



Illustrative ceramic metering plungers with straight and stepped forms

Ceramic Plungers

Product ID / SKU: FWM/CMP-PLUNGER-001

Material: Ceramic Metering Pump Components

Product type: Ceramic Metering Pump Components Component

Precision ceramic pistons and plungers for metering, dosing, filling and fluid-dispensing assemblies.

Alumina Typical Material Properties

Property	95% Al ₂ O ₃	99% Al ₂ O ₃	99.5% Al ₂ O ₃	99.8% Al ₂ O ₃	Condition / basis
Density (g/cm ³)	3.65	3.85	3.90	3.92	-
Fracture toughness (MPa·m ^{1/2})	3-4	3-4	4	4	-
Young's modulus (GPa)	320	340	370	390	-
Flexural strength (MPa)	300	330	375	390	25°C
Compressive strength (MPa)	2200	2350	2450	2500	25°C
Thermal conductivity (W/(m·K))	18-22	27	29	32	25°C
Linear thermal expansion coefficient (10 ⁻⁶ /K)	8	8	8	8	25-1000°C
Dielectric strength (kV/mm)	16	20	22	22	-
Volume resistivity (Ω·cm)	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴	25°C
Relative permittivity	9	9.7	9.7	9.8	1MHz, 25°C
Dielectric loss	0.0004	0.0002	0.0002	0.0001	1MHz, 25°C
Vickers hardness (HV)	>1300	1700	1750	1800	-
Material thermal-shock temperature difference, ΔT (°C)	220	180-200	180-200	180-200	-

Property	95% Al ₂ O ₃	99% Al ₂ O ₃	99.5% Al ₂ O ₃	99.8% Al ₂ O ₃	Condition / basis
Typical maximum material temperature (°C)	1500	1650	1700	1700	-

Zirconia (Z0201N) Typical Properties

Property	Z0201N typical value	Condition / method
Density	6.0 g/cm ³	JIS R 1634
Water absorption	0 %	JIS C 2141
Vickers hardness	12.3 GPa	HV9.807N (9.807 N load); JIS R 1610
Three-point flexural strength	1000 MPa	Three-point bending; JIS R 1601
Young's modulus	200 GPa	JIS R 1602
Poisson's ratio	0.31	JIS R 1602
Fracture toughness (SEPB)	6 MPa·m ^{1/2}	JIS R 1607
Linear thermal expansion, 40-400°C	10.5 × 10 ⁻⁶ /K	40-400°C; JIS R 1618
Linear thermal expansion, 40-800°C	11.0 × 10 ⁻⁶ /K	40-800°C; JIS R 1618
Thermal conductivity	3 W/(m·K)	20°C; JIS R 1611
Specific heat capacity	0.46 J/(g·K)	JIS R 1611
Material thermal-shock temperature difference	300°C	Water immersion; relative method; JIS R 1648
Dielectric strength	11 kV/mm	JIS C 2141
Volume resistivity, 20°C	10 ¹³ Ω·cm	20°C; JIS C 2141
Volume resistivity, 300°C	10 ⁶ Ω·cm	300°C; JIS C 2141
Volume resistivity, 500°C	10 ³ Ω·cm	500°C; JIS C 2141
Relative permittivity	33.0	1 MHz; JIS C 2141
Dielectric loss tangent	0.0016	1 MHz; JIS C 2141

Product Geometry & Configuration

Product parameter	Configuration	Basis
Material system	Ceramic Metering Pump Components	Material family; grade selected for the application
Component forms	Alumina plungers; Zirconia plungers; Matched plunger-and-cylinder sets	Drawing-defined configurations
Geometry and dimensions	Custom sizes available	Part drawing and mating interfaces
Functional surfaces	Contact, locating, joining or insulating surfaces as applicable	Surface finish and acceptance criteria on the drawing