


# Greater reliability, lower operating costs Universal joint shafts





# Handling extremely high torque levels CH Series

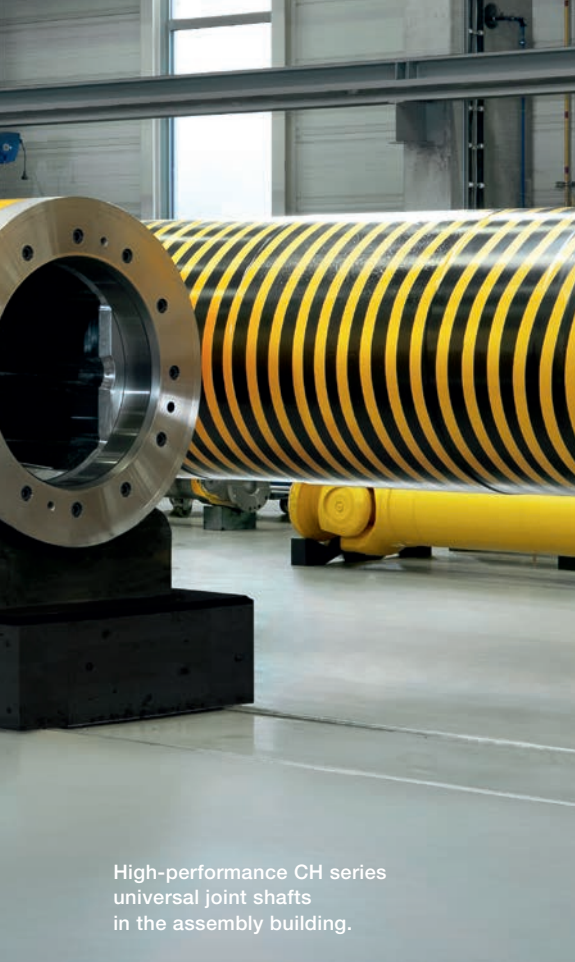
**Ideal areas of application for CH series universal joint shafts are rolling mill drives, mining machinery or systems where the universal joint shafts are subjected to high torque levels. Voith universal joint shafts are always customized to the specific drive requirements. High-performance universal joint shafts from Voith provide high operational reliability and lowest total cost of ownership. Highly trained service engineers are able to provide on-site preventative maintenance work, which is supported by the global network of well-equipped service workshops.**

A number of aspects of the Voith CH series of universal joint shafts together contribute to the low life cycle costs (LCC): high fatigue strength under vibration and long component lifetime, large torque reserves during overloads and a long bearing life combined with a service-friendly bearing concept. The innovative bearing concept improves heavy-duty universal joint shafts with joint diameters of 590 mm to 1 460 mm even further.

## **Forged universal joint shafts increase fatigue strength by up to 30 percent**

Only forged components are used in CH series joints to handle the rough operating conditions encountered especially in rolling mills. Forged steel improves fatigue strength by 20 to 30 percent compared to cast versions. Machining the flange yoke gives decisive advantages in dimensional accuracy and shaping flexibility. Complicated and costly wooden models which are essential for the casting process can be replaced by the flexible transmission of CAD data to the milling machine.

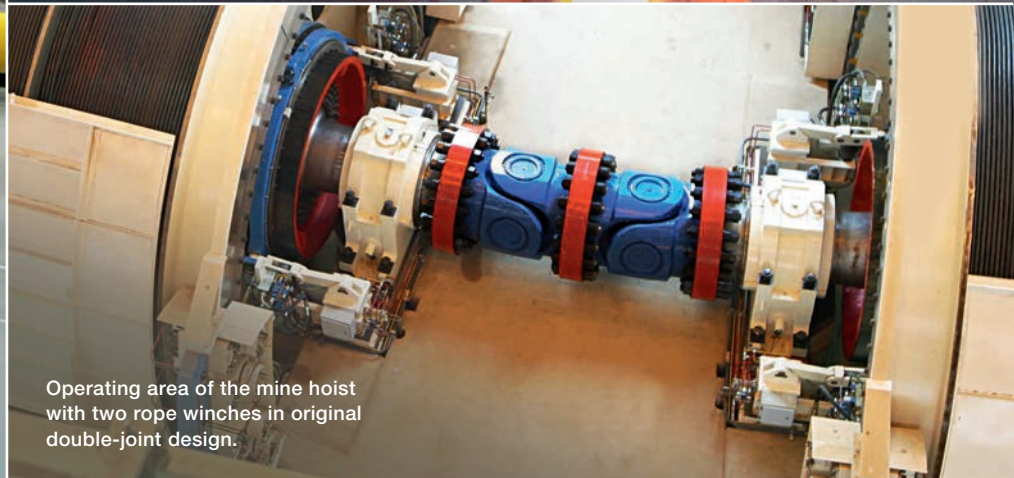




High-performance CH series universal joint shafts in the assembly building.



