

PERFORMANCE ON TRACK®

HSH® RAILS FOR TRAMWAYS

Track performance as a design criterion



Image © Johannes Zimmer

HSH® RAILS FOR TRAMWAYS

TRACK PERFORMANCE AS A DESIGN CRITERION

Trams form the backbone of urban public transportation in many modern metropolises. The ability to combine high transport capacities with competitive costs highlights the attractiveness of this transport system and defines the core requirements for tracks and rails: availability, cost-efficiency, social responsibility, and environmental consciousness.

Drawing on more than 100 years of experience, we offer our customers a unique portfolio of rail steels and profiles for tram applications. Our philosophy has always been focused on customer orientation and sustainable solutions.

Our HSH® grooved rails were specially developed meet the ever-increasing demands in urban environments:

- » 24/7 tram operation
- » Rising sensitivity to noise
- » Economic efficiency

With state-of-the-art steel design, our products achieve the longest service life while minimizing maintenance efforts. The significantly improved resistance to the two main damage mechanisms in tramway systems - wear and corrugation - ensures the maximum service life of our HSH® rails.

We offer a wide range of grooved rail steels with hardness levels ranging from 200 to 400 Brinell.

HSH® Grooved rails – Advantages

- » Longest service life
- » Low-maintenance concepts
- » Slowest corrugation formation – minimal vibrations
- » Short amortization period

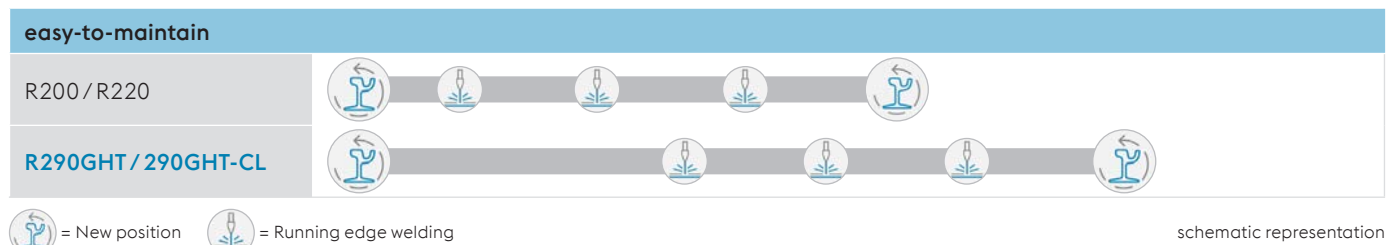
HSH® QUALITY FOR EVERY TYPE OF APPLICATION

Despite the relatively low axle loads of tram vehicles, tight curves in tram networks represent one of the most demanding applications in the wheel-rail contact. Given these high demands and taking into account individual maintenance strategies, voestalpine Rail Technology GmbH has developed tailor-made grooved rail steels for every application:

» easy-to-maintain

Under the premise of “easy-to-maintain”, the grades R290GHT and 290GHT-CL were specifically developed to offer high wear resistance while enabling the simplest gauge-corner repair welding.

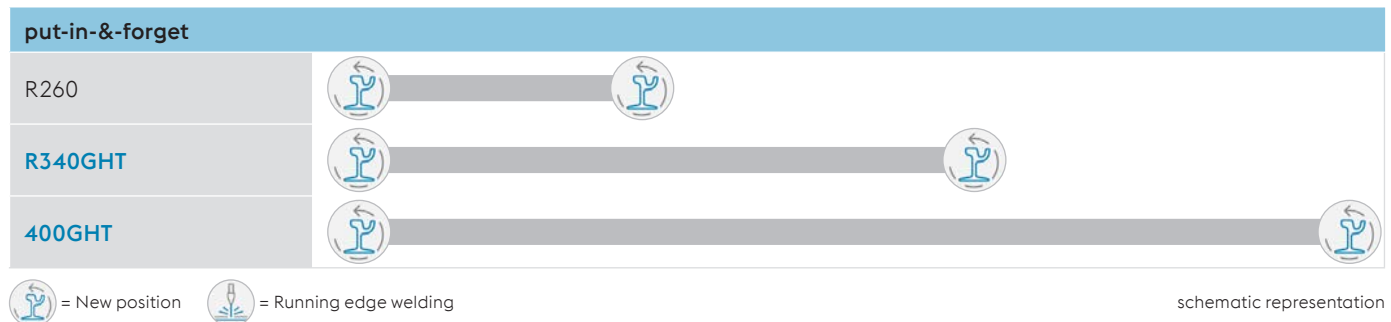
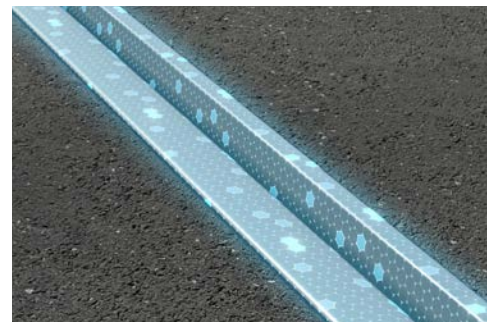
- Simple build-up welding
- Improved service life
- Effective reduction of corrugation

