

JANUAR 2014

New approaches to compact component design: HSX[®]-steels replace standard steels



The yield point of HSX® 130 is

1300  **N/mm²**

which is some two to three times greater than the yield points of conventional quenched and tempered steels.

HSX®- steels replace standard steels

In the field of drive systems engineering, there is a clear trend towards achieving higher performance from compacter, more energy-efficient designs. Components today are expected to transmit greater forces but without the need for upsizing. In fact, the requirement now is to shrink dimensions so that the resulting design is more compact. The higher-strength HSX®- steels from Steeltec AG offer design engineers a new approach to tackling this problem.

The need for efficient material solutions is becoming increasingly important in the automotive and mechanical engineering sectors and in the hydraulics industry. As a manufacturer of special steels, Steeltec AG – a member of the SCHMOLZ + BICKENBACH GROUP – is helping companies to find cost-efficient alternatives to conventional quenched and tempered steels. Steeltec's HSX® 90 steels exhibit very high strength and outstanding machinability even before they undergo customer processing. HSX®-steels enable the design of lightweight, compacter components. Compared with conventional Q&T steels, Steeltec's family of HSX®-steels do not need to undergo post-machining heat treatment and the associated downstream procedures such as straightening, grinding and deburring. The result is shorter production times and lower parts costs.

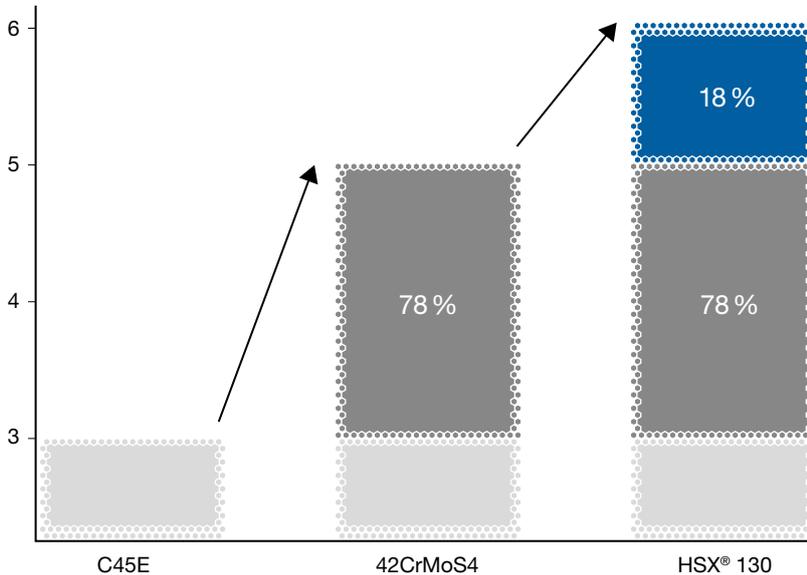
Drive shafts have to meet increasingly rigorous demands

"A drive shaft not only has to transmit higher torque levels as motor power increases, it also has to withstand greater alternating loads", explains Dirk Ochmann, Head of Sales at Steeltec AG. "The material used has to be strong enough to cope with the heavy stresses



Rated torque [kNm]

Shaft diameter: 50 mm



	$R_{p0.2}$ [N/mm ²]	R_m [N/mm ²]
C45E + QT	370	630
42CrMoS4 + QT	650	900
HSX® 130	1'300	1'350

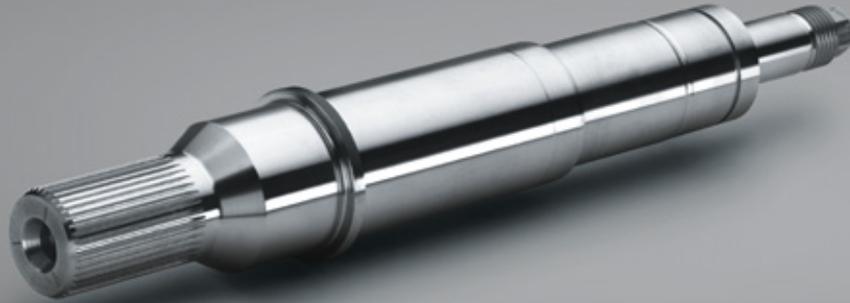
Strength class

the component will face in its operational environment.” The higher strength and the high dimensional stability of Steeltec’s HSX®-steels enable higher performance and/or compacter design even for asymmetrically configured shafts. The benefits become apparent when the material properties of Steeltec’s higher-strength HSX® 130 are compared with those of conventional steels commonly used in the mechanical engineering and automotive sectors. The unalloyed Q&T steel C45E steel is typically used for drive system components that are not subjected to heavy loads. For parts that have to withstand greater stresses, designers tend to select 42CrMoS4 steel.

A drive shaft made from HSX® 130 performs significantly better than shafts with the same dimensions but made from standard quenched and tempered steels.