Beam mill for medium and heavy beam cross sections using Voith high-performance universal joint shafts.



Operating area of the mine hoist with two rope winches in original double-joint design.

### South Korean steel producer capitalizes on the flexibility of Voith forged parts

A Voith CH joint with a joint diameter of 1 220 mm is used in the No. 4 hot strip mill, which was started up in 2014 at the POSCO Gwangyang Works in South Korea. The plant produces 3.5 million metric tons of sheet steel annually with minimum sheet thicknesses of 1.2 mm and sheet widths of between 700 mm and 2 000 mm. POSCO Gwangyang Works was convinced by the performance due to the material strength, the bearing design, the calculation of bearing life and the use of the one-piece bearing hole in the type CH 1220.40 joint. In this case, the specific technical challenge was the short installation space. In order to achieve this, a free-form forged flange yoke with integrated wobbler was designed. The joint has a mass of 15 000 kg.

### Bearing concept provides higher static loads and operational reliability in China

The 1580 hot strip mill has been in operation at Capital Steel in Tangshan, China, since 2010. Until now, Capital Steel has been using Chinese and Japanese universal joint shafts. For the first time, the company has decided to replace these components with Voith shafts for the long term. The basis for their decision to change strategies is Voith's innovative bearing concept combined with the forged flange yokes. The joint has a joint diameter of 1 200 mm.

A universal joint shaft of the CHF 1.080 40/1.200 40 type was used for the first replacement. Consequently, Capital Steel benefits from the special rolling element configuration which has increased the static loads of the radial bearing by up to 18 percent dependent on the design size. In addition, Voith is the only heavy-duty universal joint shaft manufacturer that avoids using screw connections in the bearing unit.

### CH joint with flange yoke and integral forged wobbler



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In use worldwide. Voith universal joint shafts are used in industries around the globe



This further increases the strength and load capacity of the shafts. The CH design only uses two bolts on the bearing cover and they do not have a load-bearing function but rather serve as an anti-twist device. This makes a considerable contribution to operational reliability, as with torque loading, elastic deformations occur in the joint. These deformations can lead to the loosening of screw connections which can cause bolt fractures and eventually even the potential failure of an universal joint shaft.

#### 2.5 km below: a CH joint provides safety in the mine hoist

Voith has already produced a number of cardan shafts used in mine hoists in southern Africa. The expertise we gained in these projects was one of the decisive factors in winning the contract for a hoist system in a copper mine in Zambia. The customer is FLSmidth, the company that equipped Mopani Copper Mines.

A type CH 1320.8 joint is used in the drive system of the hoisting drum. Several factors dictated the sizing of the shaft. Extremely strict safety requirements of the system had to be considered during the design phase. Ultimately, the hoist has to transport people, machinery, heavy operating material and cargo down 2.5 km in just four minutes – and, of course, bring it all back to the surface equally reliably. The high speed of about 18 m/s reached during this process places special demands on the universal joint shaft. To also ensure a long