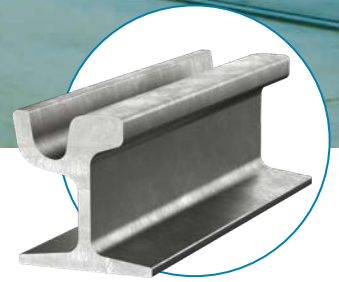


» put-in-&-forget

The term “put-in-&-forget” refers to a strategy that utilizes highly wear-resistant rail steels. For this purpose, voestalpine Rail Technology GmbH has developed the high-strength grades R340GHT and 400GHT®. Thanks to their exceptional wear resistance, they enable long service lives without the need for gauge-corner repair welding.

- Highest wear resistance
- Maximum resistance to corrugation formation
- Minimal maintenance effort
- No gauge-corner repair welding necessary





CHOICE OF RAIL STEEL

voestalpine offers a wide range of grooved rail steels, with suitability for specific maintenance strategies determined by the combination of our HSH® heat treatment concept and specially tailored material designs. Applying our HSH® heat treatment technology to our GHT steels results in grain refinement, significantly improving wear properties without negatively impacting weldability. In addition to increasing the carbon content, HSH® heat treatment is the most efficient method for enhancing wear resistance.

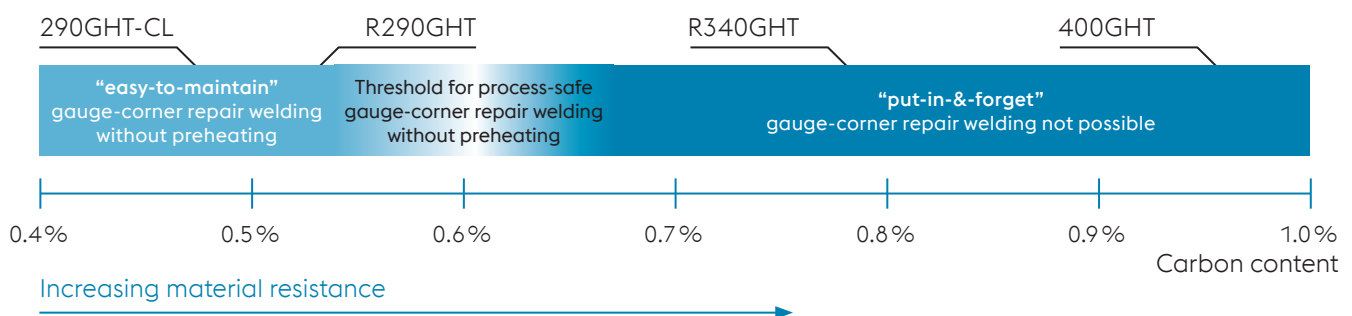
Depending on the maintenance strategy, the appropriate material concept can be selected to meet individual requirements optimally. For gauge-corner repair welding, the carbon content (found in the inspection certificate) is crucial. A carbon content of up to 0.6% is considered process-stable and practical without preheating.

