



Think Zinc.

perFORM HOT.

Hot forming

With cathodic corrosion protection



Think Zinc.

The standard in hot forming

An experienced and innovative specialist in the hot forming of galvanized steel, voestalpine meets the most sophisticated challenges of the automotive industry: weight savings coupled with excellent crash behavior and excellent corrosion protection.

phs-ultraform®

phs-directform®



Think ahead.

As a technology group, voestalpine networks steel development, manufacturing and processing. The unsurpassed material expertise of development specialists in the Steel Division is combined with the processing know-how of the forming specialists in the Metal Forming Division. This is how the pioneer spirit and more than ten years of experience have become a unique center of competence in the field of corrosion-resistant, hot-formed components. You can put your full confidence in the material and component expertise of voestalpine. The advantages speak for themselves:

- Excellent cathodic corrosion protection
- Exceptional formability
- Excellent crash performance
- Highest strengths ranging from 1,300 to 2,000 MPa
- Wide variety of solutions for individual component requirements
- Economical manufacturing

Think solutions.

phs-directform®

The pioneer in galvanized, press-hardened components produced through direct forming

phs-ultraform®

The original for galvanized, press-hardened components produced through indirect forming

Tailored-property parts

The solution of choice for weight and components optimized for crash performance

phs-directform®

The pioneer in galvanized, press-hardened components produced through direct forming

phs-directform®, the world novelty developed by voestalpine, is directly hot-formed, hot-dip galvanized steel strip to be used in corrosion-resistant light-weight components for the automotive industry.

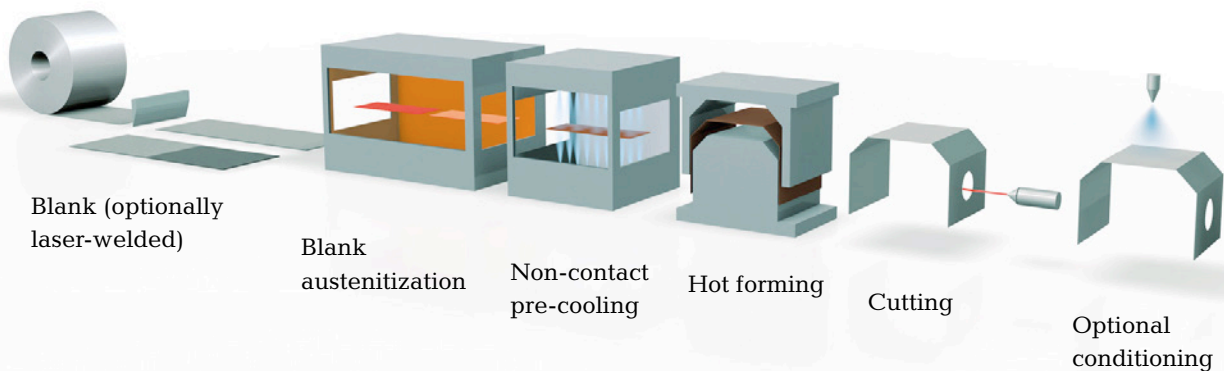
- More possibilities in component manufacturing
- More efficiency
- Resource-saving hot forming
- Convincing throughput numbers and possible applications

Material

The phs-directform® material is a conversion-delayed boron steel (20MnB8) with a galvanized coating. This guarantees high levels of corrosion resistance and produces a matt surface, thus allowing rapid heat absorption of the blank in the furnace.

Applications

The simple, reliable and economical solution in manufacturing with excellent properties during joining, in tensile strength and crash performance is especially suited to less



complex safety-related components that are subject to heavy corrosion: roof frames and roof bows, cross and side members, sill bars, tunnels, bumpers and B pillars.

Material advantages

- Excellent cathodic corrosion protection
- Very good hot forming properties
- Good crash performance
- Highest strength
- Component manufacturing in existing direct-process press-hardening lines
- Well suited to automotive painting
- Suitable for tailored-property parts

Process advantages

- Simplified process steps, cold forming not required
- Low amounts of material waste (lower material usage)
- Simple furnace technology (possible in roller-conveyor furnaces)
- Short furnaces possible
- Economic manufacturing in small batches
- Short cycle times possible
- No dew-point control during austenitization

phs-ultraform®

The original for galvanized, press-hardened components produced through indirect forming

Developed and patented by voestalpine and in serial production since 2008, phs-ultraform® combines the benefits of press-hardened components with the high-quality corrosion resistance of hot-dip galvanized strip. Special hot-dip galvanized boron steel and optimized indirect hot-forming technology achieve new dimensions in light-weight design.

