

phs-ultraform®

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

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 light-weight construction of a new dimension with regard to freedom of design, dimensional accuracy and process security and is the future-oriented solution for safety-relevant components that are subject to heavy corrosion, such as side members, A and B pillars, rockers and tunnels. phs-ultraform® has set standards in the achievement of light-weight design and is therefore highly relevant to electromobility applications.

Convincing advantages:

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

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.

Chemical composition:

Heat analysis in mass %

Steel grade	C	Si max.	Mn max.	P max.	S max.	Al	Cr max.	Ti + Nb max.	B
phs-ultraform 490	≤ 0.11	0.5	1.4	0.03	0.025	≥ 0.015	-	0.10	-
phs-ultraform 1500	0.20 – 0.25	0.5	2.0	0.02	0.005	0.02 – 0.10	0.5	0.05	0.002 – 0.005
phs-ultraform 2000 ¹⁾	0.30 – 0.38	0.5	2.0	0.02	0.005	0.02 – 0.10	0.5	0.10	0.002 – 0.005

¹⁾ Steel grade being developed, indication of preliminary values

Mechanical properties:

Test direction: transverse to rolling direction

TENSILE TEST IN NON-HARDENED DELIVERY CONDITION

Steel grade	0.2 % yield strength R _{p0.2} [MPa]	Tensile strength R _m [MPa]	Total elongation A ₈₀ [%] min.
phs-ultraform 490	340 – 420	410 – 510	21
phs-ultraform 1500	380 – 480	≥ 480	18
phs-ultraform 2000 ¹⁾	400 – 520	≥ 580	16

¹⁾ Steel grade being developed, indication of preliminary values

TENSILE AND BENDING TESTS IN HARDENED CONDITION

Steel grade	0.2 % yield strength ¹⁾ R _{p0.2} [MPa]	Tensile strength ¹⁾ R _m [MPa]	Total elongation ¹⁾ A ₈₀ [%] min.	Bending angle ¹⁾²⁾ α _{1mm} [°] min.
phs-ultraform 490	340 – 470	460 – 700	12	120
phs-ultraform 1500	950 – 1250	1350 – 1600	5	55
phs-ultraform 2000 ¹⁾	≥ 1200	≥ 1800	5	45

¹⁾ Mechanical parameters in hardened condition are standard values achieved in 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 between 5 and 10 seconds (transfer time = time between furnace 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

²⁾ Instrument measurement of bending angle during bend test according to VDA 238-100, α_{1mm} = α x thickness^{0.35}

¹⁾ Steel grade being developed, indication of preliminary values

Coating

UNHARDENED AS-DELIVERED CONDITION PURSUANT TO EN 10346

Coating class	Coating thickness [µm]	Fe content in coating [mass %] max.	Al content in coating [mass-%] max.	Admixtures in coating [mass %] max.
Z140	9 – 13	1.0	1.0	1.0
Z180	11 – 18	1.0	1.0	1.0

HARDENED CONDITION

Coating class	Coating thickness ¹⁾ [µm]	Fe content in coating ¹⁾ [mass %] max.	Gamma-phase ¹⁾²⁾
Z140	15 – 30	50 – 65	Yes/no (dependent on heat treatment)
Z180	18 – 35	45 – 65	Yes

¹⁾ Coating properties in hardened condition are standard values achieved in the professional processing of flat sheets.

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

» Transfer time between 5 and 10 seconds (transfer time = time between furnace 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

²⁾ Gamma phase: Intermetallic ZnFe phase with roughly 70% Zn, thus offering increased cathodic corrosion protection

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	1670	1670	1670	1400
phs-ultraform 2000 ¹⁾	-	-	1300	1400	1400	-

¹⁾ Steel grade being developed, indication of preliminary values

Additional dimensions upon request.

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Please find further information and downloadable files at www.voestalpine.com/phs-ultraform



voestalpine Stahl GmbH

voestalpine-Straße 3

4020 Linz, Austria

T. +43/50304/15-8018

produktmanagement@voestalpine.com

www.voestalpine.com/steel

voestalpine

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