easy-to-maintain

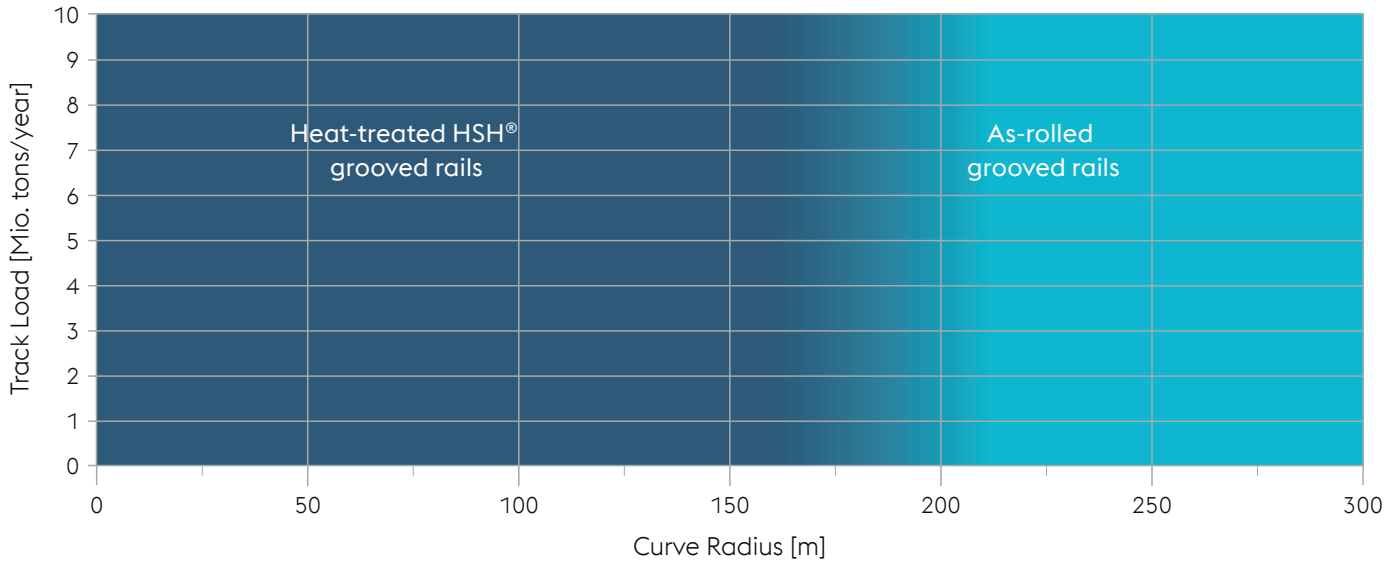
- » The low carbon content of grades 290GHT-CL and R290GHT ensures excellent weldability and allows gauge-corner repair welding comparable to grade R200.

put-in-&-forget

- » The material design of the high-strength rail steels R340GHT and 400GHT® provides the highest wear resistance of any grooved rails available on the market, enabling long service life even without gauge-corner repair welding.