Designing compact parts

Comparing the performance of these steels in terms of the torque delivered by a drive shaft demonstrates how material properties affect usability. A 50-millimetre-diameter shaft manufactured from HSX® 130 steel can transmit 96 % more torque than an identically sized shaft made from C45E and 18 % more torque than a shaft produced from 42CrMoS4 steel.



Modern drive shafts have to withstand increasingly high alternating loads from ever more powerful drive motors.

Two important parameters influencing the performance of a material are its yield point and its tensile strength. The yield point of HSX[®] 130 is 1300 N/mm², some two to three times greater than the yield points found in conventional quenched and tempered steels. At 1350 N/mm², the tensile strength of HSX[®] 130 is also substantially higher.

The higher strength of HSX[®] 130 is also a key factor in manufacturing compacter components of lower mass. If a drive shaft made from the standard Q&T steel C45E requires a diameter of 40 mm, the diameter of a shaft made from HSX[®] 130 can be reduced by 16.1 mm and thus nearly halved, reducing the mass of the drive shaft by 64 %. For drive shafts subjected to higher loads, replacing 42CrMoS4 steel by HSX[®] 130 reduces the weight of the component by 38 %. A drive shaft made from 42CrMoS4 steel with a diameter of 30.3 mm can be replaced by a shaft manufactured from HSX[®] 130 whose diameter is only 24 mm.

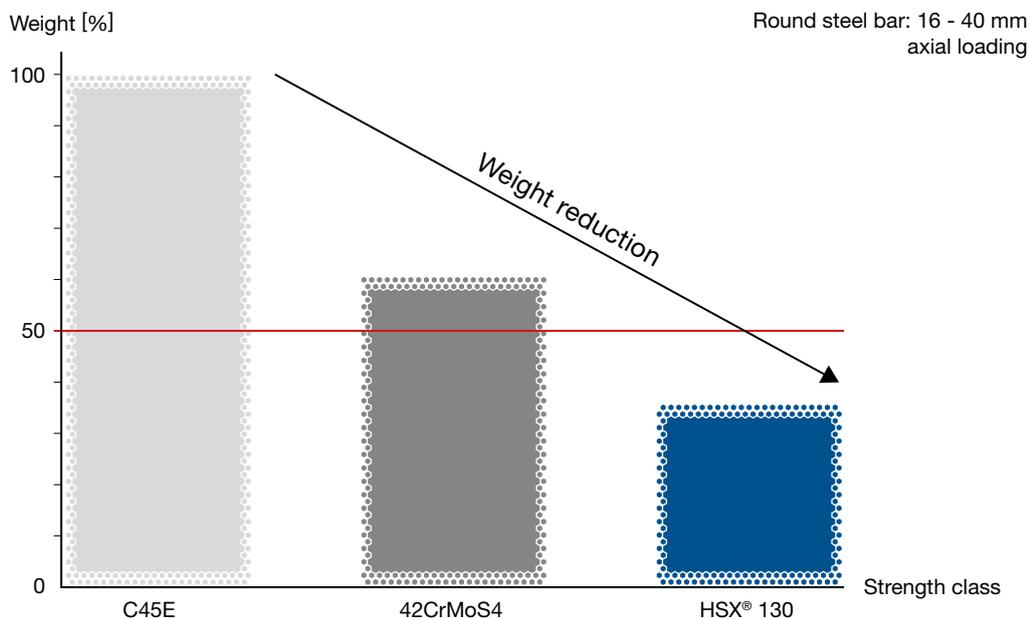
In addition to HSX[®] 130, Steeltec offers two other HSX[®]-steels: HSX[®] 110 and HSX[®] Z12. HSX[®] 110 is used in applications that require high strength and improved toughness. The high toughness of HSX[®] Z12 makes this steel particularly attractive for components that have to transmit large forces and are subjected to high impact stresses.

Major cost savings in the component production process

“At the end of the day, it’s more cost-effective for designers to replace conventional Q&T steels with our special steels,” explains Ochmann. “After all, up to 85 % of the costs of a component are incurred during the manufacturing stage. The key to lower-cost components lies in production process costs and not in the material purchase price. Despite comparatively high material purchasing costs, the use of our HSX[®]-steels makes the manufacturing process significantly more streamlined and therefore cheaper than when conventional quenched and tempered steels are used.” Steeltec’s HSX[®]-steels pass along an optimised automated production line where the material is drawn/peeled, straightened, and cut to length, before undergoing quality control and end machining. HSX[®]-steels from Steeltec already exhibit high strength when supplied to customers, strength that could only be achieved in a Q&T steel by an additional heat treatment stage.

Smaller diameters mean less weight.
Bar diameters can be reduced from 40 mm to

16,1 mm



“At Steeltec, our motto is ‘Contributing ideas!’ and we are happy to work with our customers to develop the high-performance steel solutions that meet their application needs,” underscores Dirk Ochmann.

