

PERFORMANCE ON TRACK®

400 UHC® HSH®
PRODUCT LINE

Designed to Resist.



400 UHC® HSH® PRODUCT LINE DESIGNED TO RESIST

Heavy Haul railroads are focusing on a long term perspective on increasing the annual throughput by raising axle loads, train length and train frequencies to utilize the maximum economic benefit. State-of-the-art steel technologies are needed in order to support our customers and further improve the economic efficiency. Rails with easy-to-weld steel designs offer robustness under harshest conditions and require less maintenance with longest service life time are designed by voestalpine for uncompromising heavy haul environments.

voestalpine manufactures these rails of the product line through its worldwide patented HSH® process under the brand 400 UHC® HSH® following a special metallurgic approach. Rails of this steel grade are produced in lengths of up to 120 m and are available in all rail profiles of various standards and specification.

The voestalpine 400 UHC® HSH® rail grade is a fine-pearlitic heat-treated rail grade in accordance with EN 13674-1, with a minimum hardness of 400 BHN.

The brand 400 UHC® HSH® forms a product line of different rails steels. Depending on the respective customer needs and on the very special conditions of a certain railway, the best material concept is identified and a optimum solution can be offered.

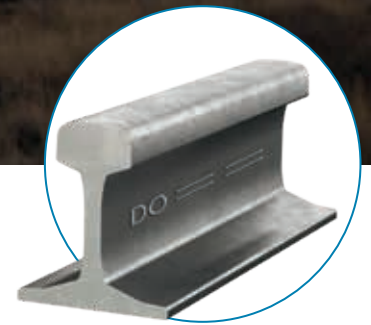
For specific applications tailored solutions under the name

400 UHC® HSH® Product Line

are available and can be found in tracks all over the world.

Customer benefits

- » Significant reduction of rail maintenance costs due to excellent track performance
- » Significant multiplication of the operational rail service lifetime compared to other rail grades
- » Lowest life cycle costs for heavily loaded tracks
- » Easy and safe weldability due to the non-alloy steel design



400 UHC® HSH® PRODUCT LINE RAIL STEEL TYPE FOR INDIVIDUAL CUSTOMER NEEDS

All grades of the product line are variations of the field-proven and widely used rail grade 400 UHC® HSH®, especially developed for individual customer needs and allowing customers to benefit from the outstanding fine pearlitic Super Premium material concept, with best weldability:

» 400 UHC® HSH®

The classic “state-of-the-art” solution for rail freight/heavy haul environments, exhibits a hyper-eutectoid ultra-fine-pearlitic heat-treated microstructure. Already serving in tracks for more than 20 years with maximum customer benefit.

» 400 UHC® CS HSH®

Especially developed to provide individually customized hardness profile while granting the same performance benefit from the outstanding Super Premium material concept.

» 400 UHC® P HSH®

A new high performance upgrade of the world-wide proven rail grade 400 UHC® HSH® featuring an even increased resistance against wear, corrugation and RCF, especially designed for uncompromising heavy haul deployment.

» 400 UHC® XR HSH®

The newest generation of voestalpine’s Super Premium product line provides highest resistance against all degradation mechanisms prevalent in track.



400 UHC® HSH® PRODUCT LINE AREA OF APPLICATION AND PROFILES

The high-strength 400 UHC® HSH® rail grade has been very successfully used in tracks with extreme load for years. It is applied especially in heavy haul transport with axle loads of 40 tons and more and has become the standard grade both for curves and for straight track.

The top performance is proven in extreme environmental conditions from temperatures $-40\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$, as well as in wear aggressive environment with sand in the rail-wheel contact area.



MATERIAL CONCEPT

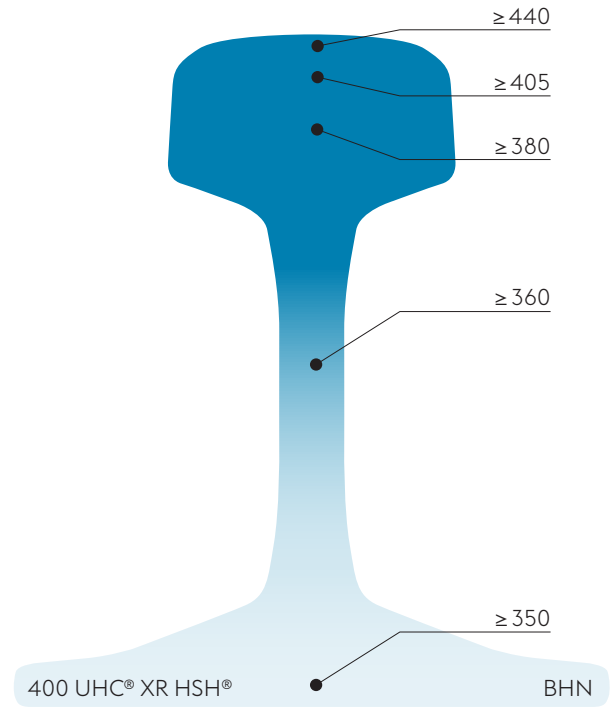
Based on deep technological knowledge and the full understanding of the interaction between microstructure and maximum rail strains, a special pearlitic microstructural concept has been identified as being the concept of choice.

