phs-uncoated

Uncoated hot-forming steels for the production of press-hardened components

phs-uncoated is ideally suited as a hot-forming steel for the automotive industry and can be used in all safety-relevant components that do not require a higher level of corrosion protection.

The material allows forward-looking and innovative lightweight designs that must meet high demands on crash behavior. The alloy composition makes it possible to process the material in both direct and indirect hot-forming processes. With its carefully selected surface treatment, phs-uncoated is suitable for use in applications such as B pillars, bumper reinforcements and interior structural members.
phs-uncoated is also used to manufacture welded blanks.

Convincing advantages

- Wide range of thicknesses for a variety of applications
- Best crash behavior
- Very good joining behavior
- Tailored-property parts possible
- Workability in the direct and in the indirect hot forming process

greentec steel

Premium quality
with reduced carbon footprint

phs-uncoated
greentec steel

Typical applications:

- B pillars
- Bumper reinforcements
- Interior structural members

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 [1]	C	Si max.	Mn	P max.	S max.	Al	Cr max.	Ti + Nb max.	B	Cu max.	N max.	Ni max.
phs-uncoated 1500 CR phs-uncoated 1500 HR	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
phs-uncoated 2000 CR [2] phs-uncoated 2000 HR [2]	0.30 – 0.38	0.5	≤ 2.0	0.02	0.005	0.02 – 0.08	0.50	0.2	0.002 – 0.005	0.2	0.01	0.5

*) Ti 0.02 – 0.05 / Nb -

Mechanical properties in as-delivered condition

Testing transverse to rolling direction

Steel grade [1] [3]	0.2 % yield strength $R_{p0.2}$ [MPa]	Tensile strength Rm [MPa]	Total elongation A80 for t < 3 mm [%] min.	Total elongation A5 for t ≥ 3 mm [%] min.
phs-uncoated 1500 CR	300 – 480	480 – 600	18	–
phs-uncoated 1500 HR	≥ 280	450 – 750	12	14
phs-uncoated 2000 CR [2]	300 – 500	450 – 650	17	–
phs-uncoated 2000 HR [2]	280 – 680	440 – 850	10	12

Mechanical properties after hot forming and hardening (Typical values)

Testing transverse to rolling direction

Steel grade	0.2 % yield strength [4] $R_{p0.2}$ [MPa]	Tensile strength [4] R_m [MPa]	Total elongation [4] A_{50} for t < 3 mm [%]	Total elongation [4] A_5 for t ≥ 3 mm [%]	Bending angle [4] [5] α_{1mm} [°]
phs-uncoated 1500 CR	1050	1500	6	–	65
phs-uncoated 1500 HR	1050	1500	6	9	65
phs-uncoated 2000 CR [2]	1200	1900	5	–	45
phs-uncoated 2000 HR [2]	1200	1900	5	8	45

Mechanical properties after hot forming, hardening and cathodic dip coating (Typical values)

Testing transverse to rolling direction

Stahlsorte	0.2 % yield strength [4] $R_{p0.2}$ [MPa]	Tensile strength [4] R_m [MPa]	Total elongation [4] A_{50} for t < 3 mm [%]	Total elongation [4] A_5 for t ≥ 3 mm [%]	Bending angle [4] [5] α_{1mm} [°]
phs-uncoated 1500 CR	1150	1500	6	–	65
phs-uncoated 1500 HR	1150	1500	6	9	65
phs-uncoated 2000 CR [2]	1400	1850	5	–	50
phs-uncoated 2000 HR [2]	1400	1850	5	8	50

[1] The voestalpine steel grades meet the specifications of VDA 239-500.
[2] Indication of preliminary values
[3] Standard supply of hot-rolled steel strip (HR) is in as-rolled condition. Material can also be ordered in soft-annealed condition, and mechanical properties are subject to separate agreement.
Standard supply of cold-rolled steel strip (CR) in annealed and skin-passed condition
[4] 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
- 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
- Hot-rolled steel strip (HR): Tensile and bending tests were carried out with test samples measuring 2 to 3 mm in thickness (bending values converted to 1 mm thickness).

[5] Instrument measurement of bending angle during bend test pursuant to VDA 238-100.
The indicated bending values were converted to 1 mm thickness based on the formula ($\alpha_{1mm} = \alpha \times \text{thickness}^{0.35}$).

Available dimensions

Steel grade	Thickness range [mm]	Width range [mm]
phs-uncoated 1500 CR	0.7 – 3.0	900 – 1600
phs-uncoated 1500 HR [1]	2.0 – 6.0	900 – 1700
phs-uncoated 2000 CR [2]	1.0 – 3.0	900 – 1550
phs-uncoated 2000 HR [1] [2]	2.0 – 6.0	900 – 1580

[1] Inhomogeneous scale may develop on hot-rolled steel strip (HR) in thicknesses ranging between 2.0 and 2.5 mm (limited surface quality).
[2] Indication of preliminary values

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

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Hot-rolled steel strip – greentec steel Edition
Max. carbon footprint 2.10 kg CO_2e per kg of steel [1]
Cold-rolled steel strip – greentec steel Edition
Max. carbon footprint 2.15 kg CO_2e per kg of steel [1]

[1] 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.

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

voestalpine
ONE STEP AHEAD.