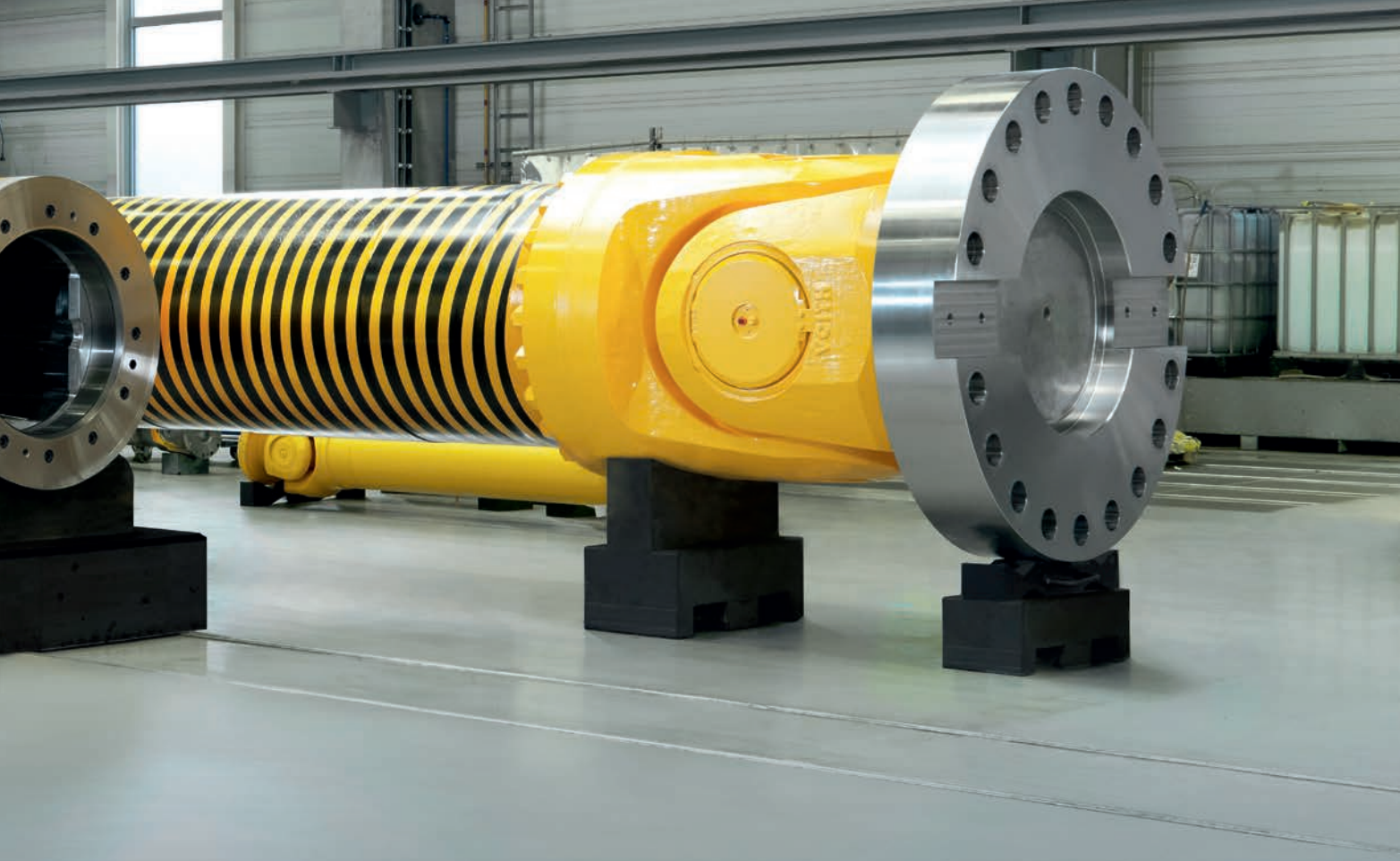
lifetime, CH universal joint shafts with a joint diameter of 1 300 mm were specified. The compact, structural solution in the center section eliminated the need for two connecting flanges. This simplification of the design saves on weight, protects all the components and, at the same time, also makes the universal joint shaft less expensive.

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#### The new design with single-piece forged center section eliminates a flange screw connection







#### U.S. steel producers rely on the new Voith bearing concept

In previous designs, the rolling elements ran directly to the journal cross. As the inner bearing race is subjected to extremely high loads, in the CH series Voith has added a bearing inner ring with an integrated axial bearing. The axial roller bearings provide maximum deformation resistance and ensure uniform load distribution. As a result, the loads of the universal joint shaft are handled reliably, even when faced with high lateral accelerations.

Nucor-Yamato Steel, of Blytheville, Arkansas, USA, relies on the new high-performance universal joint shafts, type CHT 740.40, from Voith in its NYS No. 1 beam mill that was modernized in 2014. These joint shafts transfer the torque from the motor to the work rolls. The forged flange yokes, with optimized geometry, are designed for extreme loads and provide maximum torque capacity.

The lifetime of the components at Nucor-Yamato Steel has increased by 20 percent thanks to the new bearing technology. At the same time, maintenance costs have dropped by 25 to 30 percent. The high-performance universal joint shafts have been equipped with a hydraulic cylinder according to customer specifications. This makes it possible to easily push the roll end sleeve (wobbler) onto the roll neck of the work roll.

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#### CH joint with spindle support (bearing)



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