chemically formed ceramic coatings
Bodycote offers a unique range of thermochemically formed ceramic coatings for the prevention of wear and corrosion in a wide variety of industrial applications and for every type of surface.

Bodycote’s ceramic coatings, which includes the K-Tech coatings range, have been uniquely developed for applications in specific industries. Several formulae cover a virtually limitless number of potential applications which can be applied to most ferrous and some non-ferrous metals.
Advanced surface technology

Bodycote’s thermochemically formed ceramic coatings represent a significant advance in surface engineering technology. These exceptionally hard and wear-resistant coatings offer a number of advantages compared with other ceramics.

- Substantially improved component lifetime
- Chemically, not mechanically, bonded
- Absolutely dense, pore free, corrosion barriers
- Effective coating of complex geometries and internal bores
- Low friction; the coated surface is anti-fouling
- Protection from highly corrosive environments and chemical attack
- Superior sliding wear resistance and high electrical resistivity
- Extremely fine grain structure

Your wear and corrosion challenges... solved

Bodycote’s thermochemically formed ceramic coatings can offer a solution for wear and corrosion problems across a wide range of market sectors and applications, delivering up to 25 times longer lifetime for your components.

Providing hardness of up to 2850 HV, bond strength in excess of 10,000 PSI and salt spray resistance of over 3,000 hours, Bodycote ceramics outperform other commercially available coatings.

Many coatings from the Bodycote ceramics range are applied with no measurable build up and offer resistance to thermal cycling/shock and low friction, adjustable surface finishes.

Bodycote has also introduced Tech100 Polymer, a liquid dispersion coating based on FERIK™ polymer – one of the highest performing thermoplastics in the world. FDA-approved, Tech100 offers exceptional scratch, wear and corrosion resistance and has outperformed peer coatings in wear and abrasion tests.

How does it work?

The application of Bodycote ceramics is tailored according to the substrate and end use requirement of the component.

Tech10 and Tech12 bond the ceramic with the metal surface by etching and penetrating into the surface grain boundaries, producing a ceramic oxide-to-metal bond which is exceptionally strong.

Some composite ceramics can be thermochemically bonded to specific areas on a part, including outside/inside diameters and some hidden holes and ports. These ceramics develop a bond into the substrate through the formation of a spinel-like interface between the ceramic coating and the metal surface.

In some cases, such as Tech17, the ceramic is used to seal existing coatings such as chrome and tungsten carbide. The ceramic seal is applied by saturating the coated area with a chemical solution at room temperature. These chemicals are then converted into ceramic by a low temperature firing process resulting in a reaction whereby the ceramic chemically bonds to both the coating and the substrate, filling any microporosity and preventing corrosives from attacking the substrate via blistering and undermining of the coating.
# The Bodycote ceramic coatings range

