

GUHRING

The Tool Company



TWIST DRILLS



REAMERS



DIAMOND TOOLS



TAPS



END MILLS



MODULAR TOOL SYSTEMS



RECONDITIONING
& COATING

Featuring **NEW**

ICE

Extreme Heat Resistant Coating

Coating and Reconditioning Services

GUHRING'S RECONDITIONING DIVISION TURNS WORN CUTTING TOOLS INTO ADDED PROFITS FOR YOUR COMPANY.

We can restore used standard and special carbide and PCD drills, step drills, reamers, and end mills to their original factory quality, condition and performance. We also recoat in the same facility that we recondition, allowing for quicker turn-around and excellent quality control.

Your investment in high-performance cutting tools is worth preserving. Extending a tool's life through quality reconditioning can greatly increase both productivity and profitability.

Utilizing the same high-precision CNC grinding machines that are used in Guhring's manufacturing plants, our Reconditioning Division is well-equipped to restore standard and special carbide and PCD tooling to its original factory quality, condition and performance.



High precision remanufacturing delivers longer reground tool life and often more regrinds per tool, resulting in significant cost savings in terms of both tooling and machining expenses. Guhring is able to provide factory reconditioning for our own drills, step drills, end mills, reamers and taps – and we can provide the same high-quality service for competitors' tooling as well.



With more than 50 years' combined experience in reconditioning, Guhring welcomes the additional challenge of high-performance tools, and we are able to perform alterations such as corner radii and shank alterations. Round




shank tools from 3 to 32 mm in diameter are normally able to be reground and recoated within 2 - 3 weeks. Durable plastic shipping totes are available for high-volume reconditioning customers.

Guhring's Reconditioning Division is staffed with its own customer service team, allowing for extraordinary and personalized service. Combined with our in-house coating chambers, our two U.S. locations – Brookfield, WI and New Hudson, MI – we are in a unique position to provide unmatched quality and service. Complimentary pickup and delivery is available to customers in southern WI, northern IL, and parts of MI and OH.



- High-precision CNC grinding machines
- Personalized customer service
- Reconditioning and coating at one facility
- Two U.S. locations; quick turnaround

KEY CHARACTERISTICS OF GUHRING HIGH PERFORMANCE COATINGS

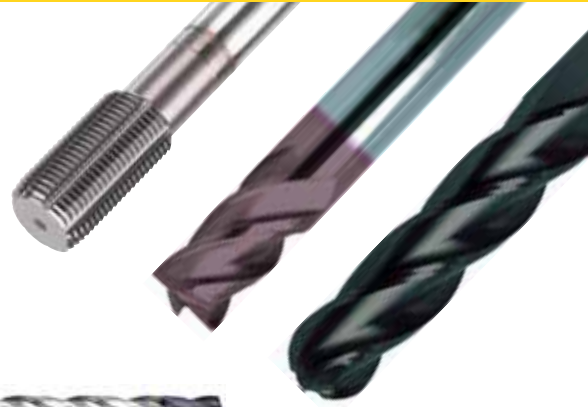
	Type	Identifying Color	Coating Process	Coating Temperature	Layer Structure	Thickness (µm)	Nano-hardness (HV 0.05)	Friction Coefficient (fetting)	Thermal Stability
TiN Titanium Nitride	Hard • Wear-resistant	Gold	PVD Physical Vapor Deposition	930° F 500° C	Monolayer	1.5 - 4.0	2400	0.50	1100° F 595° C
TiCN Titanium Carbonitride	Hard • Wear-resistant	Gray Violet	PVD Physical Vapor Deposition	930° F 500° C	Gradient	1.5 - 5.0	3000	0.25	840° F 450° C
TiAlN Titanium Aluminum Nitride	Hard • Wear-resistant	Black Violet	PVD Physical Vapor Deposition	930° F 500° C	Monolayer	1.5 - 4.0	3300	0.50	1470° F 800° C
FIREX® Special TiN-TiAlN	Hard • Wear-resistant	Red Violet	PVD Physical Vapor Deposition	930° F 500° C	Multilayer	1.5 - 5.0	3000-3300	0.50	1470° F 800° C
Super-A™ Aluminum Titanium Nitride	Hard • Wear-resistant	Dark Gray	PVD Physical Vapor Deposition	930° F 500° C	Monolayer	1.5 - 4.0	3800	0.60	1650° F 900° C
MolyGlide® MoS ₂ -Based	Soft • Lubricating	Silver	PVD Physical Vapor Deposition	305° F 150° C	Monolayer	1.0	n.a.	0.10	1470° F 800° C
ICE® Cr-Based	Hard • Wear-resistant	Metallic Silver	PVD Physical Vapor Deposition	930° F 500° C	Monolayer	1.5 - 4.0	3500	0.60	1832° F 1000° C



New! ICE® coating is a Cr-based coating that possesses the hardness and oxidation heat resistance features of TiAlN-based coatings such as FIREX® and Super-A™ but has higher shear strength and less tendency to adhesion. Unique properties engineered into this Chrome based coating allow for a reduced grain size and increased strengthening of the Aluminum & Titanium within the coating. This results in higher coating hardness and optimized oxidation stability. Excellent for aerospace and medical applications in titanium and nickel alloys. Also well suited for abrasive applications in cast iron.



