                     | 10 <sup>14</sup>                       | 10 <sup>14</sup>                       | -  | 10 <sup>-5</sup>       |    |
|  | 500°C  | ohm-cm                           | ASTM<br>D1829                            | 4 x 10 <sup>9</sup>                   | 2 x 10 <sup>10</sup>                    | 2 x 10 <sup>10</sup>                    | 2 x 10 <sup>11</sup>                    | 1 x 10 <sup>12</sup>                    | -                                    | 2 x 10 <sup>9</sup> | 2 x 10 <sup>5</sup>                        | 2 x 10 <sup>4</sup>                         | 2 x 10 <sup>4</sup>                         | -                         | < 10 <sup>3</sup>                        | ~ 10 <sup>3</sup>                        | -                          | < 10 <sup>3</sup>   | -            | -                     | > 10 <sup>5</sup>                     | -                                      | -                                      | -  | -                      |    |
|  | 1000°C   | ohm-cm                           | ASTM<br>D1829                            | 1 x 10 <sup>8</sup>                   | 2 x 10 <sup>6</sup>                     | 2 x 10 <sup>6</sup>                     | 2 x 10 <sup>7</sup>                     | 1 x 10 <sup>7</sup>                     | -                                    | 3 x 10 <sup>6</sup> | < 10 <sup>3</sup>                          | < 10 <sup>3</sup>                           | < 10 <sup>3</sup>                           | -                         | < 10 <sup>3</sup>                        | ~ 10 <sup>2</sup>                        | -                          | < 10 <sup>3</sup>   | -            | -                     | > 10 <sup>3</sup>                     | -                                      | -                                      | -  | -                      |    |