

**BÖHLER UDDEHOLM**

Duplex-VARIANTIC® Coating



## The Duplex-VARIANTIC® Advantage

BÖHLER-UDDEHOLM offers this high performance coating comprised of a specially developed plasma-nitriding process combined with a low temperature nano-layered PVD coating. Duplex-VARIANTIC was created to eliminate the drawbacks associated with high temperature treatments like TD and CVD processes while providing equivalent performance. Tools can be easily coated and stripped many times to maximize tool life without damage to the substrate.

The unique composition of Duplex-VARIANTIC is ideal for high pressure applications. Adhesive and abrasive wear is significantly reduced providing impressive production enhancements.

### Benefits of Duplex-VARIANTIC:

- ▶ Improved Part Quality
- ▶ Higher Productivity
- ▶ Less Down Time
- ▶ Lower Tooling Costs
- ▶ Longer Tooling Life
- ▶ Reduced Lubricant Consumption



## Features

The reduced application temperature of Duplex-VARIANTIC ensures that the metallurgical and dimensional characteristics of the coated tool are not compromised. The nano-layer composition greatly reduces stress and improves ductility under high loads. This prevents microcracks in the film thus increasing coating longevity.

Combined with a dense, fine grain structure Duplex-VARIANTIC offers improved lubricity, high hardness and anti-corrosive properties. The plasma-nitride layer improves the compressive strength of the substrate which results in improved coating support and associated production improvements.

- ▶ High Hardness
- ▶ Wear Resistance
- ▶ Toughness
- ▶ Low Coefficient of Friction
- ▶ Galling Resistance
- ▶ Corrosion Resistance
- ▶ High Temperature Stability

# Duplex-VARIANTIC® Coating

## Applications

Duplex-VARIANTIC has been proven to offer performance enhancements to tools in many demanding applications. This coating can be applied to all tooling materials including:

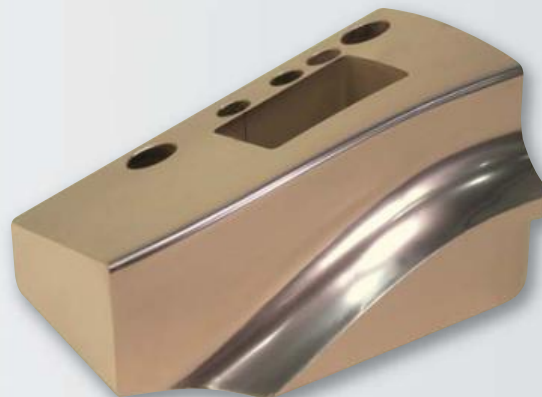
- ▶ High Temperature Tempered D2
- ▶ UDDEHOLM Caldie®
- ▶ BÖHLER K340 ECOSTAR®/ISODUR® (8 percent Chromium tool steel)
- ▶ UDDEHOLM SuperClean P/M tool steels
- ▶ BÖHLER MICROCLEAN® tool steels and high speed steels
- ▶ Stainless and Carbide

Duplex-VARIANTIC offers excellent performance and protection to properly welded substrates, and has been proven to perform in the following applications:

- ▶ High strength metal forming
- ▶ Non-ferrous metal forming
- ▶ Cold forging
- ▶ Powder compaction
- ▶ Blanking and trimming
- ▶ Piercing
- ▶ Precision stamping and fine blanking
- ▶ Plastic injection molding and extrusion

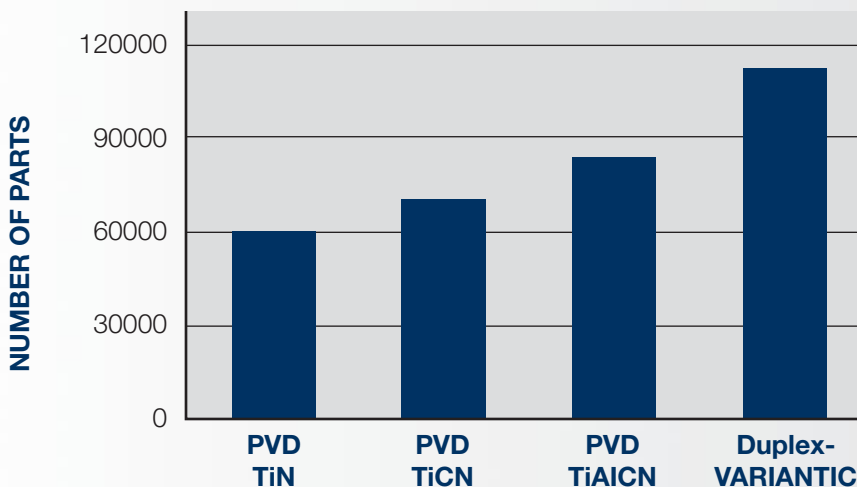
## Properties

- ▶ Material: Titanium-Aluminum Carbo Nitride, TiAlCN (multi-layers)
- ▶ Micro-hardness HV 0.05: 3500 ± 500
- ▶ Coefficient of friction against steel 100Cr6: 0.2
- ▶ Layer thickness: "with Duplex" 4-6 µm
- ▶ Maximum service temperature: 800°C/1470°F
- ▶ Colour: Old Rose
- ▶ Plasma nitriding: .002" - .004" case depth, zero white layer
- ▶ Process temperature: 500°C/925°F) maximum (with Duplex process)



## Performance

**Greater than 50% improvement in tooling life over best PVD coating.**



D2 forming die, coated with Duplex-VARIANTIC work material: hot rolled 1.0335 steel.

## The Duplex Advantage

Our proprietary Duplex system provides increased PVD performance using in-situ Plasma Nitriding prior to coating. The resulting surface preparation provides improved coating adhesion and support while improving wear resistance. The Duplex Advantage provides process and cost improvements you can rely on! Call us to arrange a visit from one of our Technical Sales Representatives.

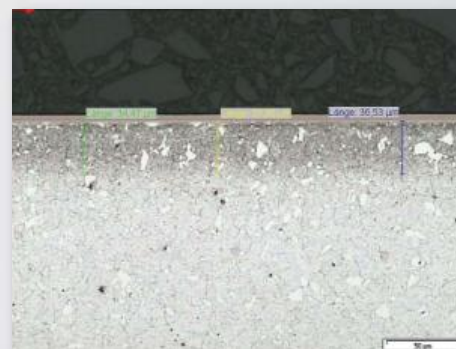
## Full Service Coating Services

BÖHLER-UDDEHOLM can service all coating requirements from new tooling programs to the refurbishment and recoating of existing tools. Our capabilities include:

- ▶ Heat Treating
- ▶ Mechanical and Chemical Coating Removal
- ▶ Welding
- ▶ Polishing
- ▶ Micro-Blasting
- ▶ PVD Coating of Small to Large Tooling
- ▶ Pick-up and delivery

## Technical Support

With over 60 years of service to the tooling industry we understand your concerns and know how to address them. We are committed to providing technical support to ensure your applications achieve their targets. We draw our expertise from years of servicing multiple market segments across the globe.



Cross-Section with Diffusion Layer

# BÖHLER UDDEHOLM

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MATERIALIZING VISIONS