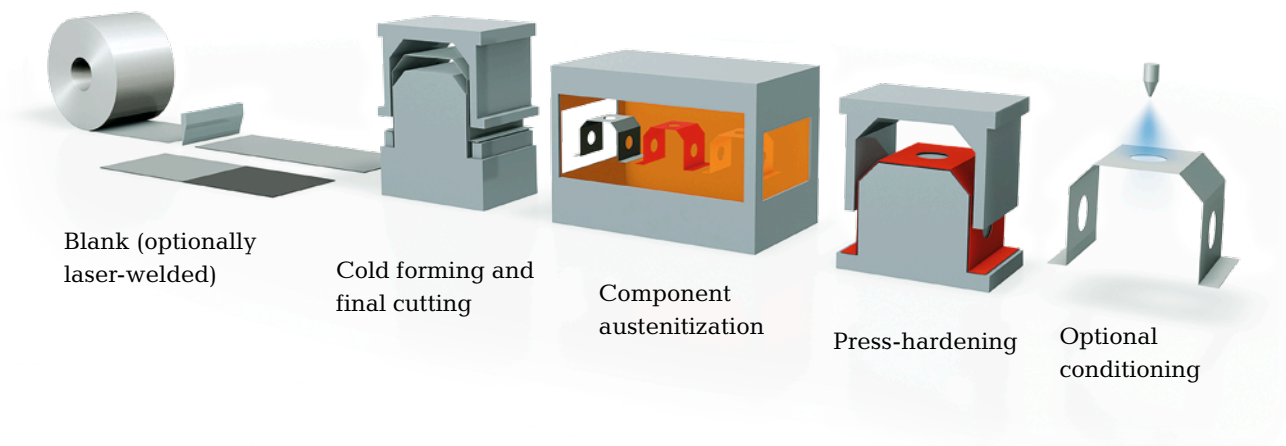
- Highest freedom of design and tested process reliability
- Consistently high component quality
- More forming efficiency
- Especially economical when producing high numbers of components

Material

phs-ultraform® is based on a boron steel (22MnB5) with an HDG/Zn coating and is available with various chemical compositions, mechanical properties and dimensions. It is the optimum material for a wide variety of applications.

Applications

phs-ultraform® is especially convincing in large components produced in high numbers. Complex component geometries and economical manufacturing are combined to create safety-relevant components that are subject to heavy corrosion: A and B pillars, sills, side walls, tunnel reinforcements, doors and hatches.



Material advantages

- Excellent cathodic corrosion protection
- Large components possible
- Complex geometries (undercutting) possible
- High-precision component geometry (low degree of elastic recovery)
- Best crash performance
- Highest strength
- High dimensional accuracy and uniform strength distribution
- Suitable for tailored-property parts

Process advantages

- Processing of blanks made of a wide variety of steel grades and thickness combinations
- Minimum tool wear, even with high unit numbers
- High component production levels through serial production
- Short cycle times resulting from rapid cooling
- Efficient cutting process in unhardened condition
- High resistance to edge cracking
- No dew-point control during austenitization
- Simulation of the entire process chain, including component properties



Hardened

Tailored-property parts

The solution of choice for weight and components optimized for crash performance

The hardness and toughness and thus the crash performance of tailored-property parts can be precisely fine-tuned to customer requirements. Whether manufactured with direct or indirect hot forming, the TPPs of voestalpine stand for optimized quality with the following benefits:

- Different combinations of steel grades and thicknesses
- Partial heating and cooling
- Many years of experience and expertise with simulation and engineering technologies

High-complexity component geometries of a wide variety can be achieved with defined strength progressions and optimized crash performance. Hardness and ductility can be adapted as required in order to achieve deformation where needed and high strength in just the right locations.

Tailor-welded blanks

The tailor-welded blanks are made of different kinds of steels and feature a variety of sheet thicknesses. It is possible to make components that feature harder and softer zones as required.

- Edge preparation of the individual blanks is not required.
- Sheet thicknesses 0.8–2.8 mm
- Strengths ranging from 500 to 2000 MPa

Patch inside/patch outside

(Spot-)welded patches for the strengthening of high-load areas are the simplest TPP variant. These patches also increase component stiffness.



Tailor-welded
blanks

Patch inside /
patch outside

Tailor-tempered

Tailor-heated

Tailor-heated

Targeted heat treatment also increases ductility. Areas that are meant to remain softer are not heated to austenitizing temperature during indirect hot forming.

- Heat loss with absorption mass
- Heat radiation for partial heating of areas to be hardened

Tailor-tempered

Additional heat treatment following the press-hardening process increases ductility and crash performance.

- Strengths can be reduced to between 1000 and 1500 MPa.

