

# Advanced Ceramics Pump and Fluid



## ADVANCED CERAMICS FOR PUMP AND FLUID HANDLING APPLICATIONS

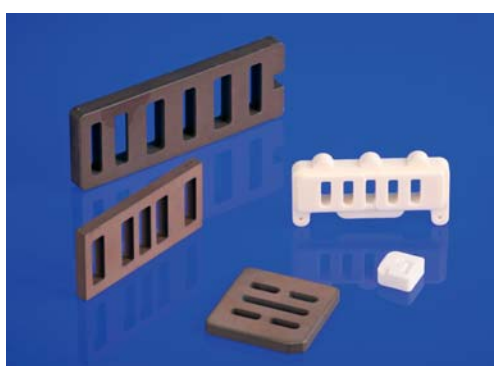


**Valve Plates and Counterface Seals**  
 Morgan Advanced Ceramics has extensive knowledge and skills in manufacturing and supplying volume precision valve plates and counterface seals. These components are used in a wide range of fluid and pneumatic control valve and seal assemblies.

- Applications Include:**
- Single-lever-mixer (SLM), 1/4 turn and 1/2 turn tap plates
  - Shower flow valves
  - Truck/cabin levelling air valves
  - Pneumatic valves
  - Automotive water pumps
  - General domestic and industrial pumps
  - Medical control units
  - Blood separation



- Ceramic Advantages Include:**
- Superior wear resistance
  - No corrosion
  - Low coefficient of friction
  - Exceptional flatness  $\leq 0.6\mu\text{m}$  ( 2 helium lightbands)
  - Surface finish typically controlled to  $< 0.4\mu\text{m Ra}$
  - High dimensional and thermal stability
  - Zero Toxicity, Water Research Advisory Scheme (WRAS) and RoHS approved



**Ceramic Pneumatic Slide Valves**  
 The principle of ceramic disc seals is also applicable to gaseous media. Ceramic directional control valves are extremely reliable and are preferentially employed in a variety of applications, for instance within automotive assembly lines and also the oil and gas industries. The main advantages of such valves are:

- Very high number of actuation without functional impairment ( 5x10<sup>7</sup>)
- No abrasion due to dust-laden airflow
- No time-dependent increase in leakage compared to rubber seals
- Totally maintenance free for the service life of the seal

### Rapid Prototypes

The need to accelerate time to market is clearly recognised by MAC. More than ever, today's businesses must be swift and agile. To ensure customers maintain their competitive position MAC provides the most cost effective, reliable and dependable path to meet product development time frames. Rapid prototyping supports this enabling a fast-track path from concept to production samples.

By utilising rapid tooling methods and CNC machining techniques, it is possible to replicate production finished components from a 3D CAD model in a short time-scale with minimum investment. Our sampling techniques are best suited to low volumes, typically 5 to 100 off, to allow customers to see and feel 'production-like' components during their development stage prior to investing in high volume production tooling.



### Primary MAC manufacturing site of Advanced Ceramics for Pump and Fluid Handling Applications

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MAC, Stourport holds ISO 9001: 2000 and ISO 14001: 2004 approvals



All MAC Stourport aluminas are approved by the Water Regulations Advisory Scheme (WRAS) for use with potable water

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All Morgan Advanced Ceramics manufacturing sites hold ISO 9000 approvals

**Morgan** Morgan Advanced Ceramics, a Member of [www.morganadvancedceramics.com](http://www.morganadvancedceramics.com)  
**MorganAdvancedCeramics** The Morgan Crucible Company Plc [www.macstourport.com](http://www.macstourport.com)  
[www.morgantechnicalceramics.com](http://www.morgantechnicalceramics.com)

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Ultra-hard wear resistant **Advanced Ceramic Components** with exceptional material characteristics and dimensional, surface and flatness tolerances for arduous fluid handling requirements

# Advanced Ceramics

# Pump and Fluid

# MAC

## Morgan Advanced Ceramics

Morgan Advanced Ceramics (MAC) is a leading supplier of high performance ceramic components offered from a comprehensive range of advanced ceramic materials. MAC forms part of Morgan Technical Ceramics division, comprising Morgan Advanced Ceramics and Morgan Electro Ceramics, a global business unit of The Morgan Crucible Company Plc.