The unique combination of a smart non alloy concept, most modern integrated production processes from raw material to the final rail, leads to a microstructure which exhibits:

- » Strengthened cementite lamellas
- » Very fine and perfectly lamellar structure
- » Small lamellar spacing

This represents a condition of the rail material in the head that is needed for best track performance and that has proven its excellent properties over years.

At the same time the soft web and soft foot ensure highest safety in track.



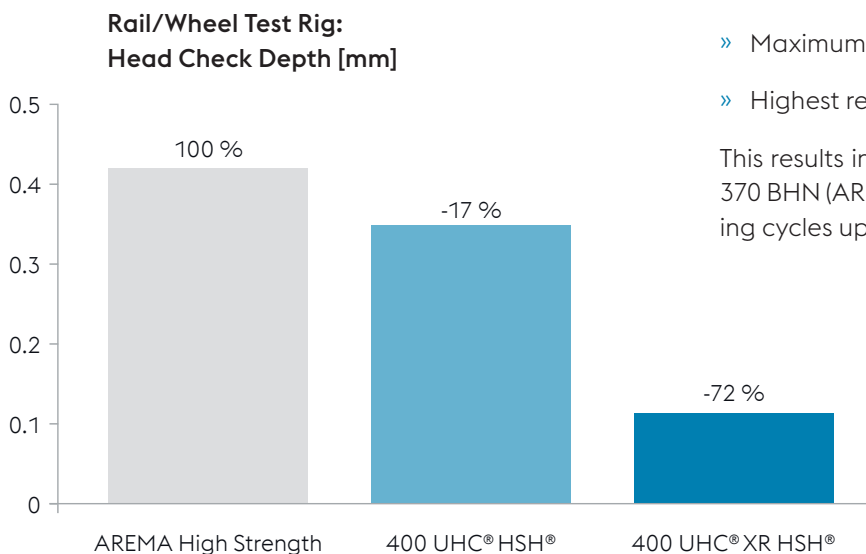
PERFORMANCE

Long-term, worldwide operational experience of heavy-haul railways as well as joint track tests with several Heavy Haul Railways underline the outstanding suitability of this rail grade for heavy haul application.

The excellent characteristics have also been confirmed in the international Heavy Haul Benchmark Test at TTCL. The operational performance of this rail grade is characterized by

- » Highest resistance to wear of all pearlitic rail steels
- » Maximum resistance to formation of corrugation
- » Highest resistance to rolling contact fatigue

This results in up to 100% more lifetime in comparison to 370 BHN (AREMA High Strength) and an extension of grinding cycles up to 3 times.

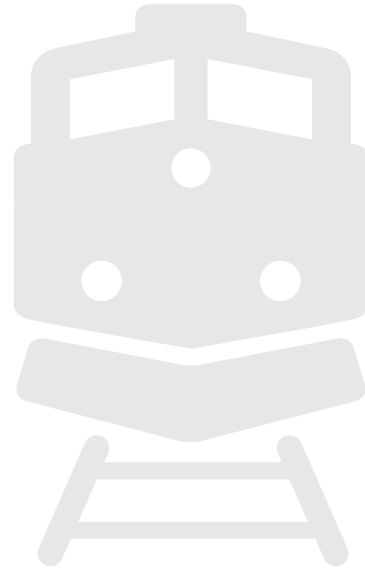


PRODUCT DESCRIPTION

The 400 UHC® HSH® rail grade product line is available in all profiles in accordance with EN, AREMA as well as other common standards and various customer specifications. The rails are available in up to 120 m in weld-free lengths.

The rails are characterised by the tightest tolerances of profile, straightness and flatness (e.g. EN 13674-1; tolerance classes A & X) and the best surface quality.

In the table below the mechanical properties for 400 UHC® XR HSH® are shown. Further information on the properties and compositions of all other steel grades is available on request.



Mechanical Properties

Steel Grade	Surface Hardness [BHN]	Yield Strength [MPa]	Tensile strength R _m [MPa]	Elongation A ₅ [%]	Branding
400 UHC® XR HSH®	440-490	> 870	> 1350	≥ 8	UHC X or

STEEL TECHNOLOGY

For all Super Premium rail steels the HSH® technology allows for highest weldability and toughness by minimizing the amount of alloying elements.



**HSH®
TECHNOLOGY**



**HIGHEST RESISTANCE
AGAINST RCF**



EASY TO WELD



**HIGH WEAR
RESISTANCE**

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



EMAS
AT-000183
Verified Environmental
Management