Applications

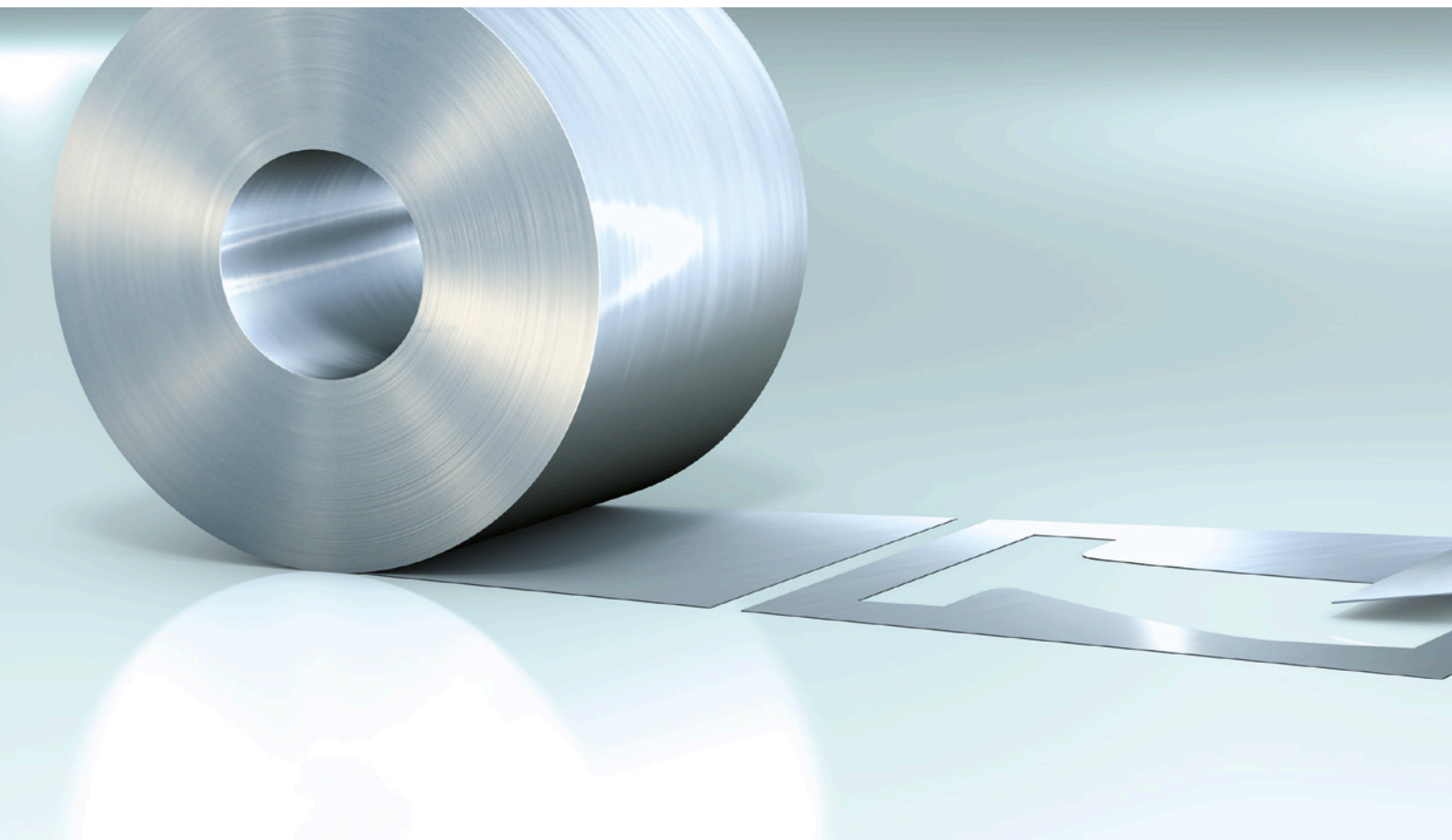
With their tailored properties, TPPs are especially suitable in load-bearing components such as B pillar reinforcements, roof frames, auto-body door rings and sills, stiffeners, rear side members, etc.

Advantages

- Highest strengths at the lowest weight
- Components Individually optimized with respect to crash performance, strength and weight
- Complex component geometries with few single components
- Experience and expertise across the entire process
- Joint developments
- Complete solutions from a single source, from the blank to the ready-to-install component
- Maximum light-weight design and minimum component weight

Think connected.

Your partner in every process step



The foundation for expertise and innovative power in voestalpine phs technology is comprehensive expertise bundled into one group of companies.

The customers of voestalpine in the automotive and automobile component supplier industries enjoy the benefits of a reliable partner.

■ Processing expertise

With their processing and material expertise, the specialists at voestalpine provide professional consultation in the development of materials and components manufactured using the direct and indirect hot-forming technologies.

■ Material expertise

Whether phs-directform® or phs-ultraform®, the innovative high-strength steels of the voestalpine Steel Division meet the most sophisticated requirements.



■ **Blank and component manufacturing**

The specialized companies of the voestalpine Metal Forming Division produce ready-to-install parts worldwide in the desired quality and quantity. These components are distributed with the globally efficient logistics available in the voestalpine Group.

■ **Global supplier**

With customer-specific logistics strategies, the voestalpine Steel Division guarantees reliable worldwide supply of high-quality steels. The companies in the Metal Forming Division on three different continents provide localized component manufacturing services.

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