



## 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, such as side members, A and B pillars, rockers and tunnels.

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

#### 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: Tensile test

Testing transverse to rolling direction

Steel grade <sup>1)</sup>	0.2 % yield strength $R_{p0.2}$ [MPa]	Tensile strength $R_m$ [MPa]	Fracture elongation $A_{80}$ [%] min.
phs-ultraform 490	280 – 450	380 – 540	21
phs-ultraform 1500	350 – 480	500 – 700	18

### Typical mechanical properties after hardening

Testing transverse to rolling direction

Steel grade	Typ. 0.2 % yield strength <sup>2)</sup> $R_{p0.2}$ [MPa]	Typ. tensile strength <sup>2)</sup> $R_m$ [MPa]	Typ. total elongation <sup>2)</sup> $A_{50}$ [%]	Typ. bending angle <sup>2) 3)</sup> $\alpha_{1mm}$ [°]
phs-ultraform 490	400	490	16	130
phs-ultraform 1500	1050	1500	6	75

### Typical mechanical properties after hardening and cathodic dip coating

Testing transverse to rolling direction

Steel grade	Typ. 0.2 % yield strength <sup>2)</sup> $R_{p0.2}$ [MPa]	Typ. tensile strength <sup>2)</sup> $R_m$ [MPa]	Typ. total elongation <sup>2)</sup> $A_{50}$ [%]	Typ. bending angle <sup>2) 3)</sup> $\alpha_{1mm}$ [°]
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. 8 – 14 seconds (transfer time = time between furnace opening and complete pressure buildup in the press)

» Cooling conditions: Cooling rate > 40 K/s 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,  $\alpha_{1mm} = \alpha \times \text{thickness}^{0.35}$

### Coating in as-delivered condition

Coating class pursuant to VDA 239-100 / EN 10346	Layer thickness [µm]	Fe content in coating [mass %] max.	Al content in coating [mass %] max.
GI60/60 - Z140	9 - 13	1.0	1.0
GI80/80 - Z180	11 - 18	1.0	1.0

### Typical values after hot forming

Coating class pursuant to VDA 239-100 / EN 10346	Layer thickness [µm]	Fe content in coating [mass %] max.
GI60/60 - Z140	20	50 - 65
GI80/80 - Z180	24	45 - 65

### Available dimensions

Maximum width [mm] per thickness, minimum width of 900 mm for wide strip

Steel grade	Thickness [mm]					
	0.5	0.7	1.0	1.4	2.0	2.2 - 2.5
phs-ultraform 490	1490	1690	1740	1740	1740	1600
phs-ultraform 1500	-	1350	1655	1655	1655	1400

Standard end trimming reduces the maximum width by 20 mm.  
Additional dimensions upon request.



Premium quality with reduced carbon footprint

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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.

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