



## phs-ultraform®

### Galvanized hot forming steels for the production of press-hardened components using the indirect process

An innovation of voestalpine, phs-ultraform® combines the advantages of press-hardened components with the high-quality corrosion resistance of hot-dip galvanized steel strip.

phs-ultraform® permits lightweight design in a special dimension with regard to freedom of design, dimensional accuracy and process security and is the future solution for safety-relevant components that are subject to heavy corrosion.

phs-ultraform® sets new standards in the achievement of lightweight design and is highly relevant to electromobility applications.

#### Typical applications

- » Roof frames
- » Bumpers
- » A and B pillars
- » Hinge reinforcements
- » Rocker panels
- » Cross members
- » Side members

#### Convincing advantages

- » Complex and large components possible, even as tailored-property parts
- » Excellent cathodic corrosion protection
- » Minimum tool wear, even with high unit numbers
- » Best crash behavior
- » High dimensional accuracy and uniform strength distribution
- » Very good joinability (spot welding, adhesive bonding)



Premium quality  
with reduced carbon footprint

**phs-ultraform®**  
greentec steel

In indirect processing, blanks made of phs-ultraform – including laser-welded blanks made of various steel grades and thickness combinations – are formed using conventional cold-forming technologies and are cut to final geometry. The material is subsequently form-hardened in hot condition. This adjusts the mechanical properties and finalizes the component geometries.

The entire process chain can be simulated down to the detailed component properties.

Depending on customer requirements, surface conditioning and/or transport corrosion protection is applied by the component manufacturer.

### Chemical composition in mass %

Steel grade <sup>1)</sup>	C	Si max.	Mn	P max.	S max.	Al	Cr max.	Ti + Nb max.	B	Cu max.	N max.	Ni max.
phs-ultraform 490	≤ 0.13	0.5	≤ 1.5	0.03	0.025	≥ 0.015	-	0.15	-	0.2	-	-
phs-ultraform 1500	0.20 – 0.25	0.5	1.1 – 1.5	0.02	0.005	0.02 – 0.08	0.35	*)	0.002 – 0.005	0.2	0.01	0.1

\*) Ti 0.02 – 0.05 / Nb -

### Mechanical properties in as-delivered condition

Testing transverse to rolling direction

Steel grade <sup>1)</sup>	0.2 % yield strength R <sub>p0.2</sub> [MPa]	Tensile strength R <sub>m</sub> [MPa]	Total elongation A <sub>80</sub> [%] min.
phs-ultraform 490	280 – 450	380 – 540	21
phs-ultraform 1500	350 – 480	500 – 700	18

### Mechanical properties after hardening (Typical values)

Testing transverse to rolling direction

Steel grade	0.2 % yield strength <sup>2)</sup> R <sub>p0.2</sub> [MPa]	Tensile strength <sup>2)</sup> R <sub>m</sub> [MPa]	Total elongation <sup>2)</sup> A <sub>50</sub> [%]	Bending angle <sup>2) 3)</sup> α <sub>1mm</sub> [°]
phs-ultraform 490	400	490	16	130
phs-ultraform 1500	1050	1500	6	75

### Mechanical properties after hardening and cathodic dip coating (Typical values)

Testing transverse to rolling direction

Steel grade	0.2 % yield strength <sup>2)</sup> R <sub>p0.2</sub> [MPa]	Tensile strength <sup>2)</sup> R <sub>m</sub> [MPa]	Total elongation <sup>2)</sup> A <sub>50</sub> [%]	Bending angle <sup>2) 3)</sup> α <sub>1mm</sub> [°]
phs-ultraform 490	400	490	16	130
phs-ultraform 1500	1150	1500	6	75

<sup>1)</sup> The voestalpine steel grades meet the specifications of VDA 239-500.

<sup>2)</sup> Mechanical parameters in hardened condition are standard values achieved in the professional processing of flat sheets.

The indicated values are not guaranteed by voestalpine Stahl GmbH.

» Austenitization conditions: Furnace chamber temperature of 910 °C, 45 s annealing time after achieving a blank temperature of 870 °C

» Transfer time approx. 10 seconds (transfer time = time between furnace opening and complete pressure buildup in the press)

» Cooling conditions: Cooling rate > 40 K/s up to roughly 200 °C, during cooling between water-cooled plates

» Temperature at which blanks are removed: < 200 °C

» Conditions of heat treatment during bake-hardening simulation: 170 °C/20 min, oil

<sup>3)</sup> Instrument measurement of bending angle during bending test pursuant to VDA 238-100, α<sub>1mm</sub> = α x thickness<sup>0.35</sup>

### Coating in as-delivered condition

Coating class <sup>1)</sup> pursuant to VDA 239-500	Layer thickness per side [g/m <sup>2</sup> ]	Indication of coating thickness [µm]	Fe content in coating [mass %] max.	Al content in coating [mass %] max.
GI60/60	60 – 90	8,5 – 13	1.0	1.0

<sup>1)</sup> Other layer thicknesses upon request

### Coating after hot forming (Typical values)

Coating class	Layer thickness [µm]	Fe content in coating [mass %] max.
GI60/60	20	60

### Available dimensions

Steel grade	Thickness range [mm]	Width range [mm]
phs-ultraform 490	0.5 – 2.5	900 – 1720
phs-ultraform 1500	0.7 – 2.45	900 – 1635

The available combinations of widths and thicknesses vary depending on the steel grade.  
Additional dimensions upon request.



Premium quality with reduced carbon footprint

**phs-ultraform®**  
greentec steel

Hot-dip galvanized steel strip – greentec steel Edition

Max. carbon footprint 2.30 kg CO<sub>2</sub>e per kg of steel <sup>1)</sup>

<sup>1)</sup> per EN 15804+A2 (EPD methodology) cradle to gate

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

The information and product properties contained in this printed material are non-binding and serve the sole purpose of technical orientation. They do not replace individual advisory services provided by our sales and customer service teams. The product information and characteristics set forth herein shall not be considered as guaranteed properties unless explicitly stipulated in a separate contractual agreement. For this reason, voestalpine shall not grant any warranty nor be held liable for properties and/or specifications other than those subject to explicit agreement. This also applies to the suitability and applicability of products for certain applications as well as to the further processing of materials into final products. All application risks and suitability risks shall be borne by the customer. The General Terms of Sale for Goods and Services of the voestalpine Steel Division shall apply to all materials supplied by the voestalpine Steel Division and can be accessed using the following link: [www.voestalpine.com/stahl/en/The-Steel-Division/General-Terms-of-Sale](http://www.voestalpine.com/stahl/en/The-Steel-Division/General-Terms-of-Sale)

Technical changes are reserved. Errors and misprints are excepted. No part of this publication may be reprinted without explicit written permission by voestalpine Stahl GmbH.

Please find further information and  
downloadable files at  
[www.voestalpine.com/phs-ultraform](http://www.voestalpine.com/phs-ultraform)



voestalpine Stahl GmbH  
voestalpine-Straße 3  
4020 Linz, Austria  
productmanagement@voestalpine.com  
www.voestalpine.com/steel

**voestalpine**  
ONE STEP AHEAD.