

lightweight
transmission
components

:CCOR

drive shaft and
flexible coupling in one:
the **flexshaft**



A revolutionary transmission design for torques of up to 10,000 kNm

Multifunctional CFRP component innovatively designed to handle load transfer under the toughest of conditions

The new flexshaft combines the key features of a drive shaft with a coupling – in a single, integrated component. flexshaft torque shafts provide maximum torque strength for high torque transmission, while offering low bending stiffness. As a result, the shaft takes on flexible coupling properties, balancing misalignments between connected components in the drive train. This reduces the number of mechanical components in the design such as couplings, universal joints, bearings, and assembly parts – the types of parts that are prone to wear and often require a lot of maintenance. The unique design for the optimum load transfer allows for transmission of torques of up to 10,000 kNm.

Fit and forget

Our unique composite construction of CFRP and steel is what makes flexshaft drive shafts stand out in terms of function and performance. Ordinary torque shafts made exclusively of steel or in conventional CFRP designs can only match the performance of our torque shafts in more intricate setups, and at much larger weights. What's more, due to its special material properties, CFRP offers a number of advantages for the construction of transmission components: flexshaft drive shafts are corrosion resistant and virtually maintenance free. Also, the relatively low coefficient of thermal expansion for CFRP in comparison to steel guarantees stable running characteristics, even at varying temperatures under a variety of operating conditions.

The innovative, patent-pending design and manufacturing concept behind these unique torque shafts means that our flexshafts can be customised to meet a variety of demands in terms of dynamic load, drive and installation conditions. As a result, the geometric design, as well as the laminate are optimally designed based on transmittable torque, desired torque strength and the bending stiffness outlined in the requirements specification. Axial load forces are ideally absorbed thanks to the fibre orientation in the laminate. State-of-the-art analysis and design tools are used for component engineering.

In a fully integrated, in situ manufacturing process, the entire shaft – including load transfer elements and attachment flanges – is completed in a single manufacturing step, prior to the final cure of the carbon fibre laminate.

This eliminates the need for bonded joints or bolted connections, ensuring a reliable load transfer and enhanced manufacturing consistency. The extraordinary features of flexshaft torque shafts can add up to great benefits for users and operators of drive systems: reduce costs, fit and forget.

01

flexshaft

drive shaft and flexible coupling in one.

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Shipbuilding
Energy
Agriculture
and forestry
Engineering

manufactured by
Schäfer MWN GmbH
www.ccor.com



Features and benefits at a glance

larger spans

thanks to higher specific stiffness

low upfront investment

due to reduced design complexities
and simplified layouts

less assembly effort

by avoiding extraneous mechanical
components

significantly reduced weight

for faster, simplified handling

Application areas:

Ship propulsion
Wind turbines

Hydroelectric power stations
Construction equipment

flexshaft

outstanding damping

for low noise and low vibration operation

maintenance-free

over the complete service life thanks to corrosion
resistance and bearing-reduced design

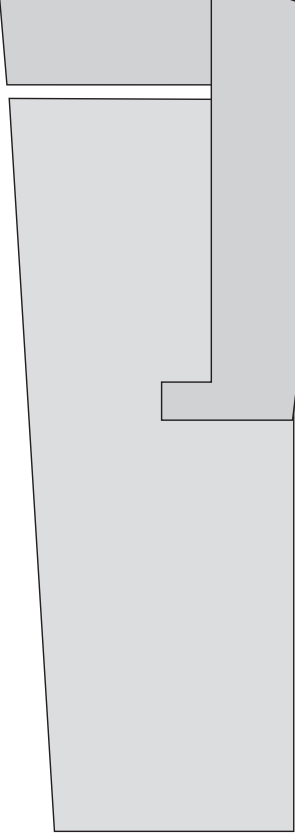
high operational reliability

on account of a fully integrated in situ
manufacturing process and significantly
improved fatigue strength

