

## Surface Treatment Technical Data

<b>Tap Surface Treatment Technical Data</b>		
<b>Coatings Offer Longer Tool Life • Increased Production Rates • Less Machine Down Time</b>		
<b>Coating Material</b>	<b>Coating Color</b>	<b>Characteristics/ Applications</b>
Tin (Titanium Nitride)	Gold	Good general purpose coating; for tapping of iron-based materials; offers resistance to abrasive and adhesive wear.
TiCN (Titanium Carbonitride)	Blue-Gray	High hardness, good wear resistance, very tough coating; for difficult-to-machine steel alloys when taps encounter excessively stressed cutting edges, and highly abrasive and/or gummy materials such as cast iron, brass, and aluminum alloys; use when high feed and speed rates are desired.
CrC (Chromium Carbide)	Silver-Gray	For cutting titanium materials, exotic space-age metals; offers high hardness combined with enhanced lubricity over uncoated tools; more prevalent in die casting operations.
CrN (Chromium Nitride)	Silver-Gray	Resists adhesive wear, corrosion, and oxidation; suitable for machining of titanium and copper; harder than conventional chrome plating.
TiAlN (Titanium Aluminum Nitride)	Violet-Gray	A multi-layer coating ideal for carbide and high speed steel tooling; excellent oxidation resistance allows high speed, and semi-dry or dry machining; best suited for tapping cast iron, stainless steel, nickel-based high temp. alloys, as well as titanium alloys.
WC/C (Tungsten Carbide/Carbon)	Black-Gray	High lubricity and little adhesive wear (low friction); ideal for applications with adhesive wear and seizure problems (e.g. poor lubrication). High lubricity allows dry machining.
'HARDLUBE' TiAlN / WC/C (Titanium Aluminum Nitride/ Tungsten Carbide/Carbon)	Black-Gray	A combination coating that offers low friction and high lubricity, as well as excellent hardness attributes; allows dry tapping with reliable chip evacuation, and increased cutting edge wear.
N (Nitride)	Dark Gray/Black	A very hard shallow surface treatment; works well on cast iron, die cast materials, magnesium, bakelite, plastic, zinc...recommended with high-wear, abrasive machining.
O (Oxide)	Silver/Gray	Produces a thin black iron-oxide coating that enhances lubricity, reducing friction. Deters chip welding and galling by acting as an insulator between tool and workpiece. Recommended for use in ferrous materials, low carbon, leaded steel, gummy materials.
N+O (Nitride + Oxide)	Dull/Flat Black	Combination of both treatments listed previously, affording the characteristics of both. Has anti-galling properties, with high wear resistance. Recommended for highly abrasive and penetration-resistant materials. Not suited for soft materials like (pure) aluminum, brasses, magnesium and similar non-ferrous materials.
WS2 (Tungsten Disulfide)	Dull Gray	A dry-film lubricant made of tungsten disulfide. Improves wear properties, reduces galling and enhances lubricity. Has an affinity for lubricants, resulting in oil-retention properties in "wet" applications.