HIGH PERFORMANCE PVD COATINGS BY GUHRING FOR CUTTING TOOLS & WEAR PARTS



Cutting tool substrates and geometries have benefited from enormous engineering advances over recent decades, and manufacturers like Guhring are continually working to make further improvements in tool productivity. Yet the heat generated during cutting tool operation, the wear caused by abrasion and the potential for chip adhesion still remain a factor in the vast majority of workpiece materials.

for the investment. Performance benefits include: significantly increased tool and part life, reduced friction and heat buildup, and high resistance to edge buildup, galling and fissure propagation.



Thus it is evident there is often a need for thin film coatings on cutting tools. Properly applied, coatings improve many tool and part characteristics. They increase surface hardness, lower the friction coefficient and thermal conductivity, and provide a chemically inert surface.

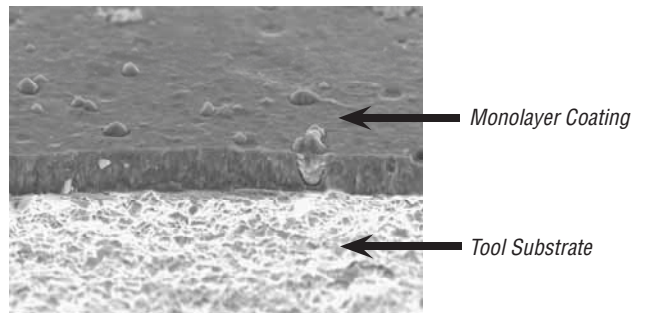
First, we clean each tool and part thoroughly in our custom-designed, five-stage ultrasonic cleaning system. Second, we sort each job by tool and part size, geometry, and material type to promote optimum coating uniformity and thickness. Properly cleaned and sorted, the tools and parts are then placed in the coating chamber. We monitor the coating process closely so that the structural integrity and the geometry of the tool or part remains intact.



As a cutting tool manufacturer, Guhring offers a level of coating expertise without equal in the industry. Guhring was the first to introduce TiN coating (Titanium Nitride) to cutting tools in 1980 and has remained a global leader in developing and applying new coating technology to improve both cutting tool and wear part performance. Today, Guhring offers a full range of high performance PVD (Physical Vapor Deposition) coatings to meet customers' diverse needs, including:

- **TiN** (Titanium Nitride)
- **TiCN** (Titanium Carbonitride)
- **TiAlN** (Titanium Aluminum Nitride)
- **FIREX**® (special TiN-TiAlN multilayer hard coating)
- **Super-A**™ (Aluminum Titanium Nitride)
- **MolyGlide**® (Molybdenum Disulfide-based soft coating)
- **ICE**® (Chromium-Based)

By effectively matching the right high performance coating to each application, Guhring Coating Division maximizes tool and wear part productivity and cost effectiveness – providing great value



Guhring utilizes both state-of-the-art cathodic arc and reactive ion coating systems to deliver superior coating adhesion, uniform thickness and structure, and batch-to-batch consistency. Quality checks are integral: XRF equipment provides coating thickness measurements and material analysis, and calotests allow us to view the structure of the coating. The end result is a cutting tool or wear part with the highest quality PVD coating and a significant advantage in an application.

This table provides general recommendations for optimum tool and part performance with Guhring high performance TiN, TiCN, TiAlN, Firex®, MolyGlide®, Super-A™ and ICE® coatings. Guhring's Coating Division coats many types of tools and wear parts, including drills, reamers, taps, countersinks, end mills, milling cutters, hobs, inserts, punches, dies, forming tools, gears, pistons, die casting molds and components, and plastic injection molds and components. Coatings can be applied to high speed steel, stainless steel, tool steel, carbide and other materials. You may also contact your local Territory Manager or Guhring Coating Division for coating recommendations.

MATERIAL		APPLICATIONS									
		Drilling	Turning	Milling	Tapping	Reaming	Broaching	Stamping	Deep Drawing	Forming	Injection Molding
Steels - general types		Firex TiN	Firex TiN	Firex TiCN	TiCN TiN MolyGlide	TiAlN TiCN MolyGlide	TiCN TiN	Firex TiN	TiCN TiN	TiCN TiN	TiN MolyGlide
Alloyed Steels Tool Steels, Stainless Steels, Super Alloys (Ni - Based)		Firex Super-A ICE	Firex Super-A	Firex Super-A	TiCN TiN MolyGlide	TiAlN TiN MolyGlide	TiCN TiAlN	Firex TiN	TiCN TiN	TiCN TiN	TiN MolyGlide
Mg - Alloys		Super-A TiAlN	Super-A TiAlN	Super-A TiAlN	TiCN TiAlN MolyGlide	TiAlN TiCN MolyGlide	TiCN TiAlN	TiCN TiN	TiCN TiN	TiCN TiN	TiN MolyGlide
Cast Irons		Firex ICE	Firex ICE	Firex Super-A	Firex TiCN MolyGlide	Super-A TiCN MolyGlide	Super-A MolyGlide				
Ti Alloys		Firex ICE	Firex ICE	Firex ICE	ICE TiCN MolyGlide	ICE MolyGlide	ICE	ICE	ICE	TiN MolyGlide	TiN MolyGlide
Al Alloys		TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide	TiN MolyGlide
Copper		TiN	TiN	TiN	TiN MolyGlide	TiN	TiN	TiN	TiN	TiN	TiN MolyGlide
Brass / Bronze		TiCN TiN	TiCN TiN	TiCN TiN	TiCN TiN MolyGlide	TiCN TiN	TiCN TiN	TiCN TiN	TiCN TiN	TiCN TiN	TiN MolyGlide
Plastics		TiN TiCN	TiN TiCN	TiN TiCN	TiN TiCN						TiN MolyGlide

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GUHRING[®]

ISO 9001:2000 CERTIFIED

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