<table>
<thead>
<tr>
<th>Tool#1</th>
<th>Tool#2</th>
<th>Tool#3 (ChemoSeal)</th>
<th>Tool#4 (NFVSeal)</th>
<th>Tool#5</th>
<th>Tool#6</th>
<th>Tool#7</th>
<th>Tool#8</th>
<th>Tool#9 (Polymer)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical data</strong></td>
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<tr>
<td><strong>Min Hardness</strong></td>
<td>Up to 2550 Hv</td>
<td>Up to 2550 Hv</td>
<td>2500-1550 Hv</td>
<td>Decreases extent hardness of the coating being applied</td>
<td>Up to 1450 Hv</td>
<td>1400-1550 Hv</td>
<td>1300-1800 Hv</td>
<td>1500-2000 Hv</td>
</tr>
<tr>
<td><strong>Bond strength</strong></td>
<td>&gt; 10,000 PSI</td>
<td>&gt; 10,000 PSI</td>
<td>Up to 10,000 PSI</td>
<td>Up to 10,000 PSI</td>
<td>&gt; 10,000 PSI</td>
<td>&gt; 10,000 PSI</td>
<td>&gt; 10,000 PSI</td>
<td>&gt; 10,000 PSI</td>
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<tr>
<td><strong>Thickness</strong></td>
<td>2 - 3 minutes</td>
<td>2 - 3 minutes</td>
<td>up to 3 inches</td>
<td>up to 3 inches</td>
<td>15 - 30 minutes</td>
<td>15 - 30 minutes</td>
<td>30 - 60 minutes</td>
<td>60 - 120 minutes</td>
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<tr>
<td><strong>Coefficient of friction</strong></td>
<td>0.22 - 0.28 (N/mm)</td>
<td>0.22 - 0.28 (N/mm)</td>
<td>0.10 - 0.13 (mm)</td>
<td>0.10 - 0.13 (mm)</td>
<td>0.10 - 0.13 (mm)</td>
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<td>0.10 - 0.13 (mm)</td>
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<tr>
<td><strong>Key benefits</strong></td>
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<tr>
<td><strong>Corrosion resistance</strong></td>
<td>Sliding and rotational</td>
<td>Sliding and rotational</td>
<td>Endurance</td>
<td>Excellent</td>
<td>Sliding and rotational</td>
<td>Excellent</td>
<td>Sliding and rotational</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Wear resistance</strong></td>
<td>High speed steel</td>
<td>High speed steel</td>
<td>Extremity</td>
<td>Excellent</td>
<td>Sliding and rotational</td>
<td>Excellent</td>
<td>Sliding and rotational</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Resistant to thermal cycling/shock</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Low friction</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td><strong>Anti-oxidation</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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</tr>
<tr>
<td><strong>Minimal dimensional change</strong></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Life extension</strong></td>
<td>Up to 10x</td>
<td>Up to 10x</td>
<td>4-10x</td>
<td>2-6x</td>
<td>2-6x</td>
<td>Up to 20x</td>
<td>Up to 20x</td>
<td>Up to 10x</td>
</tr>
<tr>
<td><strong>Ideal for...</strong></td>
<td>Light pressure wear applications</td>
<td>Light to moderate wear, corrosive and abrasive environments</td>
<td>Severe conditions, high loads, severe abrasion</td>
<td>Severe conditions, high loads, severe abrasion</td>
<td>Severe conditions, high loads, severe abrasion</td>
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</tr>
<tr>
<td><strong>Features</strong></td>
<td>Many features into surface treatments, ceramics, and metallics</td>
<td>Fuses exceptionally strong ceramics into metallic bonds</td>
<td>Does not typically require pre-machining</td>
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</tr>
<tr>
<td><strong>Industry applications</strong></td>
<td>Oil &amp; gas, plastic injection, plastic injection &amp; extrusion, extrusion, pumping, metal, poly-polymer, pressure generation, extrusion, automotive, value</td>
<td>Oil &amp; gas, plastic injection, plastic injection &amp; extrusion, extrusion, pumping, metal, poly-polymer, pressure generation, extrusion, automotive, value</td>
<td>Oil &amp; gas, plastic injection, plastic injection &amp; extrusion, extrusion, pumping, metal, poly-polymer, pressure generation, extrusion, automotive, value</td>
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</tr>
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</table>

Liquid dispersion coating, based on PE620 polymer, widely regarded as one of the highest-performing thermoplastic in the world.
Provides exceptional scratch, wear and corrosion resistance, low friction, excellent high temperature performance, strength and durability.
FDA-approved coating grade, which supports many polymer coatings.
Our quality meets your standards

We never forget that our customers have invested time, money and resources in all the components we process, which is why quality comes as a standard part of our service, ensuring that all our customers’ components are treated with care throughout.

Our facilities hold numerous international, national and customer approvals appropriate to the services they offer and the markets they serve.

Our customers can be confident their demands can be met, however stringent, with assured quality, cost-effectiveness and on-time completion every time.

Precision finishing

The precision nature of ceramic coating and any associated thermal spray coating requires accurate measurement, finishing and quality inspection. Together with daily monitoring of coating parameters and metallographic quality this accuracy ensures that our coatings are of the highest integrity.

Our facilities are equipped with precision machining and finishing machines capable of coating removal for repair of worn components, and post-coating finishing to the highest standards.
Typical applications

![Image of a factory floor with machinery and workers](image)

**Oil & Gas exploration**
Bodycote ceramics are extremely cost effective where expensive downtime is caused by component corrosion and wear. Applications include down-hole tools, mud rotors, pump sleeves, MWD (measurement while drilling) equipment, and various valve components. Internal bore applications such as valve actuators and hydraulic jacks, previously chrome plated and now ceramic coated have seen significant life increase. Tech17 (Chrome Seal), for mud rotors, has improved down-hole life by five times.

**Aerospace**
As one of the first industries to fully adopt thermally sprayed treatments into the design of precision engineered components, aerospace applications have been a focus of Bodycote’s thermal spray activities. With over 100 key thermally sprayed applications within aerospace turbine engines, Bodycote can provide surface technology solutions for a range of properties including wear control, corrosion resistance, thermal efficiency and conductivity to protect against lightning strikes. Without these surface treatments, today’s aircraft components would not operate to the required standards.