low energy consumption

due to low inertia torque

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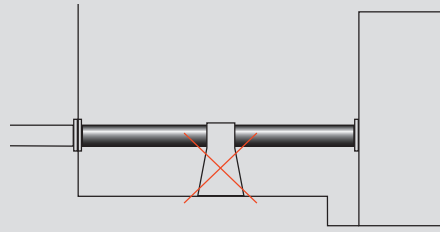
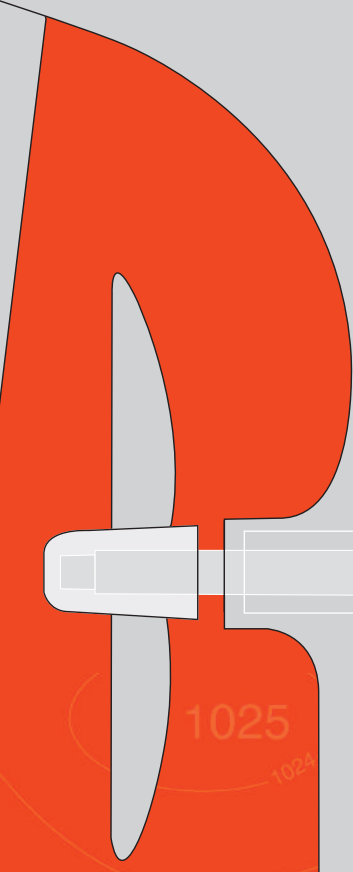
flexshaft drive shafts for **ship propulsion**

Designed for maximum power transmission and maintenance-free operation

Naval vessel power train systems are constantly exposed to varying loads. The flexshaft torque shaft is specifically designed to meet the unique requirements related to the load transmission and vibration dynamics in ships. It enables direct torque transmission from the engine to the propeller and allows for a continuous transmission of torque up to 10,000 kNm. Its low bending stiffness means the flexshaft can compensate angle misalignments and axial displacements, serving as a flexible coupling. This reduces the need for moveable parts that frequently require maintenance, thus dramatically reducing system complexity and mechanical servicing requirements. Thanks to its low density and the resulting high specific stiffness of the CFRP material, flexshaft drive shafts allow for a much longer span distance of up to 13,000 mm, significantly reducing the number of intermediate bearings to support the shaft. As a result, there is significant potential to reduce investments in expensive bearings and supporting elements.

Highly functional drive shafts for reliable and maintenance-free operation on the high seas

The flexshaft is ideal for the specific load requirements of a drive shaft in continuous operation between the ship's engine and the propeller. Its outstanding damping performance ensures propulsion at low-noise and low-vibration levels. Handling and transport are also much easier thanks to the much lighter construction compared to drive shafts made of steel. And thanks to absolutely maintenance-free operation throughout its complete service life, the flexshaft significantly contributes to sea freight profitability.



In naval power transmissions equipped with flexshaft drive shafts, expensive and high-maintenance intermediate bearings can be omitted. Because of their low weight, handling and replacement of flexshaft drives are carried out much easier.



torque max

10,000 kNm

length max

13,000 mm

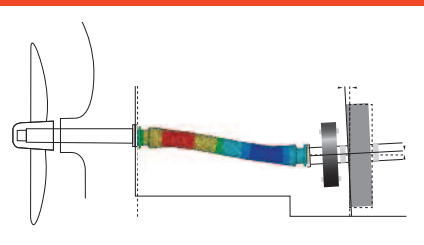
diameter max

1,500 mm

material

CFRP

flexshaft for ship propulsion

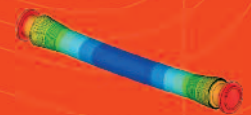


High bending flexibility can balance angle and axial misalignments; shown here, an angle displacement of $2 \text{ rad} \cdot 10^{-3}$ and an axial offset of 17 mm.

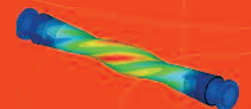
high torque strength
through double tapered design that ensures reliable load transfer from the carbon fibre shaft to the connection flange.



low bending stiffness
to compensate axial and angle displacements



tailor-made torsional stiffness
for best balance between strength and damping



flexshaft 5.0 – winner of the JEC Awards 2013



The flexshaft 5.0 torque shaft for use in offshore wind turbines was distinguished with the JEC Europe Innovation Award 2013 in the Wind Energy category.

For more Information

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