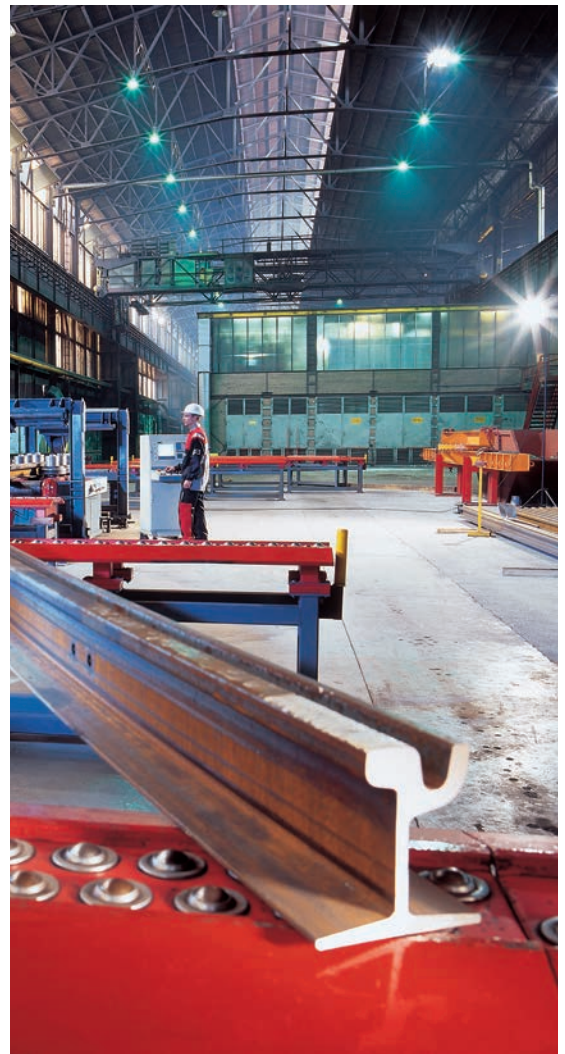


Recommendation for the use of HSH® grooved rails



We recommend the use of our HSH® grooved rails in areas with increased wear and corrugation formation. The appropriate application areas vary from operator to operator, as they depend on various factors such as vehicle running behavior, track geometry, and other conditions. Curves with radii under 150 m, in particular, are subject to higher wear and corrugation formation.

In general, we recommend using HSH® grooved rails in all high-stress areas.



PRODUCT SPECIFICATIONS

Heat-treated HSH® grooved rails are available in all profiles specified by EN14811 as well as in custom profiles according to customer specifications. Additionally, the rails can be pre-bent according to a bending plan provided by voestalpine Rail Technology and drilled for use with tie rods, as requested by the customer. They are characterized by the tightest tolerances for profile, straightness, and flatness, as well as excellent surface quality. These are essential prerequisites for achieving high-quality results in rail bending and ensuring an outstanding track alignment.



HSH® Heat treatment

- » For running and guiding head
- » Maximum wear resistance
- » Highest resistance to corrugation formation

Untreated rail web and base

- » Highest fatigue strength
- » Lowest notch sensitivity

Mechanical Properties

Product name	Description	Hardness of running surface [HBW]	Tensile strength R_m [MPa]	Elongation A_5 [%]	Branding
290GHT-CL	» Non-alloy (C-Mn) HSH® heat-treated	300 ± 20	≥ 960	≥ 11	
R290GHT	» Non-alloy (C-Mn) HSH® heat-treated	310 ± 20	≥ 960	≥ 10	
R340GHT	» Non-alloy (C-Mn) HSH® heat-treated	360 ± 20	≥ 1.175	≥ 9	
400GHT	» Non-alloy (C-Mn) HSH® heat-treated	400 ± 20	≥ 1.280	≥ 8	

Chemical composition

Product name	C [%]	Si [%]	Mn [%]	Cr [%]	P [%]	S [%]	H [ppm]
290GHT-CL	0.40 - 0.50*	0.15 - 0.58	0.70 - 1.20	≤ 0.15	max. 0.02	max. 0.025	max. 2.00
R290GHT	0.50 - 0.55	0.15 - 0.58	1.00 - 1.25	≤ 0.15	max. 0.02	max. 0.025	max. 2.00
R340GHT	0.62 - 0.80	0.15 - 0.58	0.70 - 1.20	≤ 0.15	max. 0.02	max. 0.025	max. 2.00
400GHT	0.90 - 1.05	0.20 - 0.60	1.00 - 1.30	max. 0.30	max. 0.02	max. 0.020	max. 1.50

*Extra low C-content for best weldability (deposit welding)

Detailed information such as product data sheets, profile drawings, or detailed technical descriptions is available upon request. The product management experts are happy to assist you.

Contact – Productmanagement: product_management@voestalpine.com

voestalpine PREMIUM SERVICES

voestalpine offers a unique portfolio of additional customer services including



LOGISTICS

» Our logistics team guarantees smooth rail delivery to its destination by optimization of the entire logistics chain. Our specialities are just-in-time deliveries to any construction site in Europe, as well as oversea deliveries.



WELDING

» Our experts from voestalpine Competence Center Welding (CCW) are constantly working jointly with renowned welding material suppliers to develop and improve rail welding technology.

» Beside trainings in our plant as well as on site, CCW offers also welding inspection to ensure high initial quality of rail welds



TECHNICAL SUPPORT TEAM

Our customer service team assists you in questions of:

- In-track performance evaluation
- Whole track system optimization
- Wheel – Rail interface optimization
- RAMS & LCC consulting



ISO 9001 Quality



ISO 14001 Environment
in accordance with EMAS II



ISO 45001 Safety



ISO 50001 Energy



AT-000183
Verified Environmental
Management

