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DUPLEX-VARIANTIC®-SERIES

High-performance coatings for demanding forming processes

voestalpine High Performance Metals LLC
www.eifeler.com/northamerica

voestalpine
ONE STEP AHEAD.

COATING SOLUTIONS FOR MODERN FORMING TECHNOLOGY

The demands placed on forming tools are constantly increasing – particularly due to the growing use of high-strength and ultra-high-strength steels in lightweight construction in the automotive industry. Although these materials offer advantages in terms of weight and strength, they pose enormous challenges for the tools used. The high tensile strength of the sheets leads to severe abrasive and adhesive wear, which can drastically shorten tool life and jeopardize process reliability.

The Duplex-VARIANTIC® series offers a powerful solution here. The specially developed PVD coatings combine hardness, ductility, and temperature resistance with excellent adhesion and wear reduction. This enables a significant extension of tool life and stable performance – even under extreme loads.

The machining of high-strength steels presents a number of technical challenges that require the targeted selection and optimization of the tool coatings used. Due to the high strength of these materials, there is increased tool wear, especially on the cutting edges and forming radii. The optimized plasma pretreatment results in a particularly high hardness of the Duplex-VARIANTIC® coatings. This hardness, combined with their multilayer structure, offers effective protection against material removal.

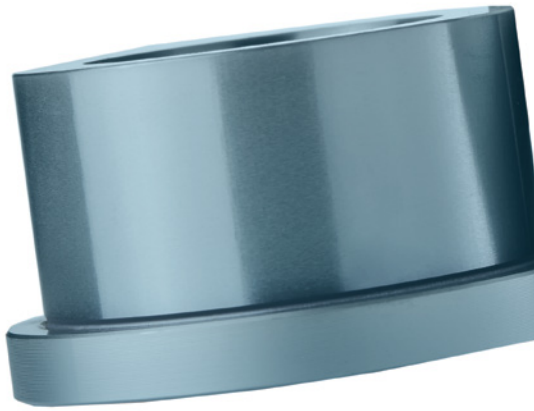
Adhesive wear is a significant problem, which can lead to cold welding and material adhesion during cutting, punching, and forming processes. The particularly smooth and carbon-rich top layer of Duplex-VARIANTIC® coatings reduces friction and reliably prevents material particles from adhering.

The high temperature stress generated during intensive forming processes can also have a negative effect on the layer structure. However, the coatings of the Duplex-VARIANTIC® series are temperature-resistant up to 800°C and retain their mechanical properties even under thermal stress.

Last but not least, the adhesion of the coating to complex tool geometries poses a challenge. Not only the pretreatment of the tools is crucial for this, but also the charging. With the help of specific devices, the tools can be charged so ideally that excellent layer adhesion is achieved – even on demanding tool shapes.

THE RIGHT SOLUTION FOR EVERY APPLICATION

- **Punching and fine blanking:** Tool edges are exposed to extreme stresses, especially with high-strength sheets with a tensile strength of 1,000 MPa or more. Here, the Duplex-VARIANTIC®-1400 plus ensures optimum protection of the smooth cut section and significantly reduces wear.
- **Drawing and deep drawing:** Friction between the tool and workpiece must be minimized to prevent material cracks and tool failure. The Duplex-VARIANTIC®-1000 with its TiAlN/TiCN combination offers a proven solution with a low coefficient of friction and high temperature resistance.
- **Pressing and bending:** Minimal forming radii and complex geometries require high ductility of the coating. The classic Duplex-VARIANTIC® offers a particularly stable multi-layer structure that provides reliable protection even under difficult forming conditions.
- **Rolling and extrusion:** These processes require even load distribution and high surface quality. The Duplex-VARIANTIC® range is available for this application and provides strong process reliability.



OUR COATINGS FOR FORMING

	Duplex-VARIANTIC®-1400 plus	Duplex-VARIANTIC®-1000	Duplex-VARIANTIC®
Tensile strength of the sheets	> 1,000 MPa	< 1,000 MPa	< 700 MPa
Hardness	3,000 ± 200 HV	4,000 ± 200 HV	3,500 ± 500 HV
Coating thicknesses	5 – 7 µm	Ca. 9 µm	4 – 6 µm
Maximum operating temperature	800°C / 1,470°F	800°C / 1,470°F	800°C / 1,470°F
Coefficient of friction against steel	0.2 – 0.6	0.2	0.2
Residual stress	-2.0 ± 0.5 GPa	-2.0 ± 0.4 GPa	-2.4 ± 0.5 GPa
Color	Blue-gray	Dark red-gold	Antique pink
Coating composition	AlCrTiN-based	TiAlN-based	TiAlN-based

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