**Henson Ceramics Limited**
Castle Works, Stafford ST16 2ET



# HCL4000 SERIES

| PROPERTY | SYMBOL | UNITS | MEASURED VALUES* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | HCL4030 Ref: 597 | HCL4040 Ref: 597 | HCL4050 Ref: 597 | HCL4051 Ref: 597 | HCL4055 Ref: 1298 | HCL4070 Ref: 597 |
| **ELECTRICAL** | | | | | | | | |
| **Relative permittivity** | $\varepsilon_{33}^{T}\varepsilon_{0}^{-1}$ | | 1050 | 1250 | 1700 | 3200 | 5000 | 420 |
| **Dielectric loss** | $\tan\delta$ | | 0.002 | 0.003 | 0.018 | 0.02 | 0.03 | 0.02 |
| **Resistivity** | $\rho_{el}$ | $\Omega$m | $10^{13}$ | $10^{10}$ | $10^{12}$ | $10^{12}$ | $10^{13}$ | $10^{12}$ |
| **ELECTROMECHANICAL** | | | | | | | | |
| **Coupling Coefficients** | $\kappa_{33}$ | | 0.71 | 0.67 | 0.70 | 0.72 | 0.80 | 0.69 |
| | $\kappa_{31}$ | | 0.32 | 0.33 | 0.34 | 0.35 | N/A | 0.31 |
| | $\kappa_{P}$ | | 0.55 | 0.59 | 0.59 | 0.64 | 0.62 | 0.53 |
| **Charge Coefficients** | $d_{33}$ | $10^{-12}CN^{-1}$ | 280 | 320 | 400 | 567 | 850 | 154 |
| | $d_{31}$ | $10^{-12}CN^{-1}$ | -105 | -120 | -165 | -270 | -420 | -60 |
| **Voltage Coefficients** | $g_{33}$ | $10^{-3}VmN^{-1}$ | 30.1 | 28.9 | 26.6 | 20.0 | N/A | 41 |
| | $g_{31}$ | $10^{-3}VmN^{-1}$ | -11.3 | -10.8 | -11.0 | -9.5 | N/A | -15.9 |
| **Frequency Constants** | $N_2$ | Hzm | | | 1940 | | | |
| | $N_1$ | Hzm | 1680 | 1650 | 1370 | 1400 | N/A | 1760 |
| | $N_P$ | Hzm | 2300 | 2260 | 2000 | 1980 | N/A | 2350 |
| **Mechanical Quality Factor** | $Q_m$ | | 1200 | 800 | <75 | 70 | 80 | 600 |
| **PHYSICAL** | | | | | | | | |
| **Curie Temperature** | $T_C$ | °C | 300 | 330 | 370 | 200 | 150 | 340 |
| **Density** | $\rho$ | $10^{3}kgm^{-3}$ | 7.6 | 7.6 | 7.75 | 7.45 | 7.8 | 7.7 |

*Measurements carried out 10 days after poling and at between 20°C and 25°C
Nominal values quoted to ± 10%, to account for raw material and process variations

Telephone: (01785) 241000 Facsimile: (01785) 214073 E-mail: mail@hensonceramics.com
Registered Office, Castle Works, Stafford. Registered in England No. 2491374.