Our aim is to work closely with our customers to solve problems relating to the design and production of application-critical components where traditional materials cannot deliver. Our extensive range of materials includes Alumina, Zirconia and Silicon Nitride. We pride ourselves on having the application engineering skills required in the design and production of highly engineered cylindrical shafts, bearings, pistons and seals to precision fit accuracy.

### Customer Support

With a world-leading reputation and manufacturing sites on three continents, an extensive sales and technical support network exists to provide the structure and capability to work with global businesses at national and international level.

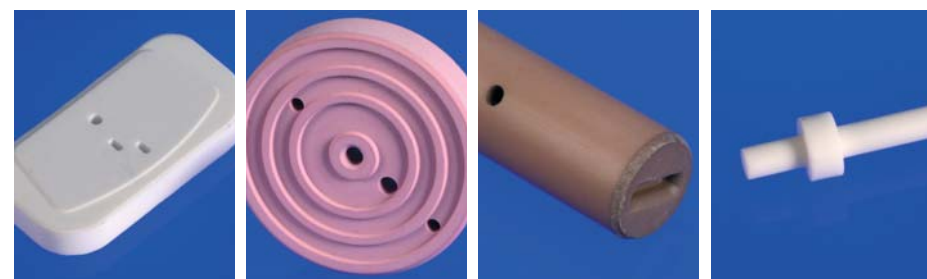
### Why Ceramics?

The continuous advances in science and technology lead to ever increasing demands on materials. Advanced ceramic materials have significant advantages because of their outstanding physical, chemical, mechanical and thermal properties. These properties enable our customers to implement design options that would be impossible using alternative materials. Our manufacturing technology also provides great versatility and freedom in the design of components.

Whatever your application, consider incorporating technical ceramic components as key design elements to give you a cost effective, high performance engineered solution.

### Materials Data (Alumina)

Mechanical Properties	Hilox 882	Hilox 961	Hilox 965	Hilox 991
% Al <sub>2</sub> O <sub>3</sub>	85	96	96	99.3
Colour	pink	brown	white	white
Fired Density g/cm <sup>3</sup>	3.56	3.85	3.80	3.88
% Open Porosity	0	0	0	0
Hardness R45N	77	83	80	87
Flexural Strength MPa	260	310	330	350
Typical Applications	seals	pumps, seals	valve seals	plungers, seals



## Shaft and Bearing Pump Components

Morgan Advanced Ceramics has been supplying high precision Alumina ceramic components for hot and cold water circulating pumps for over thirty years. In addition to our established pressing and extrusion capability, our leading-edge Ceramic Injection Moulding (CIM) facility minimises the need for grinding, hence reducing overall manufacturing costs for complex shapes by producing "as fired" geometry with tolerances of +/- <0.3%. This advance in process technology opens the door to a wide variety of application possibilities and intricate designs.

### Ceramic Advantages Include

- Maintenance free operation for pump life in excess of 15 years
- Exceptional corrosion resistance in aqueous based pumping applications
- Shaft/bearing clearances down to <=40µm to ensure minimal pump running noise
- High material thermal stability
- Extreme resistance to wear during high speed rotation (>3,000rpm) in abrasive fluid systems
- Alumina, being chemically inert and insulating avoids both electrochemical and electrolytic action

