



## Technical Bulletin

### Spartan HP (High Performance) Media for Hard Metals

Spartan HP® polishing medias are patented blends of synthetic fibers and polyurethane binder, with a look and feel that is similar to dense wool felt. Spartan manufactures polishing tools such as wheels, pads, or bobs from HP media, including impregnation with different chemistries and abrasives to modify performance. Tools made from HP media are highly customizable to solve challenging finishing applications, including use in automated CNC processes.

#### Background; “Surface Roughness (Ra)”

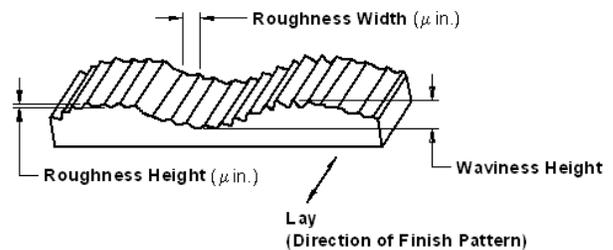
The term polishing varies from simply bringing out luster to a highly technical function, sometimes referred to as “critical” polishing applications. An example is a valve or fitting that is sealing off a toxic gas or hazardous liquid; the seal is “critical”. In these cases, polishing steps are structured steps and monitored for results.

If polishing of metal is required for the critical function of a part being produced, it generally follows milling (cutting) or grinding (de-burring) steps. These steps often leave machine marks and surface roughness to metal that can be seen by visual inspection. Polishing is used to reduce surface roughness to a level that cannot be seen by the naked eye; it must be measured. A common measurement used is Surface Roughness (Ra). For a “critical” area being polished, the desired Ra is often specified, and the methods used provide a controlled reduction of surface roughness, with measurements to confirm the results.

#### Measuring “Surface Roughness” or “Ra”

Surface Roughness can be measured by many different methods. One commonly used is the “**Average Surface Roughness, or (Ra)**”, often expressed in **microinches (“ $\mu$ in”)**. The device used to measure surface roughness is called a **profilometer**.

1 microinch = 0.000001 inch. The diagram below depicts the measurements that are made to measure roughness.



#### Surface Profile



## Polishing Media:

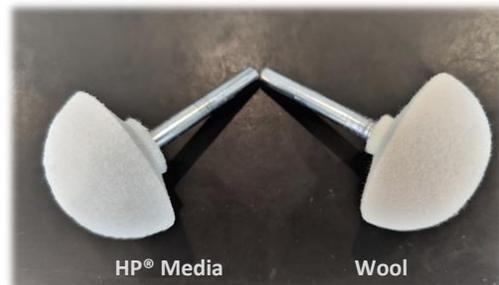
Polishing processes involve an abrasive, which cuts into a surface to remove material; a media which brings the abrasive to the surface to be polished; and force applied to the media so the abrasive will do its work. The force is usually a shearing force from a circular motion applied to the media. To change polishing results, one can change either the abrasive, the media, or the force.

Spartan Felt designs and builds tools from media to optimize polishing processes. Media can be natural materials such as cotton or wool, or synthetic materials such as polymeric fibers, fabrics, or films. By shaping a tool to match the profile of an area to be polished, the tool (media) can hold the abrasive to a part's profile and polish it more efficiently. By impregnating with abrasive, the media is even more efficient in holding abrasive to a part's profile.

Increasing the shearing force by adding more pressure or rotation speed to a tool can be tricky. Increased force will increase the ability of the abrasive to remove material from the surface being polished; however, heat from friction can build quickly and cause the tool's media to melt or burn. Spartan recognized that having a media that was less likely to burn could allow the application of higher force and improve the polishing efficiency of hard metals. Spartan HP® media products were developed fill this need. The composition of HP® media has inherently high heat resistance to withstand heat generated by friction. HP media was designed with porosity that helps heat dissipate from the substrate and enables cooling air to flow through the media to the part being polished. Under controlled conditions, HP® media can hold abrasive against hot substrate for longer periods of time than any other media we have worked with. Additionally, Spartan HP® media products are not affected by water; they can be run in wet conditions often found in CNC processes. These simple advantages are highly effective in polishing hard metals.

## Spartan HP® Media Properties:

- **High Heat Resistance**
- **Low Heat Absorption**
- **Porous Structure**
- **Accepts Abrasive Impregnation**
- **Easily Shaped**
- **Water Resistant**



## The Benefit of Heat Resistance and Low Heat Absorption:

In developing polishing tools and processes for hard metal alloys such as titanium, Spartan has found that HP® can be used under high pressure and torque, providing much more shearing force to the abrasive. This results in faster material removal from the metal surface. Polishing times are faster with HP® than over any other media tested.

## The Benefit of Holding Shape and Fit:

Tools made from HP® can be shaped to fit a profile of a part being polished, i.e., a taper or a specific radius. Spartan has found that because of the heat resistance, the tool will hold its shape, enabling the part profile to be polished evenly without removing more material than necessary. HP® products have been shown to reduce rejects due to deformation or creating areas where too much material was removed to meet specification.

### **The Benefit of Water Resistance:**

With the prevalence of water-cooled CNC cutting, and the desire for automation, water resistance of finishing tools is an important advantage. HP® is not degraded by water, enabling the use polishing tools in a wet process, such as CNC.

### **The Benefit of Abrasive Impregnation:**

HP® media can be impregnated with abrasives, such as aluminum oxide, silicon carbide, or diamond. As the tool wears, new abrasive becomes available. Abrasive impregnation can eliminate the need for additional compound, and the mess it makes when slinging off the tool.

### **Recommendation:**

1. In applications where hard metals are being polished, Spartan tools made with HP® media will provide efficient finishing to an Ra of about 3-5. Wool was found the best choice as a last step to achieve an Ra lower than 3-5, or to achieve mirror finishes. HP® media is an excellent pre-cursor to wool when a mirror finish is required.
2. The water and heat resistance of Spartan HP® media makes it a good choice for tools to be used in automated settings. Plus, abrasive impregnation of the HP® media can reduce or eliminate the need for abrasive compound and the mess it creates. A simpler, cleaner process is also helpful in automation.

### ***Spartan Felt celebrates 50 years in 2022, designing and developing polishing tools and polishing processes.***

HP® medias are patented and are the only synthetic felt-like materials developed expressly for polishing that we are aware of. The advantages of HP® media complement wool and have enabled us to offer customers better polishing products for hard metals.

If you would like to see how HP® media tools might improve your polishing applications, please contact us for additional information.



#### **Spartan Felt Co, Inc.**

151 Felt Drive  
Roebuck, SC 29376  
(864) 576-7919  
info@spartanfelt.com  
www.spartanfelt.com