**Pump & chemical**
Dramatic results have been achieved for the pump industry, particularly in chemical applications. Pumps exposed to petrochemicals, acids, seawater, chlorides, hydrochloric and cryogenic temperatures have experienced extended life cycles by factors of up to 100, when tested against unprotected pumps. Reciprocating piston pumps, centrifugal impeller pumps and high pressure injection pumps have benefited from Bodycote ceramic coatings.

**Plastics**
Pipe extruders run PVC pellets through an extruder which transforms the pellets into a molten state. Bodycote ceramics are used to coat the Y-pipe, spider, diffuser, cone and pin components. This has resulted in a significant life increase and a five-fold reduction in cleaning cycles. Chrome plated extruder screws, a key component of the injection moulding process, are treated with Tech17 (Chrome Seal), resulting in a ten times life increase over conventional chrome plate.

**Printing**
Rolls used within aggressive environments, such as those found in steel, paper and printing industries, suffer severe wear and corrosion problems resulting in high replacement costs, reduced performance, impaired quality and excessive downtime. With the use of high pressure high velocity oxy-fuel (HVOF) thermal spraying techniques, a durable engineered surface, with high micro hardiness and excellent wear and corrosion resistant properties, can be applied to the roll face and journals. This coating can be either textured or ground super finished, giving the required characteristics which enhance the performance of the roll and extend service life.

**Steel**
Bodycote ceramics have been successfully used to combat tool problems in the zinc die casting, cold forming and hot forging industries. Bodycote ceramics are also resistant to molten zinc and tin, having successfully improved the performance of correcting rolls and zinc pot rolls, used in the manufacture of galvanised steel strip. Significant improvements in life and downtime costs have been achieved. Other applications include guide bars, pump internals, and electric motor bearings.

**Textile**
Yarn contact components for textile machinery require extreme resistance to wear and corrosion, as well as a very low friction surface to prevent yarn damage. Bodycote ceramic coatings on thread guides, draw rolls, air jet plates, cooling tracks, Godet rolls and yarn feeders, greatly reduce maintenance and downtime costs. The extremely fine grain structure of Bodycote ceramic produces a very smooth low friction surface (COF 0.21 – 0.26). This combination produces excellent wear properties.

**Canning**
Can machine manufacturers often specify Bodycote ceramic as a direct replacement for chrome plate. Extreme hardness (2850 Hv) and a low friction surface significantly improve component life and reduce product damage. Typical applications are guides, can turrets and u-bends.
Down to earth – a component journey

**Mud rotors**
Corrosion and wear can lead to expensive downtime in oil & gas exploration, where equipment is in continual use. Mud rotors operate at the bottom of drilling wells, thus, the removal and replacement of worn rotors is particularly time consuming and costly. Following processing by Bodycote, the life of mud rotors is improved significantly.

**A thermochromically formed ceramic surface treatment is applied resulting in a super-hard, corrosion resistant layer which protects the steel and gives superior wear resistance.**

**The rotor must be finish polished using diamond tools due to the extreme hardness of the ceramic treatment.**

**The steel is then machined into the rotor shape required for down-hole drilling.**

*Photo courtesy of Viessmann www.vieissmann.com*

**Bodycote Component Journeys**
This is just one example of how Bodycote brings together the huge wealth of knowledge and expertise from across the Group to provide the vital engineering services our customers need...

For more component journeys visit [www.bodycote.com](http://www.bodycote.com)

*Denotes the parts of the component journey undertaken by Bodycote*

**End application – oil drilling service**
Operating an international network of facilities and serving a wide range of industries, Bodycote is the world’s largest and most respected provider of thermal processing services – a vital link in the manufacturing supply chain.

Bodycote operates in two major areas: the Aerospace, Defence & Energy business serves the aerospace, defence, power generation and oil & gas industries, whilst the Automotive & General Industrial business serves sectors including automotive, construction, tooling, medical and transportation.

Bodycote offers ceramic coatings from countries around the world:

**UK**
Knowsley, UK  
+44 151 546 2147

**USA**
Hot Springs AR, USA  
+1 501 760 1696
Houston TX, USA  
+1 281 227 8222

**UAE**
Dubai, UAE  
+971 4 885 1300

**Singapore**
Singapore, Singapore  
+65 6576 9888