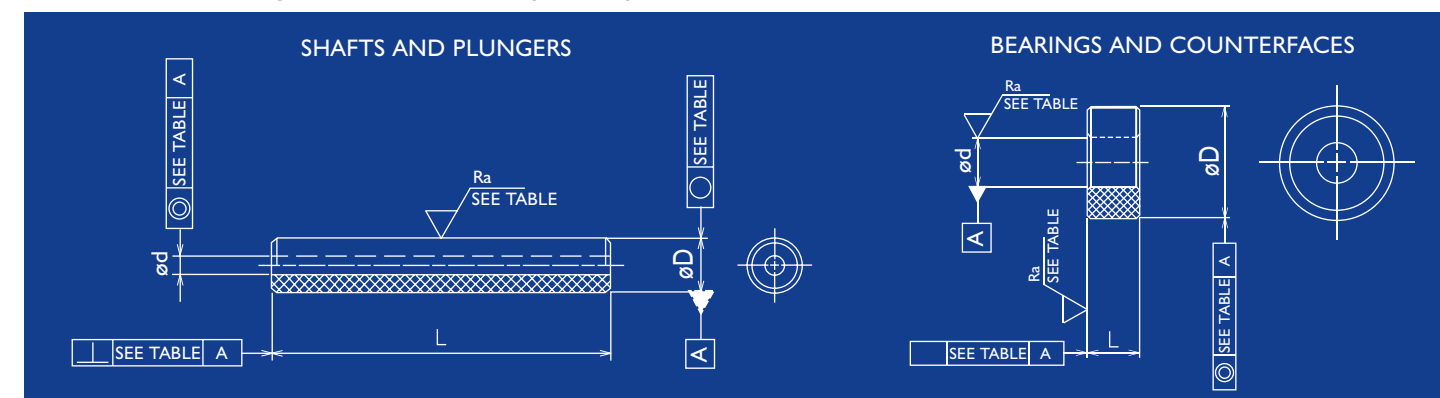
### Applications Include

- Domestic hot water circulators
- Pond, fountain and aquarium pumps
- Submersible pumps
- Dosing pumps
- Industrial and chemical pumps

### Typical Drawing Tolerances

Dimension	Range	Tolerances: As-Fired	Machined
∅D	2 - 50 mm	±1%	±0.005 mm
∅d	1 - 30 mm	±1%	±0.0075 mm
L	20 - 150 mm	±1%	±0.1 mm
⊥	0.2 - 0.02 mm	±0.2 mm	±0.02 mm
⊙	0.1 - 0.05 mm	±0.1 mm	±0.05 mm
○	0.1 - 0.04 mm	±0.1 mm	±0.005 mm
Ra	0.2 - 1.0 µm	1.0 µm max	0.2 µm max

### Schematic Drawings of Ceramic Pump Components



Grundfos Alpha Pro "A-rated" energy efficient circulator pump incorporates ceramic shafts and bearings manufactured by MAC. (photograph is the property of Grundfos A/S)



Kärcher HDS 13/24 PB Pressure Washer, incorporating MAC plungers, used to clean "President Head" sculptures at Mount Rushmore for the first time in 64 years. (Photographs are the property of Alfred Kärcher GmbH & Co. KG.)



## Plungers and Pistons

Morgan Advanced Ceramics has over twenty five years experience in manufacturing high precision alumina plungers and pistons for heavy duty pressure washer pumps and specialist pumps.

### Applications Include

- High/low pressure reciprocating pumps for:
  - Domestic use
  - Industrial use
- Fire Extinguishing equipment
- Laboratory dispensing equipment
- Specialist dosing pumps



### Ceramic Advantages Include:

- Maintenance free operation for minimum 5 to 10 years
- Used at pressures in excess of 500bar
- Exceptional hardness and wear resistance in arduous pumping applications
- Compressive strength significantly better than most engineering metallic materials
- High Corrosion resistance for a wide range of medical and chemical fluids
- Excellent dimensional stability even after prolonged exposure to aggressive fluids or extremes of temperature
- Components can be machined and polished to tight engineered tolerances



MAC High Grade Alumina Plungers are used in this Fire Extinguishing Pump Application. (Photo the property of HYPRO LLC)