phs-scalefree®
THE FIRST HOT FORMING STEEL UP TO 2000 MPa
WITH A THIN ZINC COATING

phs-scalefree 2000 is a special development in the field of lightweight automotive design that opens up new perspectives for the manufacture of high-strength components.

The single-phase zinc-ferrite coating is our secret for success. It ensures excellent scale protection with outstanding hot forming properties and provides additional corrosion protection.

phs-scalefree® is the quality solution for B pillars or internal structural components. Galvanized manganese-boron steels for hot forming are also recommended for large components and are easier to form than uncoated or hot-dip aluminized PHS steels.

Mission accomplished.
The new steel solution strengthens the position of voestalpine as the PHS specialist. phs-scalefree® was specifically developed to optimally complement the extensive portfolio of press-hardening steels for hot forming.

---

<table>
<thead>
<tr>
<th>EN 10346</th>
<th>VDA 239-100</th>
<th>Special voestalpine grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>phs-scalefree 2000</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>phs-scalefree 1500</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>phs-scalefree 490</td>
</tr>
</tbody>
</table>

Premium quality with reduced carbon footprint
UNBEATABLE IN MANUFACTURING AND COMPONENT QUALITY

Thin zinc coating for high level of processability

» No special PHS furnace atmosphere required. The zinc layer protects the PHS surface from scaling, and the high emissivity of the zinc-iron surface ensures rapid heating.

» During coating and throughout corrosion process, the single-phase zinc-iron coating leads to reduced hydrogen absorption when compared to multi-phase zinc-iron coatings and thus protects components from cracking.

» phs-scalefree® steels have very good adhesive bonding properties because of their special surface.

» phs-scalefree® can be hot-formed using either the direct and indirect process.

High-strength components for greater safety

» The high-strength components guarantee the best crash performance with the lowest weight.

» The single-phase zinc-ferrite coating protects the components from corrosion.

» The experts at voestalpine will provide advice and support from component design to production.

PHS process for freedom of design

» In the direct process, variable geometries can be produced due to lower friction in the hot forming tool (when compared to uncoated or hot-dip aluminized PHS steels).

» Complex geometries, including undercuts, are possible in the indirect process as a result of cold forming in the initial process step.

Scale protection for higher cost-savings

» The clean and scale-free processes ensure longer tool service life, reduced part cleaning requirements and longer tool cleaning intervals, which leads to savings in the forming process.

» The reduction of tool deposits and low tool wear also ensure consistently high component quality.

Lightweight design for sustainability

» High strengths up to 2000 MPa ensure lower wall thicknesses, lighter vehicle weights for lower fuel consumption and reduced carbon emissions.

» The press hardening technology also enables larger components. Material usage as well as the number of parts and joints can be reduced.

Carbon footprint, greentec steel product

<table>
<thead>
<tr>
<th>greentec steel product</th>
<th>Max. carbon footprint [kg CO₂ Co₂e per kg of steel]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot-dip galvanized steel strip</td>
<td>2,3</td>
</tr>
</tbody>
</table>

¹) The carbon footprint is calculated pursuant to worldsteel CML 2001-2016 (system expansion) on a cradle-to-gate basis.

All products, dimensions and steel grades listed in each voestalpine supply range are available as greentec steel.

The information and product properties contained in this printed material are non-binding and serve the exclusive purpose of technical orientation. They do not replace individual consultation provided by our sales and customer service teams. Information and product properties provided in this data sheet shall not be deemed guaranteed characteristics unless this has been agreed upon individually. Technical changes reserved. Errors and misprints excepted. No part of this publication may be reprinted without explicit written permission by voestalpine Stahl GmbH.

Please find out more about phs-scalefree® on our home page at voestalpine.com/ultralights/phs-scalefree