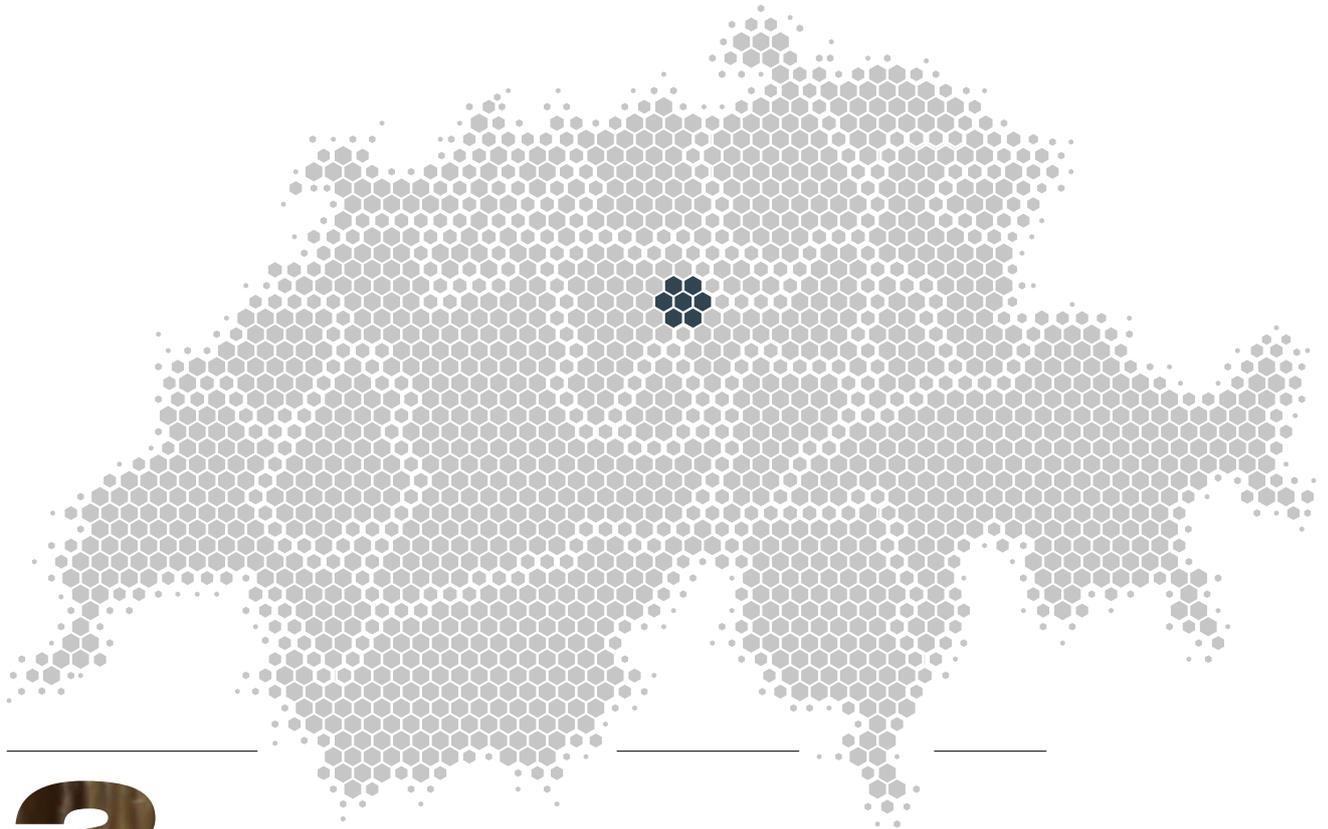
Steeltec AG manages the international distribution of its products via its own subsidiaries in Germany, France and Italy and through the global distribution network of the SCHMOLZ + BICKENBACH GROUP. As a result, Steeltec is never far from its customers, ensuring rapid delivery of its products to clients around the world.

Summary

The higher strength HSX®-steels from Steeltec AG are an economical alternative to conventional Q&T steels. Combining high intrinsic strength, excellent machining properties and shorter processing times, HSX®-steels have the material profile to meet the increasing demand for high-performing, lightweight engineering components. Customers are supplied with a modern, highly efficient material that can help to drive down overall production costs.

If the same performance specifications are used, a component made from HSX® 130 can be designed to be compacter and lighter than a component made from conventional Q&T steels.





2**Production facilities in Emmenbrücke (CH)****250****highly skilled employees**

About Steeltec AG

Making good better! High-strength special steels tailored to meet customer requirements: high-value precision parts coupled with low manufacturing costs.

Steeltec AG is one of Europe's leading manufacturers of bright steels. With its focus on high-strength and higher-strength special steels and special free-cutting steels, Steeltec has established itself as an important partner of the automotive and hydraulic industries and the mechanical engineering sector. Steeltec works closely with customers, suppliers and research institutions to continually improve the production and engineering properties of steel, driving competitiveness across the entire value chain. Working within these partnerships, Steeltec develops high-performance steel solutions that meet its customers' application needs.



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